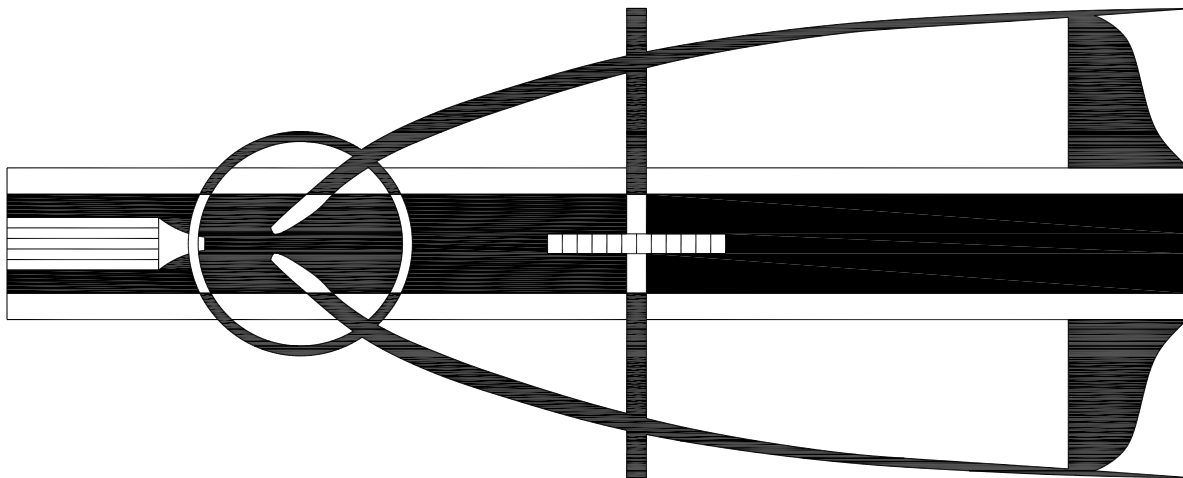


SINGULAIR® BIO-KINETIC®

WASTEWATER TREATMENT SYSTEM MODEL 960

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Singulair Bio-Kinetic wastewater treatment system with all necessary parts and equipment as described in the following specifications. Treatment of the domestic wastewater shall be accomplished by the extended aeration process with non-mechanical flow equalization, pretreatment of the influent, and filtration of the final effluent. The treatment system shall provide primary, secondary, and tertiary treatment of the wastewater flow, and if required, chlorination and dechlorination of the effluent prior to discharge. All treatment processes shall be contained within reinforced precast concrete tankage meeting ACI standard 318-02. The wastewater treatment system shall be a Singulair Model 960 as manufactured by Norweco, Inc., Norwalk, Ohio, USA. Systems utilizing fiberglass, steel, or plastic tankage are subject to floatation when dewatered and shall not be considered for this application.



The wastewater treatment system shall include precast concrete tankage providing separate pretreatment, aeration and final clarification chambers. Principal items of equipment supplied with the system shall be cast-in-place inlet, transfer and outlet ports, outlet coupling, pre-wired electrical control center, mechanical aerator, aerator mounting casting with removable cover, molded plastic vent assembly, Bio-Static sludge return, Bio-Kinetic system mounting casting with removable cover and Bio-Kinetic tertiary treatment device for flow equalization and final filtration of system effluent.

SPECIFICATIONS

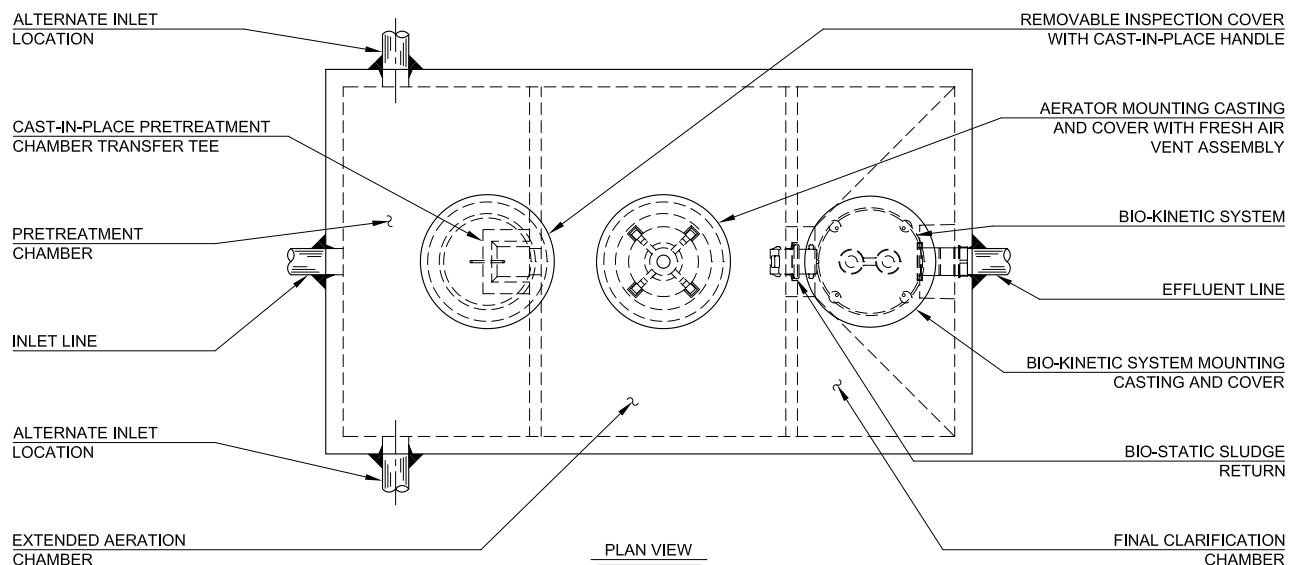
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OPERATING CONDITIONS

Total holding capacity of the system shall provide a minimum of 48 hour retention of the daily flow. The pretreatment chamber shall provide at least 18 hour retention, the extended aeration chamber shall provide at least 24 hour retention, and the clarification chamber shall provide at least 6 hour retention. The non-mechanical flow equalization device shall increase each individual chamber and total system retention time in direct proportion to loading. Design of the system shall include a compartmented tank and non-mechanical flow equalization device to insure successful treatment performance without upset even when the significant runoff period is six hours. Hydraulic design considerations of the system and flow equalization device shall be such that intermittent peak flow factors as high as four shall not upset hydraulic reliability within the system. Capability of the system to perform as outlined, when built by an approved manufacturer, shall be certified by an independent testing laboratory and approved for use by the local governing regulatory agency.

PRETREATMENT CHAMBER

The pretreatment chamber shall be an integral part of the wastewater treatment system. All domestic wastewater shall be preconditioned and flow equalized while passing through the pretreatment chamber prior to being introduced to the extended aeration chamber. The outlet of the pretreatment chamber shall be equipped with a discharge tee that extends vertically into the liquid so that only the preconditioned equalized flow from the center area of the chamber is displaced to the extended aeration chamber. The discharge tee and transfer port shall be of adequate size to handle a peak flow factor of four without restricting the outlet and disturbing hydraulic displacement to the extended aeration chamber. A removable inspection cover shall be cast into the top of the pretreatment chamber to allow tank and transfer tee inspection. As a safety measure, the uncovered opening shall be small enough to insure that the tank cannot be entered for inspection or service.

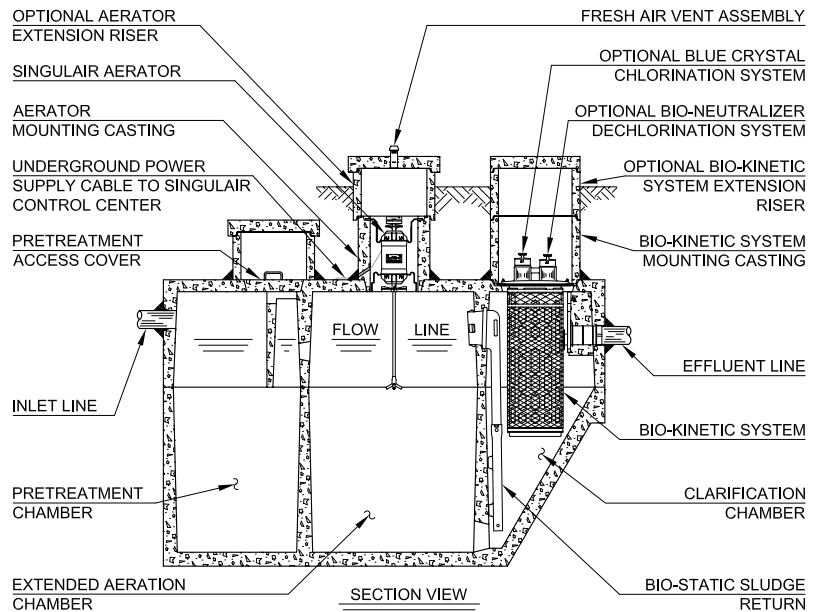


AERATION CHAMBER

The extended aeration chamber shall provide in excess of twenty-four hour retention of the equalized daily flow. The chamber shall be of sufficient size to provide a minimum of eighty cubic feet of tank capacity per pound of applied BOD. The aeration chamber length-width-depth ratio shall be designed to insure uniform tank mixing and provide optimum treatment. The aeration chamber(s) shall be an integral part of the system flow path and constructed of properly reinforced five thousand PSI, twenty-eight day compression strength precast concrete. All castings used to construct the precast concrete tankage shall be monolithic units with external and internal walls incorporated into each section.

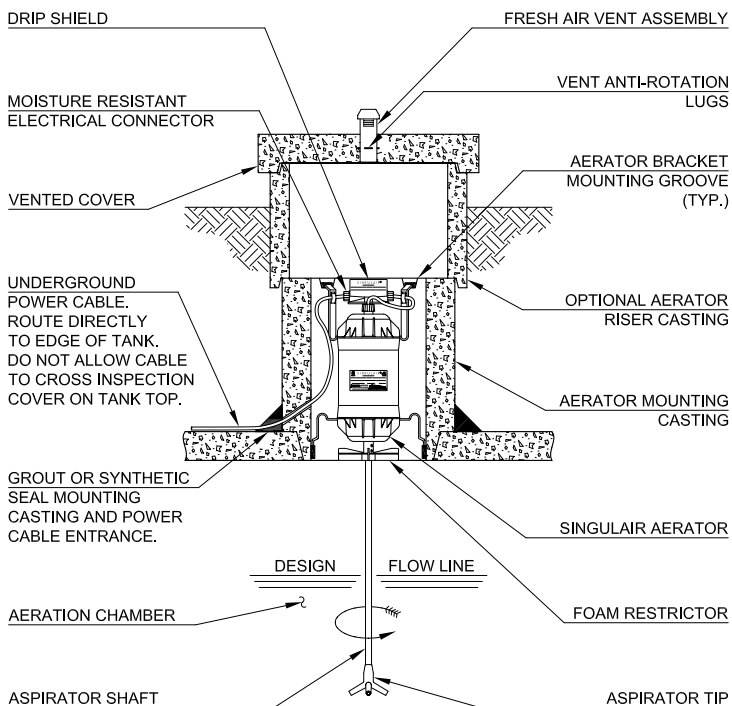
FINAL CLARIFICATION CHAMBER

The final clarification chamber shall consist of five functionally independent zones operating together to provide satisfactory settling and clarification of the equalized flow. An inlet zone shall be provided and shall dissipate transfer turbulence at the flow inlet of the clarification chamber. Its performance shall also eliminate turbulence in other zones of the clarifier. Liquid shall be hydraulically displaced from the inlet zone to the sludge return zone. Here hydraulic currents sweep settled sludge from the hoppers and return these solids via the inlet zone to the aeration chamber. As solids are removed, liquid is displaced to the hopper zone of the clarifier. In this zone, settling by gravity takes place. Three of the four sidewalls are slanted to form a hopper which directs all settled material back to the sludge return zone. Clarified liquid from the hopper zone shall be displaced into the final settling zone to provide additional clarification of the liquid. The liquid is finally displaced to the outlet zone for final filtration and discharge from the system. Non-mechanical equalization of the flow, through all five independent zones, shall provide optimal settling and clarification.



MECHANICAL AERATOR

Each Model 96 Singulair aerator shall be installed in a concrete aerator mounting casting above the aeration chamber. It shall include plated mounting brackets, moisture resistant electrical connector, fractional horsepower motor, molded plastic drip shield, molded plastic foam restrictor, stainless steel aspirator shaft and molded glass-filled nylon aspirator. Only the stainless steel aspirator shaft and molded nylon aspirator shall be installed in contact with the liquid. There shall be no submerged electrical motors, bearings, or fixed air piping in the aeration system. Singulair aerator motors shall be designed not to exceed the motor nameplate rating when installed and operated as recommended for the system. The fractional horsepower aerator motor shall be equipped with a foam restrictor to protect the motor against high water and foam. The motor shall be 4 pole, 1725 RPM, 115 volt, 60 Hertz, single phase, ball bearing constructed with a 1.0 service factor. It shall draw less than 4.0 amps when operating at the rated nameplate voltage. Aerator motors operating at speeds in excess of 1800 RPM experience increased bearing wear, increased operating costs and heat build up and shall not be considered for this application.



FRESH AIR VENTING SYSTEM

The fresh air supply for the Singulair system shall be provided through a molded plastic vent assembly cast into the concrete access cover above the aerator. Fresh air shall be drawn into the vent assembly through slotted screening ports molded into the vent body and circulated through the drip shield into the aerator intake port. Fresh air shall be drawn down the hollow motor shaft through the intermediate shaft and stainless steel aspirator shaft for infusion into the liquid through the molded nylon aspirator. The plastic aerator vent assembly shall be an epoxy-joined, two-piece assembly to eliminate the possibility of cap loss or removal. The concrete access cover shall weigh in excess of seventy-five pounds to discourage unauthorized access.

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ELECTRICAL CONTROL CENTER

Model 96 electrical controls shall be mounted in an injection molded, lockable, corrosion proof enclosure for protection of wiring and components. The enclosure shall be equipped with a tamper evident seal to discourage unauthorized access. Each Singlair control center shall be as manufactured by Norweco, Inc., Norwalk, Ohio, USA, and shall include a manually resettable circuit breaker, selector switch, red warning light and audible alarm (to indicate unprogrammed interruption of aerator operation), internal grounding lug, control wiring and nameplate with distributor address and telephone number.

TIME CLOCK

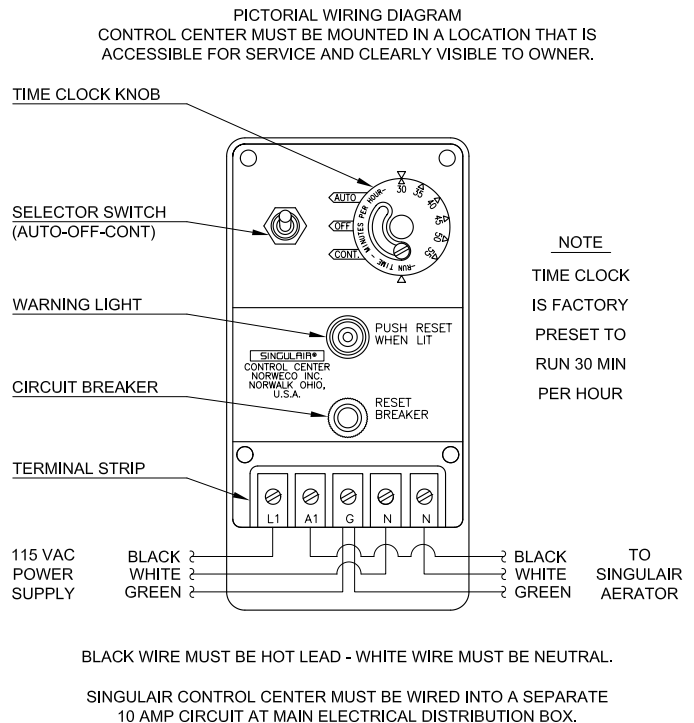
The aerator run cycle shall be controlled by the use of an adjustable time clock. Each time clock shall be supplied as a pre-wired integral component of the control center. The minimum time clock setting shall not permit the aerator to be "off" for more than 30 minutes per hour. It shall be adjustable in 5 minute increments and designed such that any adjustment results in additional run time up to 55 minutes per hour. Full-time operation (60 minutes per hour) is achieved by moving the selector switch to the "continuous" position. Use of a time clock can seriously affect treatment system performance and operating cost. Therefore, systems that have not been performance certified at the minimum time clock setting by an independent testing laboratory shall not be considered for this application.

BLUE CRYSTAL® CHLORINATION SYSTEM (Optional)

The wastewater treatment system shall be furnished complete with a six-month supply of Blue Crystal disinfecting tablets installed in the chlorine feed tube of each Bio-Kinetic tertiary treatment device. Blue Crystal tablets shall be specifically formulated for consistent chlorine dosage and effluent disinfection to the sustained, variable and intermittent flows that are typical of domestic wastewater treatment systems. The tablets shall be manufactured from pure calcium hypochlorite and shall contain a minimum of 70% available chlorine. Each tablet within the feed tube shall be 2⁵/₈" diameter, compressed to a 1" thickness, weigh approximately 5 ounces and be white in color with blue crystals for easy identification. All flow through the Bio-Kinetic system shall contact the Blue Crystal tablets. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chlorine.

BIO-NEUTRALIZER® DECHLORINATION SYSTEM (Optional)

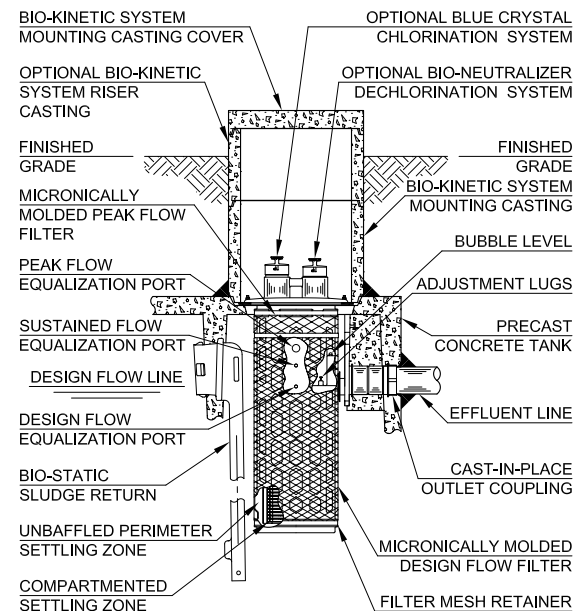
The wastewater treatment system shall be furnished complete with a six-month supply of Bio-Neutralizer dechlorination tablets installed in the dechlorination feed tube of each Bio-Kinetic tertiary treatment device. The dechlorination tablets shall contain active ingredients specially formulated to chemically neutralize both free and combined chlorine. Each tablet within the feed tube shall be 2⁵/₈" diameter, compressed to a 1³/₁₆" thickness, weigh approximately 5 ounces and be green in color for easy identification. All flow through the Bio-Kinetic system shall contact the Bio-Neutralizer tablets prior to discharge. The tablets shall dissolve slowly, releasing controlled amounts of chemical for the instantaneous removal of residual chlorine from the system effluent. The dechlorination rate shall be automatic and flow dependent. Periods of high flow shall expose more tablets to the liquid passing through the system and during periods of low flow, fewer tablets shall be exposed. Dechlorination tablets other than those specifically designed for use in the Bio-Kinetic system shall not be considered for this application.



SPECIFICATIONS

BIO-KINETIC® SYSTEM

A Bio-Kinetic system shall be installed in the system mounting casting(s) above the outlet zone of the clarification chamber. Each Bio-Kinetic system shall provide non-mechanical flow equalization through all plant processes including pretreatment, aeration, clarification, tertiary filtration, chlorination and dechlorination to insure acceptable treatment results. The assembly shall be supplied with locking lugs and removable moisture/vapor shield and shall consist of a design flow and peak flow micronically molded filter, baffled perimeter settling zone, non-mechanical flow equalization, flow distribution deck, lifting handles, level indicator, adjustment lugs, optional chlorination feed tube, unbaffled perimeter settling zone, solids contact zone, vertical inlet zone, compartmented settling zone consisting of forty-two baffled chamber plates, effluent stilling well, final discharge zone, adjustable outlet weir, optional dechlorination feed tube, outlet zone and gasketed discharge flange. All components shall be manufactured from inert synthetic material or rubber, assembled in circular fashion and connected to a plastic outlet coupling. The outlet coupling shall accept a 4" diameter, Schedule 40, PVC discharge pipe. Each Bio-Kinetic system shall be installed in a vertical position so that the inverts of the design flow equalization ports are located at the normal liquid level of the clarifier. If intermittent flow rates exceed the capacity of the design flow ports, flow shall be held upstream until the intermittent flow dissipates or continues to increase. If the intermittent flow continues to increase, the liquid level may reach a pair of sustained flow equalization ports. With four ports in use, flow through the system increases while continuing to provide non-mechanical flow equalization to all upstream and downstream processes. Peak flow equalization ports are supplied but should not be required in a properly sized system. Optional Blue Crystal and Bio-Neutralizer tablet feed tubes shall be positioned such that the flow-activated chemical cannot make contact with the liquid upstream of the feed tubes.



FLOW EQUALIZATION

The wastewater treatment system shall include a non-mechanical, demand use, flow equalization device. The device shall control normal residential flow rates and reduce typical residential flow surges (e.g. shower @ 10 minutes duration, bathtub discharge @ 5 minutes duration, clothes washer discharge @ 2 minutes duration, and dishwasher discharge @ 2 minutes duration). The flow equalization rate shall be dependent upon the specific loading pattern and the duration of flow surges. At the 500 gallon per day NSF Standard 40 design loading schedule, minimum performance of the device shall equalize daily flow an average of 48%. Flow equalization devices not capable of this level of performance and/or incorporating electro-mechanical equipment that increase operating costs shall not be considered for this application.

BIO-STATIC® SLUDGE RETURN

A Bio-Static sludge return shall be installed in the cast-in-place opening(s) in the aeration/clarification chamber wall to provide positive return of settled solids. Each Bio-Static sludge return shall be located such that the inlet end invert, in the aeration chamber, is mounted one inch below the invert of the design flow equalization ports in the Bio-Kinetic tertiary treatment device (submerged one inch below design flow liquid level). Aeration chamber hydraulic currents shall enter the sludge return(s) and be directed through the Bio-Static device into the second zone of the clarification chamber. The hydraulic currents containing the settled and resuspended sludge shall be directed through the clarification chamber inlet zone and returned to the aeration chamber. The Bio-Static sludge return shall accomplish resuspension and return of settled solids without disturbing the clarified liquid in the final settling zone and outlet zone. Each Norweco Bio-Static sludge return shall be manufactured from inert synthetic material and be permanently mounted in the aeration/clarification chamber wall without separate external fasteners or mounting brackets. Each sludge return shall be a passive hydraulic device with no moving parts. Electro-mechanical sludge return equipment requires system dewatering for maintenance and shall not be considered for this application.

WARRANTY AND EXCHANGE PROGRAM

The manufacturer shall provide a two year limited warranty for each Singulair aerator, control center, Bio-Kinetic system and any other Singulair components purchased from the manufacturer. A comprehensive exchange program offers Singulair owners an additional forty-eight years of equipment protection. The distributor shall provide warranty and exchange program details to the regulatory agency, contractor and customer as required.



EQUIPMENT MANUFACTURER

The equipment specified herein shall be the product of a manufacturer having a minimum of seven years experience in the construction of prefabricated wastewater treatment equipment and systems. Bids shall be prepared on the basis of the equipment and material specified herein for purposes of determining the low bid. This is not done, however, to eliminate other products or equipment of equal quality and efficiency. If equipment is to be substituted, approval of such substitution must be made prior to execution of any order. It is assumed that substitution will result in a reduction of cost to the contractor and that if accepted, these savings will be passed along by a reduction in the base bid.

SINGULAIR® MODEL 960 DATA CHART

Designation: Model 960-	500 GPD	750 GPD	1000 GPD	1250 GPD	1500 GPD
Daily Treatment Capacity (Gallons Per Day)	500	750	1000	1250	1500
Total System Capacity (Gallons)	1300	1600	2300	2850	3400
Number of Singulair Aerators	1	1	2	2	2
Number of Bio-Kinetic Systems	1	2	2	3	3
Number of Bio-Static Sludge Returns	1	1	1	2	2
Drawing Number (PC-5)	7006	7007	7008	7009	7010

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