

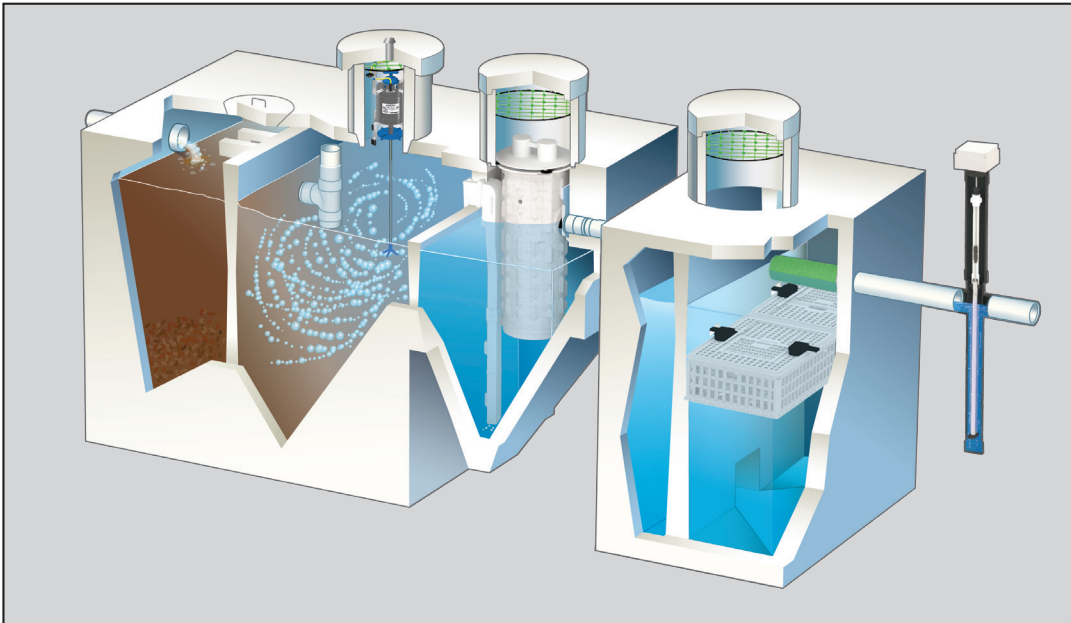
***norweco***<sup>®</sup>

**SINGULAIR<sup>®</sup> BIO-KINETIC<sup>®</sup>**  
**WATER REUSE TREATMENT SYSTEM**  
**MODEL R3**

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**GENERAL SPECIFICATIONS**

The contractor shall furnish and install one complete Singulair R3 water reuse 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, attached growth filtration and disinfection of the final effluent. The treatment system shall provide primary, secondary and tertiary treatment of the wastewater flow with polishing and ultraviolet disinfection of the effluent prior to discharge. All treatment processes shall be contained within reinforced precast concrete tankage meeting the requirements of ACI Standard 318. The wastewater treatment system shall be a Singulair Model R3 as manufactured by Norweco, Inc., Norwalk, Ohio, USA.



The R3 system shall include precast concrete tankage providing separate pretreatment, aeration, clarification and final effluent polishing. The tankage shall be furnished with cast-in-place inlets, submerged transfer ports, aerator mounting casting with safety net and removable cover, cast-in-place molded plastic vent assembly, cast-in-place outlet coupling, Bio-Kinetic system mounting casting with safety net and removable cover and Bio-Film Reactor riser casting with safety net and removable cover. Principal items of electro-mechanical equipment supplied with the system shall be a 1725 RPM mechanical aerator, UL Listed Service Pro electrical control center, Bio-Static sludge return, Bio-Kinetic tertiary treatment device for flow equalization and filtration, Bio-Film Reactor with 500-F filter and a Model AT 1500 ultraviolet disinfection system.

**SPECIFICATIONS**

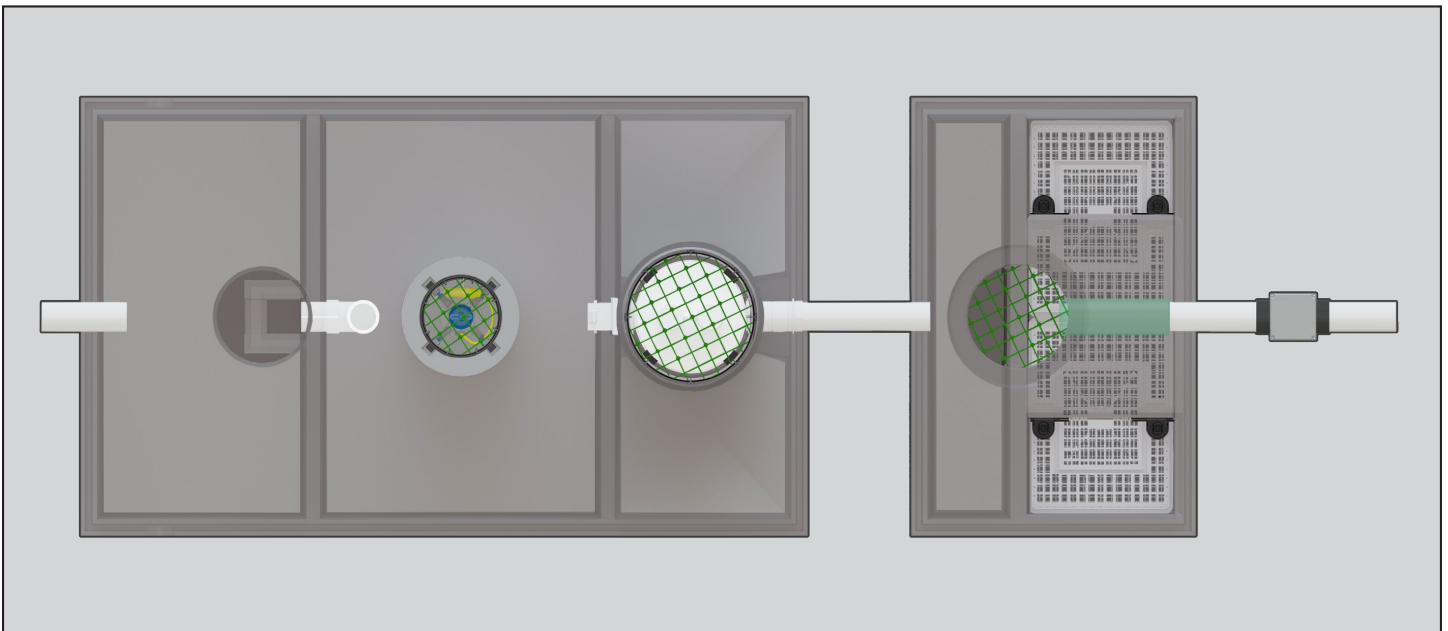
# SINGULAIR® R3

## OPERATING CONDITIONS

Total holding capacity of the system shall provide a minimum of 60 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, the clarification chamber shall provide at least 6 hour retention and the Hydro-Kinetic Bio-Film Reactor shall provide at least 12 hour retention. The non-mechanical flow equalization device shall increase retention time in direct proportion to loading. Design of the system shall insure successful treatment performance without upset even when the significant runoff period is six hours. Hydraulic design considerations shall be such that intermittent peak flow factors as high as four shall not upset hydraulic reliability within the system. All access openings shall have the ability to be equipped with a safety device to prevent accidental entry. 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.

## CERTIFIED PERFORMANCE

The system shall be performance certified to meet all requirements of NSF/ANSI Standards 40, 245 and 350 by an independent, ANSI accredited, third-party testing facility. The system shall achieve less than 10 mg/L Carbonaceous Biochemical Oxygen Demand (CBOD), less than 10 mg/L Total Suspended Solids (TSS), less than 5 NTU Turbidity, and disinfect E. Coli to below a geometric mean of 14 MPN/100 ml. Total Nitrogen (TN) shall also be reduced by greater than 50% to less than 19 mg/L in the effluent. The system shall be eligible for 2 points from the US Green Building Council under the LEED BD+C: New Construction v.3 program, and shall earn 20 points from the NAHB/ICC/ASHRAE 700-2015 National Green Building Standard. Systems incapable of meeting these effluent quality parameters, or unable to achieve these Green Building credits, do not provide the desired level of safety and protection for water reuse and shall not be considered for this application.



## PRETREATMENT CHAMBER

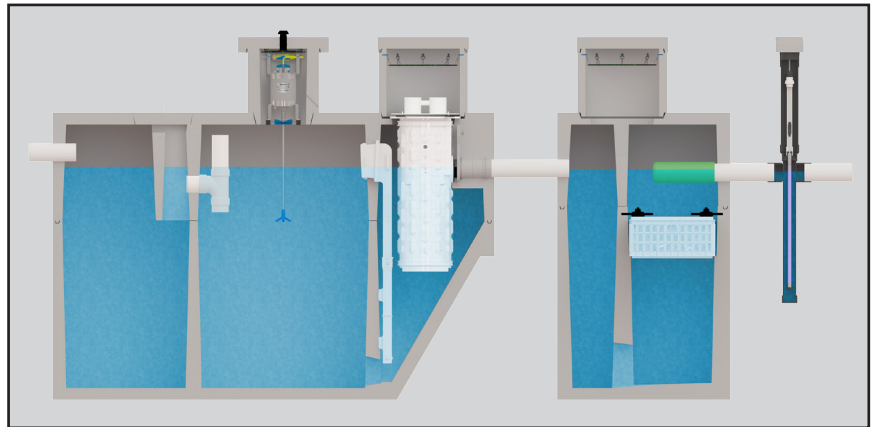
The pretreatment chamber shall be an integral part of the wastewater treatment system. All domestic wastewater shall be preconditioned and flow equalized while passing through the pretreatment chamber. The outlet of the pretreatment chamber shall be equipped with a discharge tee that extends vertically into the liquid so that only the preconditioned equalized flow from the center area of the chamber is displaced to the extended aeration chamber. 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 24 hour retention of the equalized daily flow. The chamber shall be of sufficient size to provide a minimum of 80 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 5,000 PSI, 28 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.

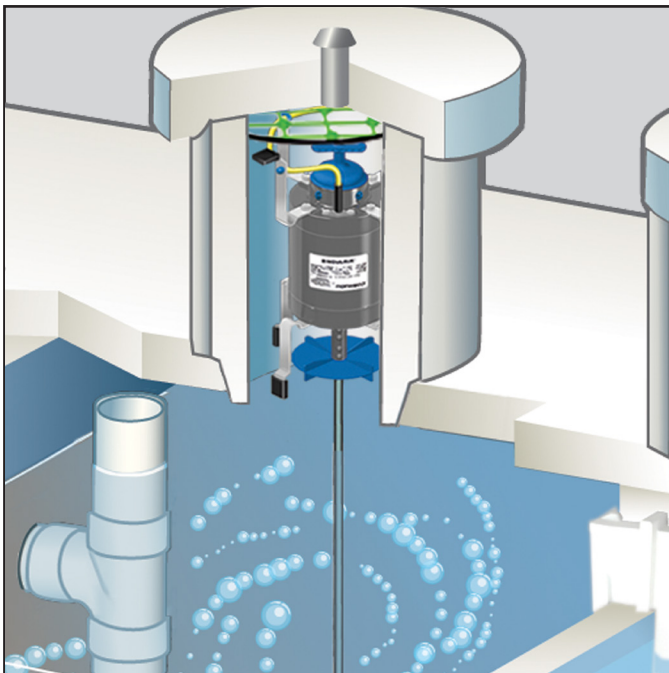
## FINAL CLARIFICATION CHAMBER

The final clarification chamber shall consist of 5 functionally independent zones to provide satisfactory settling of the equalized flow. An inlet zone shall be provided and shall dissipate transfer turbulence at the flow inlet of the clarification chamber. Liquid shall be hydraulically displaced from the inlet zone to the sludge return zone. A Bio-Static sludge return shall be installed into the cast-in-place opening(s) in the aeration/clarification chamber wall to provide positive return of settled solids. Hydraulic currents shall sweep settled sludge from the hopped walls 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. 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 shall provide optimal settling and clarification.



## MECHANICAL AERATOR

Each Singlair aerator shall be installed in a concrete aerator mounting casting above the aeration chamber. Fresh air shall be supplied through a molded plastic vent assembly cast into the concrete access cover above the aerator. The Singlair aerator shall include plated mounting brackets, NEMA 6 rated electrical connector, UL recognized fractional horsepower motor, molded plastic lifting handle, molded plastic air intake screens, molded plastic foam restrictor, stainless steel aspirator shaft and molded glass-filled nylon aspirator tip. The motor shall contain precision manufactured o-ring type seals installed between the motor shell and the machined aluminum endbells to insure watertight integrity is maintained. Molded Viton elastomer shaft seals shall be utilized to protect the bearings from contamination. Only the stainless steel aspirator shaft and glass-filled nylon aspirator tip shall be installed in contact with the liquid. There shall be no submerged electrical motors, bearings or fixed air piping in the aeration system. Singlair 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 without UL recognition have not demonstrated compliance with international electrical standards for safety and reliability and shall not be considered for this application.



# BIO-KINETIC®

## SERVICE PRO® ELECTRICAL CONTROL CENTER

The Service Pro electrical control center with MCD technology shall provide Monitoring, Compliance and Diagnostic functions for the Singlair R3 treatment plant using a microprocessor based platform. The Service Pro control center shall contain nonvolatile memory to prevent loss of programming in the event of a power failure. The pre-wired controls shall be mounted in a lockable NEMA rated enclosure designed specifically for outdoor use. Each Service Pro control center shall be a UL Listed assembly and shall include a time clock, alarm light, reset button, power switch, power light, phone light, aerator alarm light and three auxiliary alarm lights. The control center shall monitor all treatment system operating conditions including aerator over current, aerator under current and open motor circuit. In the event the control center detects one of these conditions, power to the aerator shall be interrupted, a diagnostic sequence shall begin and the visual alarm shall activate. After a programmed recovery interval, an automatic restart attempt shall be initiated. If normal aerator operation does not resume during 24 programmed recovery and restart cycles, the audible alarm shall activate and the telemetry system shall report the specific condition to the Service Pro monitoring center. In the event that any of the auxiliary inputs detect abnormal operation of the treatment system auxiliary equipment, the audible and visual alarms shall immediately activate and the telemetry system shall report the alarm condition to the monitoring center. The service provider shall automatically be notified by the Service Pro monitoring center of the specific alarm condition using phone, fax or email.



## TIME CLOCK

The aerator run cycle shall be controlled by an adjustable, pre-wired time clock. The minimum 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 "continuous" operation (60 minutes per hour). Use of a time clock can seriously affect system performance and operating cost. 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.



## SERVICE PRO® MONITORING CENTER

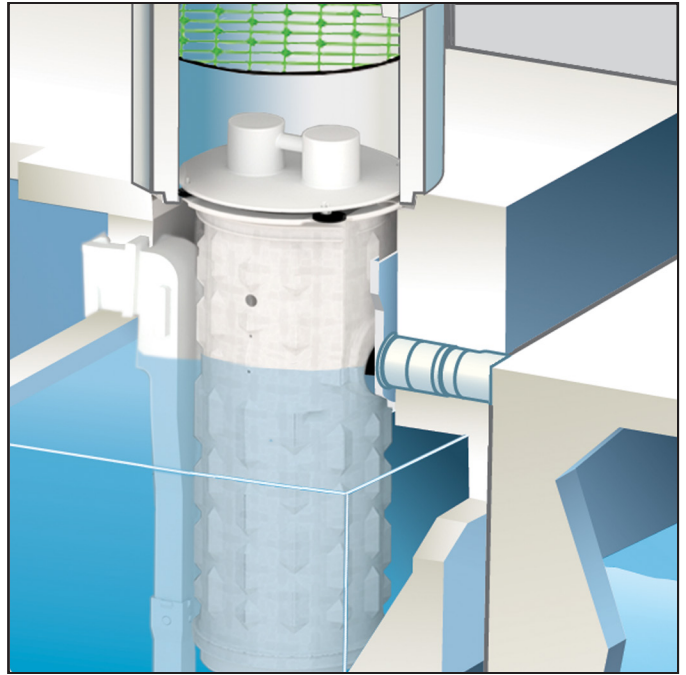
The Service Pro monitoring center shall include a 128 bit encrypted password protected website for interface with the monitoring center database. Access to the secure website shall be obtained through a unique user name and password that provides tiered access to data from monitored treatment systems. Access level tiers shall include distributors, service providers, regulatory agencies and individual system owners. Distributors and service providers shall be able to create accounts, enter serial numbers for system equipment, maintain service records and grant regulatory agencies access to the information. The monitoring center shall have the capability to schedule future service inspections and provide notification. Individual system owners shall be able to view information regarding their own systems, as well as download instructional information. Integrity of stored data shall be maintained through the use of multiple servers operating in geographically isolated locations.



# SPECIFICATIONS

## BIO-KINETIC® SYSTEM

A Bio-Kinetic system shall be installed below the safety net in the mounting casting(s) above the clarification chamber. Each system shall provide non-mechanical flow equalization through all plant processes. 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, flow distribution deck, lifting handles, level indicator, adjustment lugs, unbaffled perimeter settling zone, solids contact zone, vertical inlet zone, compartmented settling zone consisting of 42 baffled chamber plates, effluent stilling well, final discharge zone, adjustable outlet weir, outlet zone and gasketed discharge flange. All components shall be manufactured from inert synthetic materials or rubber, assembled in circular fashion and connected to a plastic outlet coupling. The outlet coupling shall accept a 4" diameter, Schedule 40, PVC pipe. Each Bio-Kinetic system shall be installed with the inverts of the design flow equalization ports 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. 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 flow equalization to all upstream and downstream processes. Peak flow equalization ports are supplied but should not be required in a properly sized system.



## 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. The flow equalization rate shall be dependent upon the specific loading pattern and the duration of flow surges. At the 600 gallon per day NSF Standard 40 design loading schedule, minimum performance of the device shall equalize daily flow an average of 50%.

## HYDRO-KINETIC BIO-FILM REACTOR®

The Hydro-Kinetic Bio-Film Reactor shall provide final treatment of the effluent to a near pristine state. Flow equalized liquid from the clarifier shall enter the influent chamber, travel down and be evenly distributed beneath the filtration media. The effects of gravity shall cause solids to settle to the bottom of the tank. As liquid travels up through the proprietary attached growth media, further reduction of organic matter shall take place. Additional settling and consolidation of solids shall take place downstream of the filter media. After passing through the filtration media for final polishing, the highly treated liquid shall flow through the 500-F filter for fine particulate removal before exiting the Bio-Film Reactor through the outlet tee.

## MODEL AT 1500 ULTRAVIOLET DISINFECTION SYSTEM

The system shall be furnished complete with a Model AT 1500 ultraviolet disinfection system. The Model AT 1500 system shall incorporate a turbulence inducer and dual-pass design to insure bacteria receive maximum exposure to the ultraviolet light source. The ultraviolet disinfection system shall be UL Listed under Standard 979 as a residential treatment device and shall include a disinfection chamber, turbulence inducer, extension riser, quartz tube, Teflon cover, ultraviolet bulb and controls. An interlock switch shall be furnished to automatically disable the ultraviolet light source when the disinfection chamber is accessed. Ultraviolet disinfection systems without a residential UL Listing have not demonstrated compliance with international electrical standards for safety and reliability and shall not be considered for this application.

## WARRANTY AND EXCHANGE PROGRAM

The manufacturer shall provide a three year limited warranty for each Singulair aerator, Service Pro control center and Bio-Kinetic system purchased from the manufacturer. A comprehensive exchange program offers Singulair R3 owners a lifetime of equipment protection. All other system components are backed by a two year limited warranty. 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 R3® DATA CHART

Designation: Model R3-	500 GPD	750 GPD	1000 GPD	1250 GPD	1500 GPD
Daily Treatment Capacity (Gallons Per Day)	500/600	750/800	1000	1250	1500
Total System Capacity (Gallons)	1720	2020	3140	3690	4240
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
Number of Bio-Film Reactors	1	1	2	2	2
Drawing Number (PC-5-)	1187	1188	1189	1190	1191

## PROGRESS THROUGH SERVICE SINCE 1906

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and wastewater treatment*

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220 REPUBLIC STREET  
NORWALK, OHIO, U.S.A. 44857-1156  
TELEPHONE (419) 668-4471  
FAX (419) 663-5440  
[www.norweco.com](http://www.norweco.com)

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