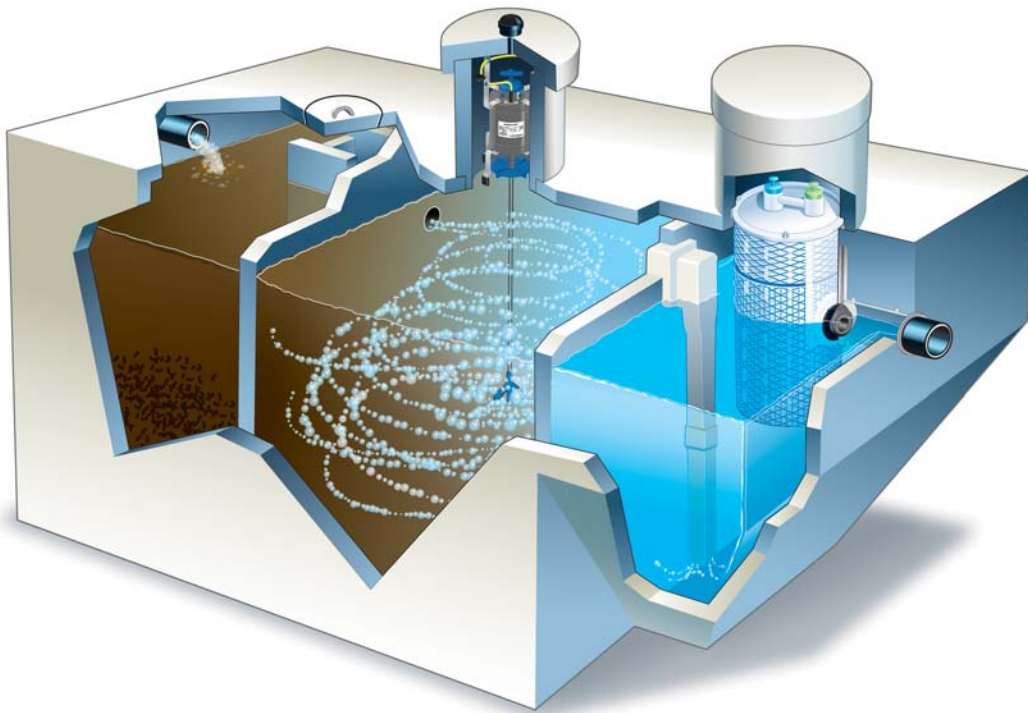


SINGULAIR®

**INDIVIDUAL HOME
WASTEWATER TREATMENT PLANT
with**

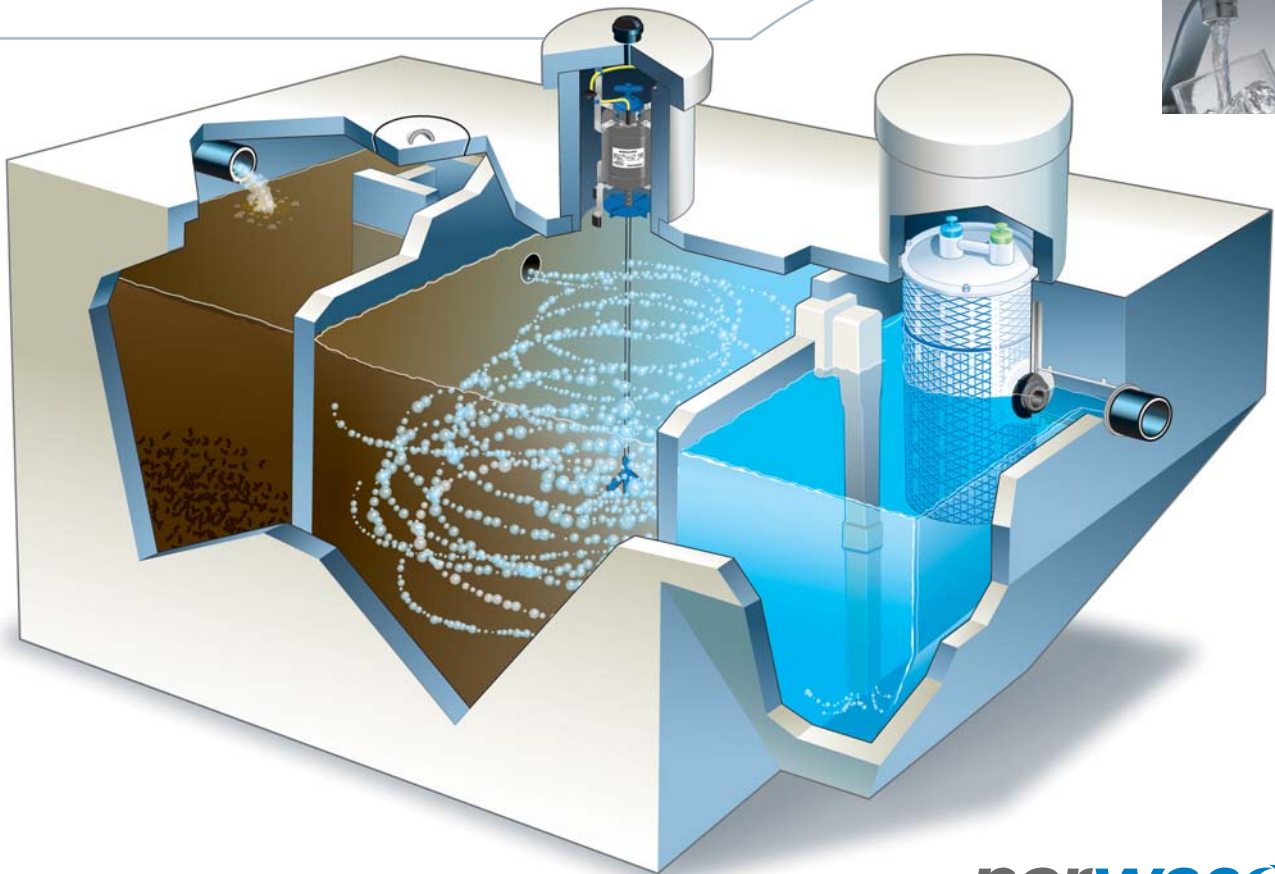
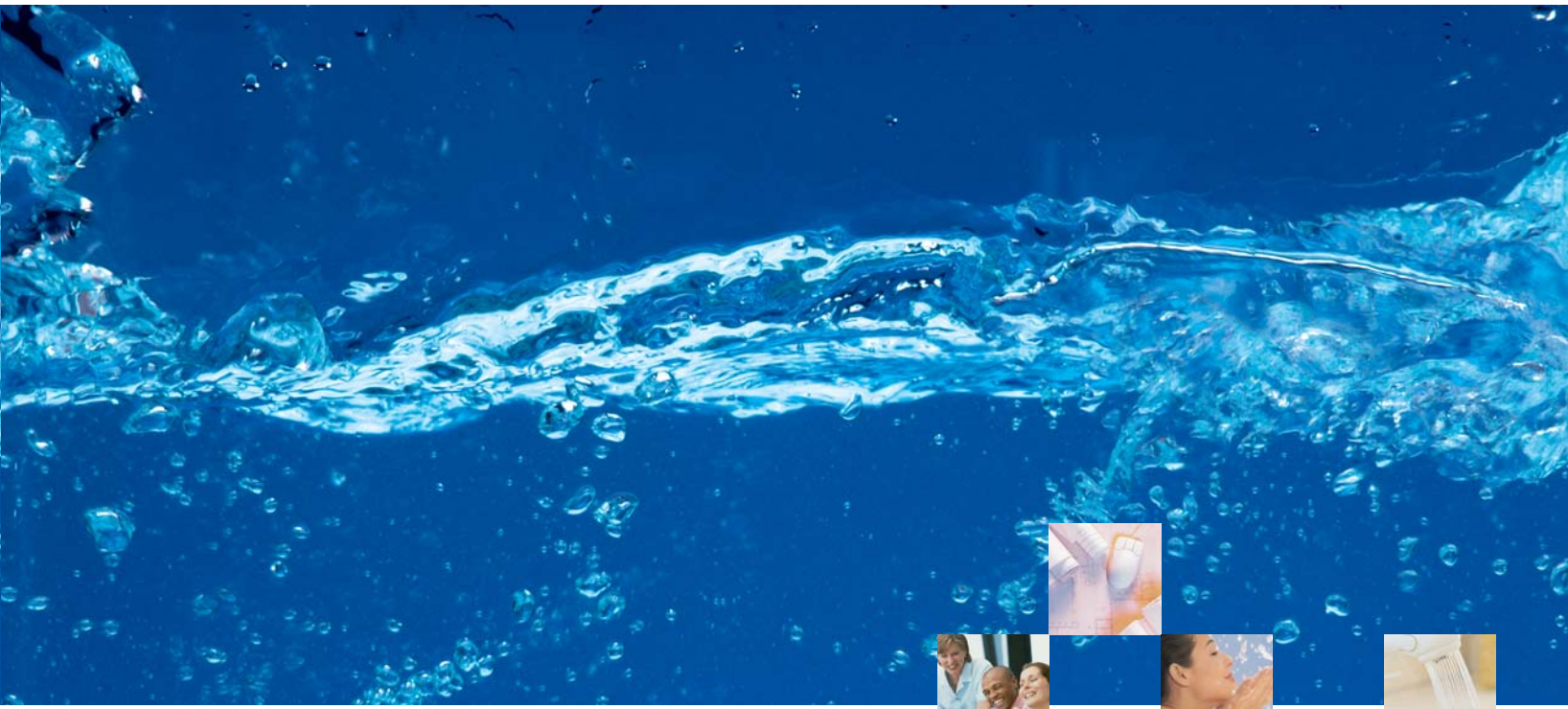
BIO-KINETIC® SYSTEM



PROGRESS THROUGH ***norweco***® SERVICE SINCE 1906

O & M MANUAL

SINGULAIR®



norweco®

*Engineering the future of water
and wastewater treatment*



Norweco distributors are located throughout the United States and much of the rest of the world. Research, product development, manufacturing, marketing and sales support are conducted inside our offices and factory in Norwalk, Ohio. Everyone at Norweco is committed to shaping the future of our industry.

engineering

the future

of water and wastewater treatment

Specify Singulair®

Your local Norweco distributor is fully trained to install your Singulair System and any other Norweco product you choose to protect your environment. Each of our distributors has completed a nationally accredited Singulair factory-training program.

The Singulair System comes to you complete, including delivery, tank setting, equipment installation, plant start-up and service. A series of service and adjustment inspections are scheduled for the first two years of operation at the time your system is installed. These inspections are included in the sale so that your system continues to perform at the highest level to protect you and your investment. Extended service contracts are also available from your Norweco distributor.



SINGULAIR®

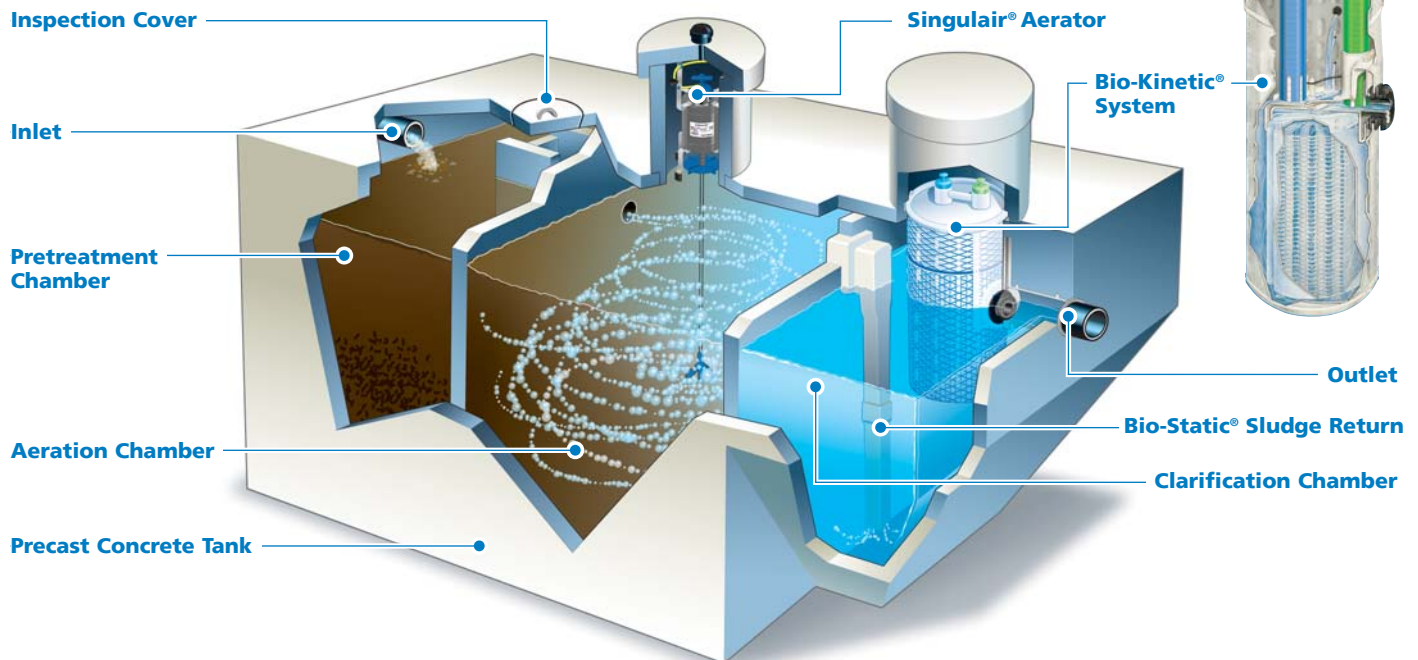
A dynamic combination of
electro-mechanical equipment, solid state
technology and web-based monitoring
that translates to increased property
value, performance certified for you

The new state-of-the-art Singulair treatment system is the trouble-free, energy-efficient alternative to that out-dated, unmanageable septic tank. It sets a new standard for properties that are not connected to centralized sewers. It quietly, efficiently and automatically treats all incoming wastewater, returning harmless effluent to the environment in just 24-hours. Because it operates only 30-minutes every hour, the new Singulair uses half the energy required by continuous-run systems.

We've been providing progress through service since 1906. When you consider the facts presented in this brochure, you will see why Norweco is recognized everywhere as providing today's answer for the protection of tomorrow's environment.

solutions in wastewater treatment

Singular® rivals the performance of the world's most advanced treatment equipment



Inlet

Untreated wastewater enters the system here.

Pretreatment Chamber

Wastewater enters at the Singular inlet and is equalized here as anaerobic bacteria and gravity precondition it.

Aeration Chamber

Here, safe, living aerobic bacteria convert the wastewater into stable substances. Flow equalization maximizes this biological oxidation and assures 24-hour retention and treatment.

Aerator provides complete treatment

Our exclusive aerator infuses the fresh air that safe, living micro-organisms require to fully digest and treat wastewater inside the Aeration Chamber. Powered by our 1725 RPM, 115 volt, fractional horsepower motor, our quiet, reliable aerator is inexpensive to operate, reduces heat build up and dramatically increases bearing life. Each aerator is precision engineered, tested and certified to operate only 30-minutes per hour. Only the stainless steel aspirator shaft and reinforced nylon aspirator come in contact with liquid in the Aeration Chamber.

Clarification Chamber

Flow equalization enhances the settling of biologically active substances inside the Clarification Chamber. Wastewater has now been converted into clarified liquids in this chamber.

Flow Equalization Ports

They control the flow through all upstream and downstream processes and they regulate the amount of treated effluent that can enter the Bio-Kinetic System.

Bio-Kinetic® System

Constructed entirely of plastic and rubber components that are impervious to this environment, our Bio-Kinetic System combines filtration, settling, non-mechanical flow equalization, optional disinfection, adjustable outlet weir and optional dechlorination features into a single, revolutionary package.

Precast Concrete Tank

Every Singular System is constructed of high quality, non-corrosive materials under our rigid quality control standards. The tank, access risers and cover are reinforced precast concrete manufactured locally by your factory-trained, licensed Norweco distributor.

Inspection Cover

Access is safe and easy.

Outlet

Only a clear, safe and odorless liquid exits the system here for return to your environment.



SERVICE PRO® Control Center

EVERY SINGULAR AERATOR IS INSTALLED WITH A SOLID STATE ELECTRICAL CONTROL CENTER. EACH IS EQUIPPED WITH RESETTABLE CURRENT SENSOR, ON/OFF SELECTOR SWITCH, RED WARNING LIGHT, TIME CLOCK, AUDIBLE ALARM, AUXILIARY INPUTS AND FCC LICENSED AUTODIALER FOR REMOTE MONITORING OF INDIVIDUAL COMPONENTS.

Progress Through Service Since 1906. Ultimately, our success over all these years boils down to perceived, appreciated and consistently delivered quality service to our customers.

customer focus



Consider the facts:

- The Singulair Bio-Kinetic System meets or exceeds government standards. The Singulair System is performance certified and listed by NSF International. The Singulair is certified to NSF Standard 40 and our Bio-Kinetic System is certified to NSF Standard 46. Underwriters Laboratories and the Canadian Standards Association have recognized, certified and/or listed all electromechanical components. The auto dialer telemetry system is licensed by the Federal Communications Commission.
- The Bio-Kinetic System includes 3 positive filtration zones with 8 independent settling zones.
- 48-hour retention in the Singulair System reduces pumping frequency as compared to smaller capacity systems.
- Operating costs are low. The only electrical component is our low RPM aerator.
- Excessive hydraulic flows can cause major problems for septic tanks, sand filters and any treatment method that does not provide flow equalization. The exclusive non-mechanical flow equalization feature of our Bio-Kinetic System guarantees that all incoming wastewater is fully treated, regardless of heavy use periods.
- You can install an efficient Singulair plant for about the same cost as an old-fashioned septic tank.
- Eliminates odors and all unsightly, unsanitary conditions so common with septic tanks.
- Durable, reliable components are safely installed out-of-sight below grade. No exposed power cords, compressors, filters or air lines accessible to children or pets.
- No need to purchase a separate tank – our precast concrete pretreatment chamber is part of the Singulair System.
- The Singulair System automatically equalizes influent and effluent flow through all treatment and disposal stages. Flow variations from guests, parties or vacations do not effect treatment performance.
- All flow is equalized an average of 50% at the NSF Standard 40 600 GPD (gallons per day) design loading pattern.
- Your local, factory-trained, certified and licensed Norweco distributor sells, installs and services your Bio-Kinetic System with pride. You'll find your distributor's name and contact info conveniently posted on the system's control center.



Optional Blue Crystal® Residential Disinfecting Tablets

OUR PURE CALCIUM HYPOCHLORITE TABLETS ARE SPECIALLY FORMULATED FOR USE IN THE SINGULAIR SYSTEM FOR EFFICIENT, RELIABLE DISINFECTION. EACH BLUE CRYSTAL TABLET CONTAINS AT LEAST 70% AVAILABLE CHLORINE. PACKAGED IN RE-SEALABLE CONTAINERS, OUR TABLETS ARE AVAILABLE FROM YOUR LOCAL NORWECO DISTRIBUTOR IN 10 AND 100 POUND POLYETHYLENE PAILS.



Optional Bio-Neutralizer® Dechlorination Tablets

RELIABLY, SAFELY AND ECONOMICALLY REDUCE RESIDUAL CHLORINE AND PROTECT ENVIRONMENTALLY SENSITIVE SURFACE WATER WITH OUR SPECIALLY FORMULATED TABLETS. PACKAGED IN EASY TO HANDLE, RE-SEALABLE CONTAINERS, OUR BIO-NEUTRALIZER DECHLORINATION TABLETS ARE AVAILABLE IN 25 AND 45 POUND POLYETHYLENE PAILS FROM YOUR LOCAL NORWECO DISTRIBUTOR.



comprehensive protection, guaranteed



Singulair is warranted against defects in material and workmanship under normal use and service by a comprehensive Lifetime Warranty and Exchange Program.

This 3 year Limited Warranty and Lifetime Exchange provides single source protection and covers all system components. Complete Warranty and Exchange information, a Warranty Registration Card and Owner's Manual are included with purchase.

The Singulair Bio-Kinetic System components have been listed, licensed and/or certified by each of the following agencies/organizations.



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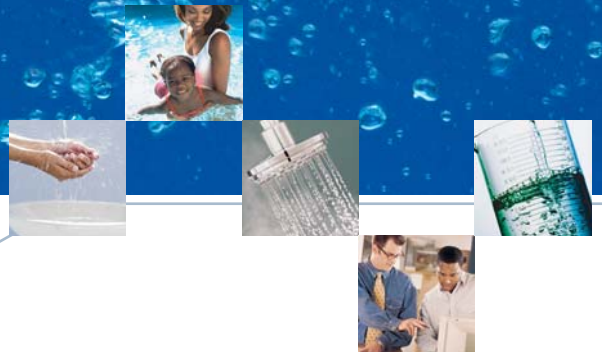
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Norweco[®], Norweco.com[®], Singulair[®], Modulair[®], Travalair[®], Singulair Green[®], Lift-Rail[®], Microsonic[®], Bio-Dynamic[®], Bio-Sanitizer[®], Bio-Neutralizer[®], Bio-Kinetic[®], Bio-Static[®], Bio-Gem[®], Bio-Max[®], Bio-Regeneration[®], Bio-Perc[®], Blue Crystal[®], ClearCheck[®], ChemCheck[®], Tri-Max[®], Service Pro[®], Grease Buster[®] and "BUSTER" logo are all registered trademarks of Norwalk Wastewater Equipment Company, Inc.

SERVICE PRO®



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and wastewater treatment

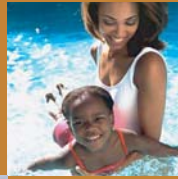
A man and a woman in business attire are looking at a computer screen. The man is on the left, wearing a white shirt and a patterned tie, with his hand near his chin. The woman is on the right, wearing a dark blazer over a light-colored top, smiling. The background is a light blue wall.

SERVICE PRO®

our cutting edge
answer for the protection
of tomorrow's environment

Our Service Pro Control Center is the up-to-the-minute way to manage your Norweco Singulair treatment system. It's the only control center that employs revolutionary Monitoring, Compliance and Diagnostic (MCD) Technology. It automatically operates the treatment plant, monitors system operations and provides verification of all service work performed. Detailed information describing the performance of the Singulair treatment plant is accessible 24/7 via our password encoded website. Please consider the facts presented in this brochure. You will see why our new Service Pro Control Center is the only management tool your treatment system needs and why Norweco is recognized as providing today's answer for the protection of tomorrow's environment.

solutions in wastewater treatment



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engineering the future

of water and wastewater treatment

Specify the new SERVICE PRO® Control Center with MCD technology

The licensed factory-trained Norweco distributor in your area is ready to get a Singlair System and Service Pro Control Center up and running for you today. The control center and Service Pro website provide a powerful management tool that can monitor system performance, verify compliance with installation requirements and diagnose the operation of all system components. The Singlair System, Service Pro Control Center and Service Pro website combine to deliver state-of-the-art performance and homeowner protection. Remote monitoring and the web based management of site specific functional information assure years of reliable wastewater treatment and trouble-free operation. For additional information contact your local Norweco distributor today!

This is all you need to keep your treatment system running smoothly at peak performance

The new Service Pro Control Center uses Norweco Monitoring, Compliance and Diagnostic (MCD) Technology to automatically...

1. Operate each Norweco Singulair aerator and all wastewater treatment system components
2. Monitor their operations
3. Verify any service work performed on the aerator and all other system components
4. Provide secure 24/7 access to detailed history reports for each Singulair System on the Service Pro network at www.servicepromcd.com

THE SERVICE PRO® CONTROL CENTER IS ALL YOU NEED TO OPERATE, CONTROL, PERFECTLY MANAGE AND MAINTAIN YOUR ONSITE WASTEWATER TREATMENT SYSTEM AND SINGULAIR PLANT. OUR ENGINEERS HAVE MADE IT EASY TO MONITOR SYSTEM PERFORMANCE, VERIFY COMPLIANCE WITH INSTALLATION REQUIREMENTS AND DIAGNOSE THE OPERATION OF ALL SYSTEM COMPONENTS. SERVICE PRO MANAGES IT ALL AND KEEPS YOU FULLY INFORMED OF DAY TO DAY OPERATIONS WITH ITS SECURE ONLINE 24/7 REPORTING FEATURE.



Secure 24/7 online performance accountability

The Service Pro Control Center is linked via telemetry to Norweco's Service Pro website. MCD technology allows remote operational oversight of Singulair Systems and real-time tracking of all service. Confirmation of proper system operation and the amount of time spent during each service visit are all reported and permanently recorded by the Service Pro website. If ever an alarm condition is received the registered service provider is automatically notified. Detailed service reports and an operational history for all Singulair Systems equipped with a Service Pro Control Center are available on the secure, password protected website.





customer focus

Progress Through Service Since 1906. The number one reason why Norweco has succeeded for so many years is that we've been working hard to get the next generation of products to our customers. The Service Pro Control Center was developed to provide our customers the most technologically advanced remote monitoring system. Our industry leadership position rests on our commitment to service.

Consider the facts:

- Built-in telemetry device uses the household phone system to communicate directly with the Monitoring, Compliance and Diagnostic database. The Service Pro Control Center's programming code is securely maintained in a nonvolatile memory – all service data is fully protected against risk of a power outage.
- No unnecessary service calls. Self-diagnostic technology evaluates any Singulair alarm condition. If the condition is temporary, the Service Pro Control Center automatically resets without activating the alarm and telemetry dialer. In the event of a more serious problem, both alarms and the FCC licensed autodialer are activated to automatically notify your local Norweco service provider.
- Notification of your local Norweco service provider in the event of a Singulair alarm condition by fax, email or phone is immediate and continues until the required service has been performed.
- Customized service reports are automatically generated. Your licensed distributor can tell on a daily basis which systems are due for service and when service contracts are due for renewal.
- A complete service history for every Singulair System with Service Pro Control Center is recorded and maintained online at www.servicepromcd.com and can be easily accessed any where, any time.
- Each service record is absolutely secure and only a mouse-click away for Singulair plant owners, the local Norweco distributor, service providers and local regulatory agency personnel. Each individual is issued a unique password that allows limited access to enclosed areas of the Service Pro website. The password determines which level of access is available to the password holder.
- Plug and play connections make installation and service effortless. The secure Service Pro Control Center enclosure contains knockouts for all incoming and outgoing wiring. Without even a screwdriver or a pair of pliers, you can connect the Service Pro panel to any residential phone line.
- Fully warranted. The Service Pro Control Center is protected by Norweco's single source warranty program. Registration is automatic.
- Use of the Service Pro Control Center is not limited to new construction. Existing Singulair Systems can be easily added to the Service Pro network and remotely monitored. All that is necessary is the installation of a telephone line.
- Operation and maintenance of a Singulair treatment plant and up to three additional components of the wastewater treatment system can be remotely monitored by the Service Pro Control Center and website. Proper operation of the entire treatment system is confirmed by the MCD Technology. Every alarm condition and the amount of time spent on each service call are permanently recorded and readily accessible for performance oversight.
- Precision engineered and easily installed for comprehensive owner protection, the Service Pro Control Center and web based management system capably handle all residential wastewater treatment applications. The once and for all answer to guarantee proper operation and maintenance is only a mouse-click away.
- The Singulair Bio-Kinetic System components with Service Pro panel have been listed, licensed and/or certified by each of the following organizations.



Today's Answer for the Protection of Tomorrow's Environment



comprehensive protection, guaranteed



Our Service Pro Control Center with revolutionary MCD technology is sold, installed and serviced by your local factory-trained and licensed Norweco distributor. It is warranted against defects in material and workmanship under normal use and service for two years from the installation date. Continuing protection is maintained by the Service Pro Control Center and website for the life of the remote monitoring agreement.

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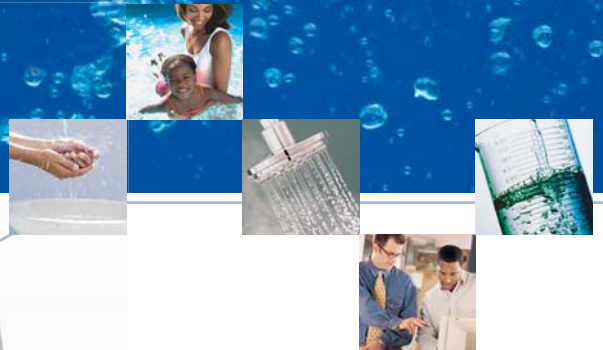
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Progress Through Service Since 1906

Your factory-trained and licensed local Norweco distributor is ready to get a revolutionary Service Pro Control Center up and running for you today.

Norweco®, Norweco.com®, Singulair®, Modulair®, Travalair®, Lift-Rail®, Microsonic®, Bio-Dynamic®, Bio-Sanitizer®, Bio-Neutralizer®, Bio-Kinetic®, Bio-Static®, Bio-Gem®, Bio-Regeneration®, Bio-Perc®, Blue Crystal®, ClearCheck®, ChemCheck®, Service Pro®, Grease Buster® and "BUSTER" logo are all registered trademarks of Norwalk Wastewater Equipment Company, Inc.

INTEGRATED CONTROLS



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and wastewater treatment*

SERVICE PRO® INTEGRATED SYSTEM CONTROLS (ISC)

THE MOST ADVANCED, RELIABLE AND EASY TO USE CONTROLS AT YOUR FINGERTIPS

The Service Pro ISC eliminates separate controls for individual wastewater treatment components. Designed for Singulair systems with a simplex effluent pump and up to three auxiliary inputs, the Service Pro ISC manages it all. Solid state construction provides precise monitoring and built-in surge suppression for all treatment components, protecting their operation and extending performance life. A user-friendly LCD screen simplifies programming for drip irrigation, spray irrigation, low pressure dose or any pumping option.



Each prewired control center integrates one 15 amp alarm breaker, one 15 amp aerator breaker, one 20 amp pump breaker, aerator and pump circuitry, electrical insulator, electrical current monitoring, visual and audible alarms, aerator timer, multifunction pump timer and LCD screen into a single, lockable NEMA 4X enclosure. Three pump timer options are built in: demand use, time of day and cycle operation. A terminal strip with individual connections for both the incoming power and all system components makes wiring safe and easy. One dedicated 30 amp, single-pole, 115 volt circuit breaker in the main electrical service panel is the only power source required for the entire system.

THE SERVICE PRO® INTEGRATED SYSTEM CONTROL CENTER IS EASY TO INSTALL, START-UP AND SERVICE. THE HIGH CONTRAST LCD INTERFACE PROVIDES CONVENIENT PROGRAMMING AND CONTINUOUS REAL-TIME SYSTEM STATUS. AUXILIARY INPUTS ARE EASILY CONFIGURED VIA THE SIMPLE LCD SCREEN WITHOUT SETTING JUMPERS FOR NORMALLY OPEN OR NORMALLY CLOSED OPERATION. SOLID STATE PROGRAMMING AUTOMATICALLY SENSES AUXILIARY INPUT VOLTAGES FROM 5 TO 120 VOLTS, AC OR DC, AND INTELLIGENT FLOAT LOGIC CONTINUOUSLY MONITORS FLOAT STATUS.

The LCD user interface can also be used to access historical operating and performance data for the system, such as aerator elapsed run time, aerator run cycles, pump elapsed run time, pump run cycles and system status – all guided by the LCD's simple menus. Optional failsafe control features can be added to provide additional levels of process management. Three auxiliary alarm inputs are provided to monitor virtually any accessory component of the treatment system including UV disinfection systems, chemical feed systems and pump stations. Singulair Total Nitrogen Treatment (TNT) time cycle operation is available for systems installed in nitrogen sensitive areas.

- NEMA 4X enclosure
- Programmable aerator and pump operation
- Three programmable auxiliary inputs
- Low voltage circuitry to floats and auxiliary alarms for safe operation

The Service Pro Integrated System Control Center components have been listed, licensed and/or certified by each of the following agencies and organizations.



Progress Through Service Since 1906

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Blue Crystal® Residential Disinfecting Tablets

norweco®

Engineering the future of water
and wastewater treatment



Blue Crystal disinfecting tablets are the first microbiocide specifically developed for use in residential wastewater treatment applications. Using a proprietary grade of calcium hypochlorite as the active ingredient, Blue Crystal tablets are manufactured to provide a consistent chlorine dose. To insure the effective treatment of residential wastewater flows, Blue Crystal tablets automatically adjust their dissolve rate in direct proportion to the rate of incoming flow. Residential treatment plant owners and operators can finally meet regulatory disinfection requirements with a product that is inexpensive, safe and easy to use. Formulated to maintain positive disinfection during low, sustained, variable and intermittent flow rates that are common to residential systems, Blue Crystal disinfection tablets provide a very quick, effective and long-lasting bacteria kill.



Safe to use in all domestic wastewater treatment systems, Blue Crystal tablets are approved and listed with the United States Environmental Protection Agency for the treatment of wastewater. Designed to provide rapid disinfection, the potent formulation of Blue Crystal reduces 99% of bacteria within the first ten minutes of contact. Blue Crystal tablets help maintain wastewater pH levels above 6.8 and dissipate quickly after complete disinfection, leaving no hazardous by-products in the effluent. Acid based products, such as common swimming pool tablets, disinfect slowly and produce a non-degradable chlorine residual while lowering effluent pH. Even occasional use of these acid based products in wastewater treatment can result in the discharge of inadequately treated wastewater and create potentially harmful or hazardous gases. Blue Crystal tablets set a new performance standard for disinfection by offering the highest level of effectiveness, convenience and safety for homeowners, regulatory officials and the environment.

(Continued on reverse)

Advantages

- Specifically formulated for residential treatment systems
- Maintains disinfection in low and intermittent flows
- Economical and convenient to use
- Blue crystals for easy identification
- Promotes a stable pH level
- USEPA approved for wastewater treatment

Specifications

Tablet Size	2 5/8" diameter, 1" thick
Approx. Tablet Weight	5 oz. (140 grams)
Approx. Tablet Density	125 lbs./ft. ³
Active Ingredient	Calcium Hypochlorite $\text{Ca}(\text{OCl})_2 \cdot \text{H}_2\text{O}$
Available Chlorine	70%
Inert Ingredients	30%
Appearance and odor	White tablet with blue crystals and mild chlorine odor
USEPA Registration	63243-4

Caution

Blue Crystal disinfecting tablets are a strong oxidizing agent and highly corrosive. Use or contact with oils, acids, petroleum products, reducing agents or other compounds, such as swimming pool tablets, is extremely dangerous - fire or explosion could result. Improper use of this product may cause personal injury or property damage. Tablets may be fatal if swallowed and tablet dust is irritating to the eyes, nose and throat. Keep out of the reach of children and do not allow tablets or feed tubes to contact skin, eyes or clothing. Do not handle the tablets or feed tubes without first contacting your local distributor and obtaining specific instructions for usage, handling and storage. Store only in sealed original container and in a well-ventilated area. Read the product container label carefully prior to use. It is unsafe and a violation of Federal law to use Blue Crystal disinfecting tablets in a manner inconsistent with its labeling.

Bio-Dynamic®
LF 1000
Tablet Feeder



Bio-Sanitizer®
Disinfecting
Tablets



Bio-Max®
Dechlorination
Tablet



Bio-Neutralizer®
Dechlorination
Tablets



Bio-Perc®
Biological
Remediation
Tablets



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Bio-Neutralizer® Dechlorination Tablets

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Bio-Neutralizer dechlorination tablets are uniquely formulated to provide an efficient and cost effective way of removing free and combined chlorine from the effluent of wastewater treatment systems. Scientifically blended to protect dissolved oxygen levels and to reduce wicking or swelling in the feed tubes, Bio-Neutralizer dechlorination tablets automatically maintain a flow dependent application rate, up to intermittent peak flow factors of four. Optimum dechlorination rates are uniformly maintained even when the significant runoff period of the treatment system is six hours. When used in a Bio-Dynamic tablet feeder or other approved gravity flow tablet system, Bio-Neutralizer dechlorination tablets provide a stable and consistent release of environmentally safe sodium sulfite. A controlled dosage effectively reduces the chlorine residual to non-detectable levels while maintaining overall effluent quality.

High concentrations of residual sodium sulfite can degrade beneficial dissolved oxygen levels, increase BOD₅ and reduce overall effluent quality. The superior formulation and predictable performance of Bio-Neutralizer dechlorination tablets provides a consistent reduction or elimination of chlorine residual without significantly reducing dissolved oxygen. Packed in 25 lb. and 45 lb. DOT approved containers, Bio-Neutralizer dechlorination tablets are a preferred alternative to costly liquid, hazardous gas or mechanical dechlorination systems. Bio-Neutralizer dechlorination tablets, when used with Norweco's Bio-Sanitizer disinfecting tablets or Blue Crystal residential disinfecting tablets, insure that only a stable, high quality effluent is returned to the environment. If your treatment system requires dechlorination or if you're located near environmentally sensitive surface water and want to add a dechlorination system, consider the advantages of Norweco's Bio-Neutralizer dechlorination tablets.

(Continued on reverse)

Advantages

- Environmentally safe
- Removes all chlorine to non-detectable levels
- Consistent sulfite dose
- Does not affect dissolved oxygen
- Beveled edge design minimizes wicking
- Non-hazardous when used as directed
- No mixing of chemicals or solutions

Specifications

Tablet Size	2 5/8" diameter, 13/16" thick
Approx. Tablet Weight	5 oz. (140 grams)
Approx. Tablet Density	125 lbs./ft. ³
Active Ingredient	Sodium Sulfite - (Na ₂ SO ₃)
Active Ingredient	35%
Inert Ingredients	65%
Appearance and odor	Green tablet with mild odor
U.S.E.P.A. Designation	Non-Hazardous

Caution

Bio-Neutralizer dechlorination tablets are a strong reducing agent containing sodium sulfite. Direct contact with oxidizing agents such as Bio-Sanitizer disinfecting tablets, swimming pool tablets or any other chlorine containing compound is extremely dangerous. Water or wastewater being treated with Bio-Neutralizer dechlorination tablets should be at or near a neutral pH. If water or wastewater has an available chlorine level greater than 100 ppm or water temperature greater than 100°F, do not use any mixture containing sodium sulfite or other reducing agents. A reaction may occur which could generate heat and chlorine gas. This product should not be used to treat water intended for human consumption. Care must be taken in handling and storage. Store only in sealed original container and in a well-ventilated area. Read the product container label carefully prior to use. Keep out of the reach of children.

Bio-Dynamic®
LF 1000
Tablet Feeder



Bio-Sanitizer®
Disinfecting
Tablets



Bio-Max®
Dechlorination
Tablets



Blue Crystal®
Residential
Disinfecting
Tablets



Bio-Perc®
Biological
Remediation
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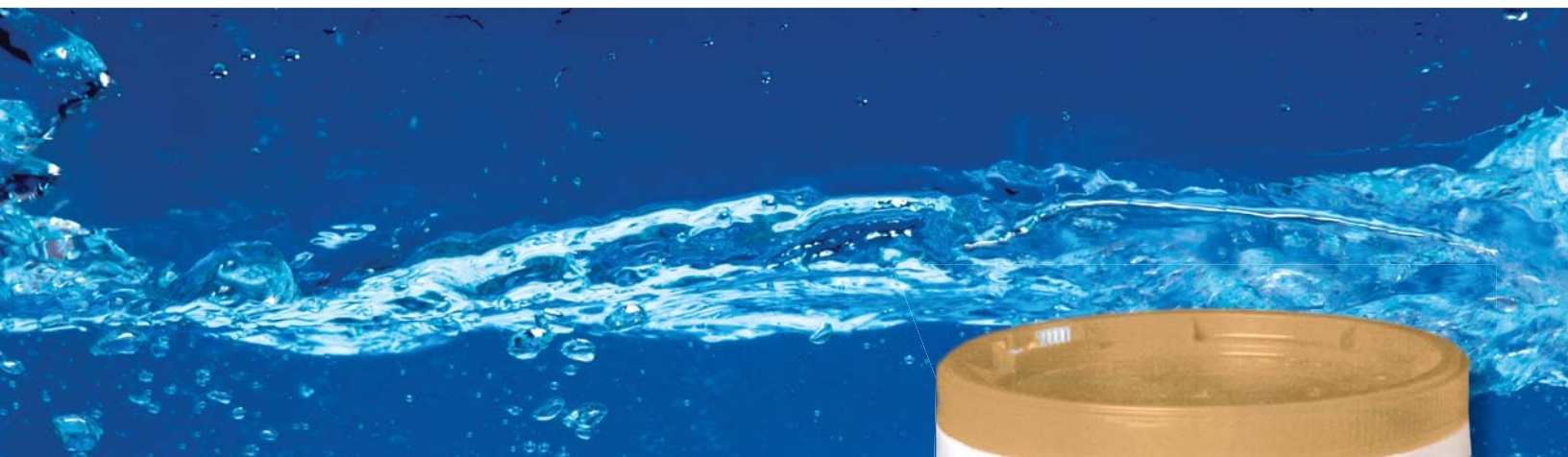
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Bio-Perc® Biological Remediation Tablets

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Engineering the future of water
and wastewater treatment



Bio-Perc biological remediation tablets rejuvenate failing wastewater treatment systems by reducing or eliminating organic buildup in distribution lines and disposal processes. Formulated for use in all residential and small commercial treatment systems, Bio-Perc tablets enhance the operational life of leach fields, surface sand filters, subsurface sand filters, sand trenches, cesspools, mounds, low pressure distribution systems, evapotranspiration beds, constructed wetlands, septic tank effluent pump (STEP) systems and any other type of system prone to failure from the buildup of organic solids. When incorporated into a regular maintenance program, Bio-Perc tablets restore failing wastewater treatment systems to proper operation and prevent the failure of new systems.



Sand filters and soil-based disposal systems often receive more organic material than they can oxidize. Excessive organic loading reduces system capacity and ultimately leads to the total failure of the treatment system. Chemical shock treatments or mechanical remedies, such as blasting the tile field with high pressure air or water, are expensive and the benefits last only a short time. Bio-Perc tablets provide continuous, long-term treatment and are safe, easy and economical to use.

Bio-Perc tablets add billions of beneficial microorganisms to accelerate the biological digestion that naturally occurs in wastewater disposal systems. Dissolving in direct proportion to the incoming flow rate, Bio-Perc tablets can be dosed by any gravity-flow feeder or added directly into a distribution box, pump station or dosing chamber. Providing continuous treatment on demand, Bio-Perc tablets allow failing treatment systems to function as originally designed for only a fraction of the replacement cost. Bio-Perc biological remediation tablets are available from your local Norweco dealer or distributor in a conveniently packaged, DOT approved and child resistant 10 lb. resealable polyethylene pail.

(Continued on reverse)

Advantages

- Environmentally safe when used as directed
- Protects against premature system failure
- Doses automatically based on flow rate
- Effective for all effluent disposal systems
- No excavation or heavy equipment required
- Economical and easy to use

Specifications

Tablet Size	2 5/8" diameter, 1" thick
Approx. Tablet Weight	5 oz. (140 grams)
Approx. Tablet Density	125 lbs./ft. ³
Active Ingredient	Select bacteria cultures
Bacteria Count	220 billion/pound
Inert Ingredients	Dissolve rate stabilizers
Appearance and odor	Bronze tablet with mild odor
U.S.E.P.A. Designation	Non-Hazardous

Caution

Bio-Perc biological remediation tablets are a proprietary, non-hazardous bacterial additive for wastewater treatment. Do not use this product in a manner inconsistent with its labeling. Do not contaminate food, feed or potable water with this product. Avoid contact with skin, eyes, mouth, respiratory system and clothing. Do not mix with acids or alkaline compounds. Use gloves and eye protection when handling tablets. Avoid inhalation of dust or vapors. Keep out of the reach of children. Extreme heat or extreme cold will affect product performance. Store only in sealed original container in a well-ventilated area. Do not handle Bio-Perc tablets or feed tubes without first contacting your local distributor and obtaining specific instructions for usage, handling and storage. Exercise care when removing tablets from container or filling feed tubes to prevent moisture contamination. Read the product container label carefully prior to use. Do not reuse empty container.

Bio-Dynamic®
LF 1000
Tablet Feeder



Bio-Sanitizer®
Disinfecting
Tablets



Bio-Max®
Dechlorination
Tablets



Blue Crystal®
Residential
Disinfecting
Tablets



Bio-Neutralizer®
Dechlorination
Tablets



norweco®

*Engineering the future of water
and wastewater treatment*

220 Republic Street
Norwalk, Ohio, U.S.A. 44857-1156
PH: 419.668.4471
FAX: 419.663.5440
www.norweco.com

Progress Through Service Since 1906

We engineer, manufacture, install and maintain advanced water and wastewater treatment technologies for residential properties, communities and commercial properties that are not connected to sewer lines. Norweco treatment systems are in service all over the world.

Norweco®, Norweco.com®, Singulair®, Modulair®, Travalair®, Lift-Rail®, Microsonic®, Bio-Dynamic®, Bio-Sanitizer®, Bio-Neutralizer®, Bio-Kinetic®, Bio-Static®, Bio-Gem®, Bio-Max®, Bio-Regeneration®, Bio-Perc®, Blue Crystal®, ClearCheck®, ChemCheck®, Service Pro®, Grease Buster® and "BUSTER" logo are all registered trademarks of Norwalk Wastewater Equipment Company, Inc.

Bio-GEM®

Grease Eliminating Microbes

norweco®

Engineering the future of water
and wastewater treatment



Bio-Gem is a patented blend of cultured bacteria, aggressive enzymes and natural growth accelerators developed to effectively digest grease, fats and oils in wastewater treatment systems, lift stations, sand filters, drain lines and grease traps. Regular use of Norweco's Bio-Gem can reduce or eliminate costly line plugs, pump outs and municipal surcharges. Maintenance procedures that involve jetting of clogged lines or the use of harsh commercial degreasers often damage equipment and contaminate groundwater. Completely safe, effective and convenient to use, Norweco's Bio-Gem is a natural way to eliminate grease, fats and oils throughout your treatment system.

Bio-Gem is a patented Bio-Enzymatic product specifically formulated to digest grease, fats and oils in wastewater treatment systems, lift stations, sand filters, drain lines and commercial grease traps. When used as directed, Bio-Gem's bacterial action will quickly and effectively convert common grease, fats and oils into carbon dioxide and water. With regular applications, Bio-Gem eliminates odors, stabilizes effluent quality, significantly reduces system maintenance and minimizes costly tank pump outs.

The multifaceted treatment provided by Bio-Gem is achieved through the use of recently developed biological techniques that combine concentrated spore forming microorganisms, aggressive enzymes and natural growth accelerators into a stable, easy to use liquid. Norweco's three fold formulation provides an advanced method of actually treating and eliminating grease, fats and oils instead of merely emulsifying them and sending the problem downstream.



(Continued on reverse)

Features

- Environmentally safe when used as directed
- High bacteria count
- Multifaceted biological blend provides complete treatment
- Economical and easy to use
- Works in aerobic or anaerobic conditions
- Long term storage stability (2 to 4 years)
- Eliminates odors
- Fast acting
- Reduces maintenance and pumping frequency

Specifications

Bacteria Count	550 Billion/Gallon
Appearance	Blue Liquid
Fragrance	Herbal Scent
Type	Aerobic and Anaerobic Pathways
Form	Spore
Gram Positive	100% (Salmonella and Shigella Free)
Standard Packaging	Gallon bottles (4-1 gallon bottles per case)
Shelf Life	2-4 years

Application and Dosage

Bio-Gem is an easy to use concentrated liquid which can be dosed directly into the system. Application rates for Bio-Gem are dependent upon the type of system being treated, its condition and the flow through the system. Basic application rates for drain lines start at 10 to 12 oz. per day. For medium volume grease traps (65-200 cubic feet), a rate of 18 to 20 oz. per day is recommended. Lift stations, wet wells and wastewater treatment plants are dosed at the ration of 18 to 25 oz. per 10,000 gallons of flow. For severely fouled systems contact your local Bio-Gem distributor or Norweco, Inc. for the best application rate for your system.

**Bio-Dynamic®
LF 1000**
Tablet Feeder



Bio-Sanitizer®
Disinfecting
Tablets



Bio-Neutralizer®
Dechlorination
Tablets



Blue Crystal®
Residential
Disinfecting
Tablets



Bio-Perc®
Biological
Remediation
Tablets



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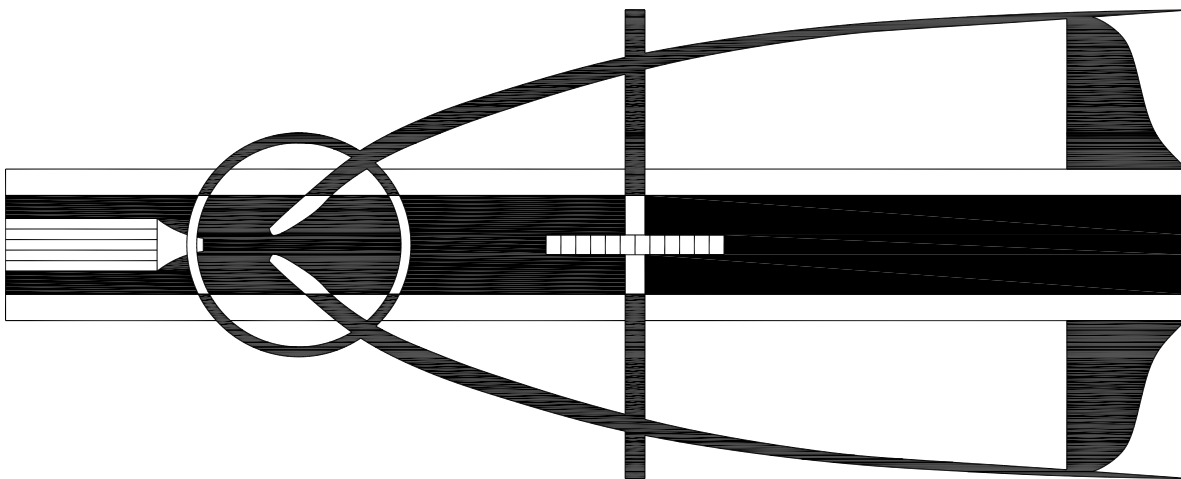
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norweco[®]

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 the requirements of ACI Standard 318. 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 flotation 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. The tankage shall be furnished with cast-in-place inlets, submerged transfer ports, aerator mounting casting with removable cover, cast-in-place molded plastic vent assembly, cast-in-place outlet coupling and Bio-Kinetic system mounting casting with removable cover. Principal items of electro-mechanical equipment supplied with the Singulair system shall be a 1725 RPM mechanical aerator, UL Listed Service Pro electrical control center with MCD technology, Bio-Static sludge return and Bio-Kinetic tertiary treatment device for flow equalization and final filtration of system effluent.

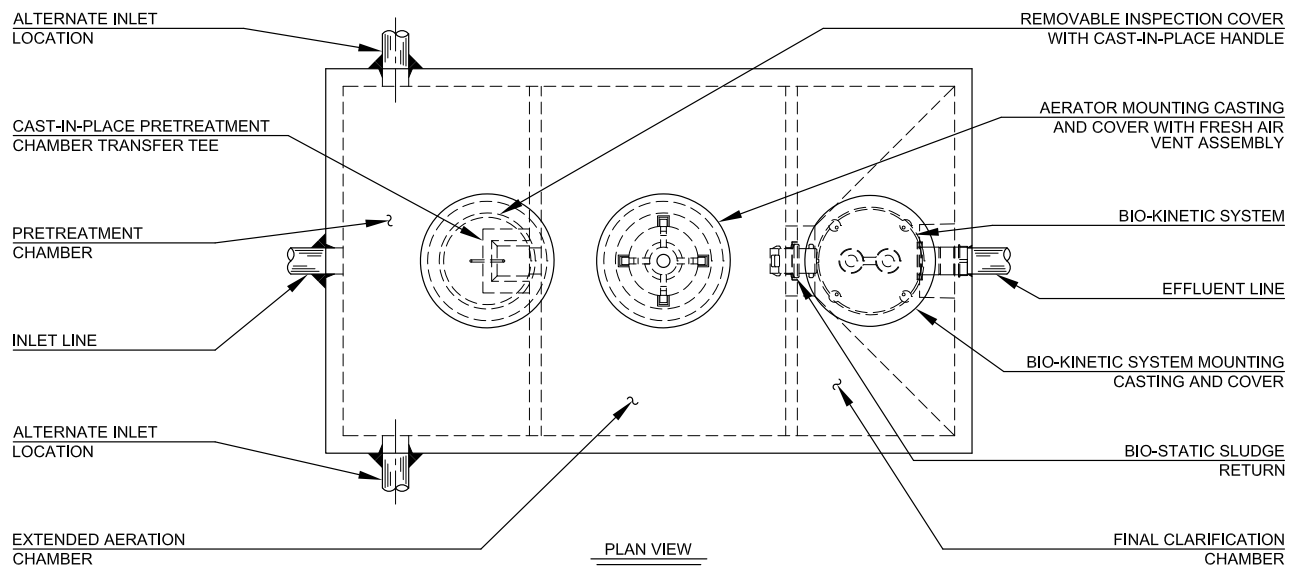
SPECIFICATIONS

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

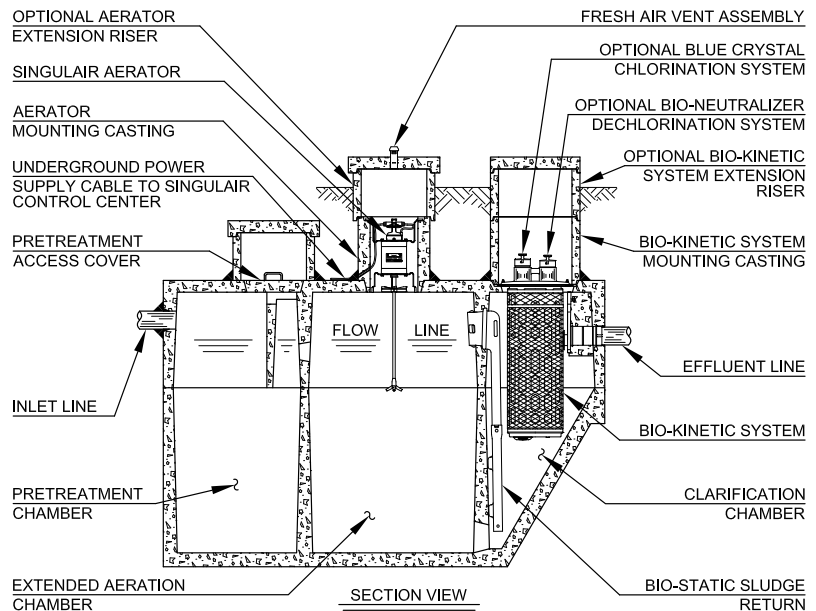
The extended aeration chamber shall provide in excess of 24 hour retention of the equalized daily flow. The chamber shall be of sufficient size to provide a minimum of 80 cubic feet of tank capacity per pound of applied BOD. The aeration chamber length-width-depth ratio shall be designed to insure uniform 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 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. 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. 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 5 independent zones, shall provide optimal settling and clarification.

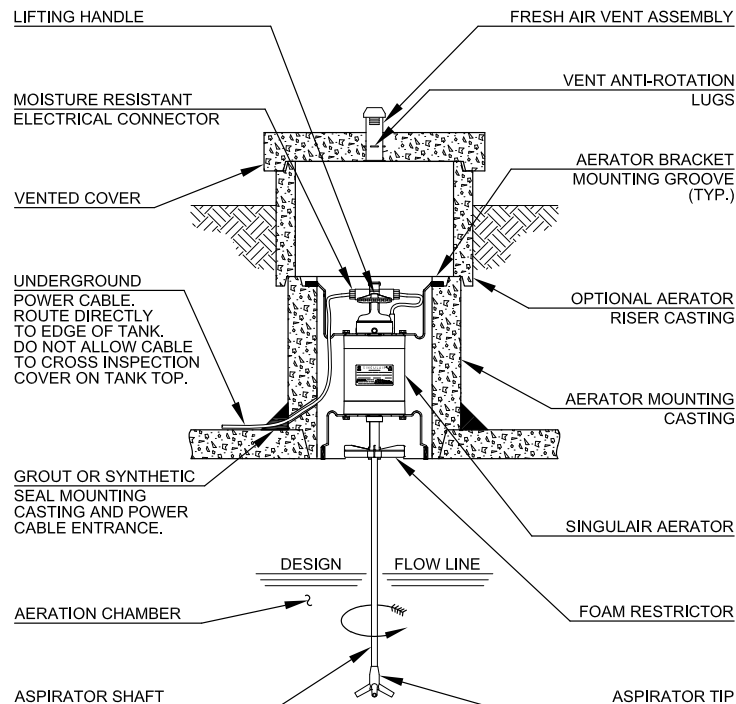
BIO-STATIC® SLUDGE RETURN

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. Aeration chamber hydraulic currents shall enter the sludge return(s) and be directed into the sludge return zone of the clarification 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.



MECHANICAL AERATOR

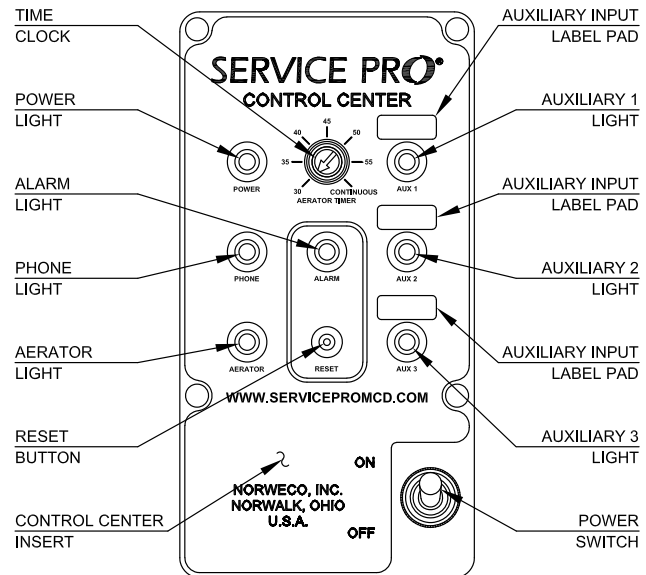
Each Singulair aerator shall be installed in a concrete aerator mounting casting above the aeration chamber. Fresh air shall be supplied through a molded plastic vent assembly cast into the concrete access cover above the aerator. The Singulair aerator shall include plated mounting brackets, NEMA 6 rated 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. 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 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 Singulair 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.



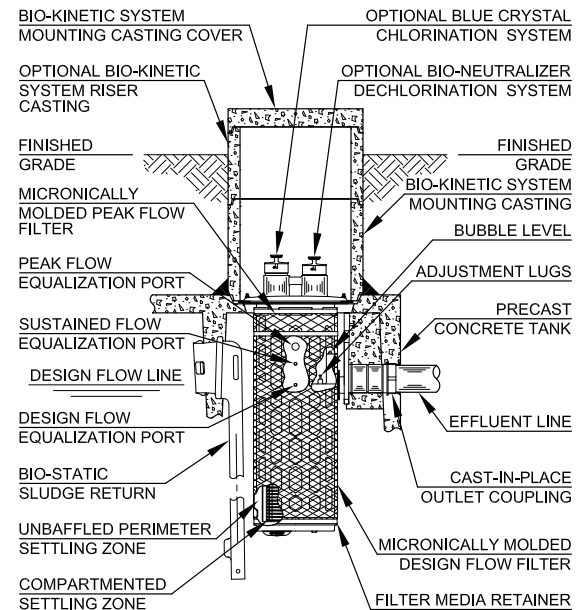
SERVICE PRO® MONITORING CENTER

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, maintain service records and grant regulatory agencies access to the information. 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 in the mounting casting(s) above 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. 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, optional chlorination feed tube, 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, optional dechlorination feed tube, 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. 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. 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%.

BLUE CRYSTAL® CHLORINATION SYSTEM (Optional)

The Singlair system shall be furnished complete with a tablet feeder and a six month supply of Blue Crystal disinfecting tablets. 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 contain a minimum of 70% available chlorine. Each tablet 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. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chlorine.

BIO-NEUTRALIZER® DECHLORINATION SYSTEM (Optional)

The Singlair system shall be furnished complete with a tablet feeder and a six month supply of Bio-Neutralizer dechlorination tablets. The dechlorination tablets shall contain active ingredients specially formulated to chemically neutralize both free and combined chlorine. Each tablet shall be 2⁵/₈" diameter, compressed to a 1³/₁₆" thickness, weigh approximately 5 ounces and be green in color for easy identification. The tablets shall dissolve slowly, releasing controlled amounts of chemical for the instantaneous removal of residual chlorine from the system effluent.

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 owners a lifetime 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)	500/600	750/800	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

PROGRESS THROUGH SERVICE SINCE 1906

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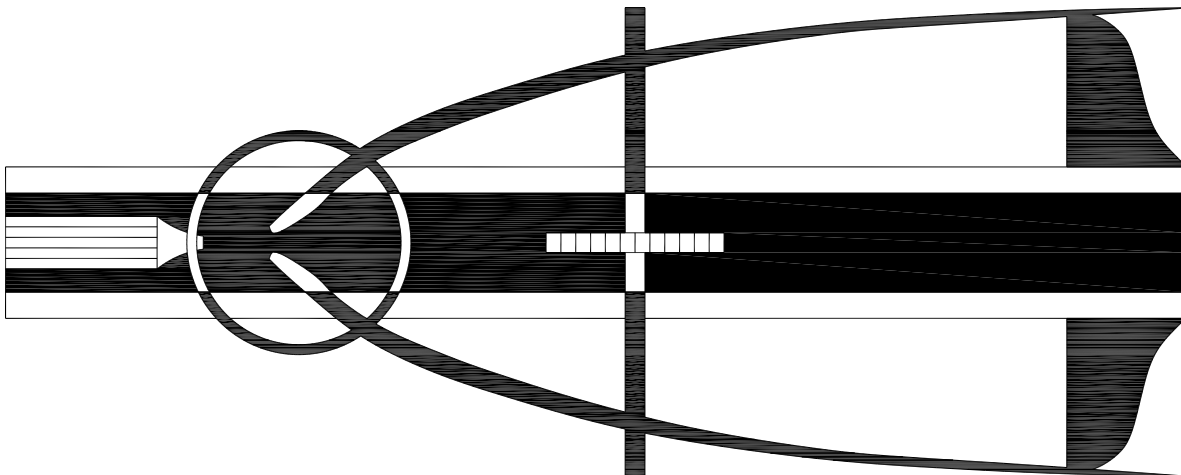
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SINGULAIR[®] BIO-KINETIC[®]
WASTEWATER TREATMENT SYSTEM
MODEL TNT

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Singulair Bio-Kinetic Model TNT system for Total Nitrogen Treatment 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. In addition to primary, secondary and tertiary treatment of the wastewater flow, the treatment system shall provide nitrification, denitrification, and if required, chlorination and dechlorination 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 TNT as manufactured by Norweco, Inc., Norwalk, Ohio, USA. Systems utilizing fiberglass, steel, or plastic tankage are subject to flotation when dewatered and shall not be considered for this application.



The wastewater treatment system shall be capable of reducing Total Nitrogen without the addition of chemicals, specialized add-on processes or additional components. Nitrification and denitrification shall be accomplished within the chambers of the treatment system prior to effluent disposal. Biological reduction of nitrogen shall occur naturally by autotrophic bacteria, capable of converting ammonium nitrogen to nitrate and heterotrophic bacteria, capable of transforming nitrate to harmless gas. The treatment system shall include precast concrete tankage providing separate pretreatment, aeration and clarification chambers. Principal items of electro-mechanical equipment shall be a 1725 RPM mechanical aerator, UL listed Service Pro control center with MCD technology, Bio-Static sludge return and Bio-Kinetic tertiary treatment device for flow equalization and final filtration of system effluent.

SPECIFICATIONS

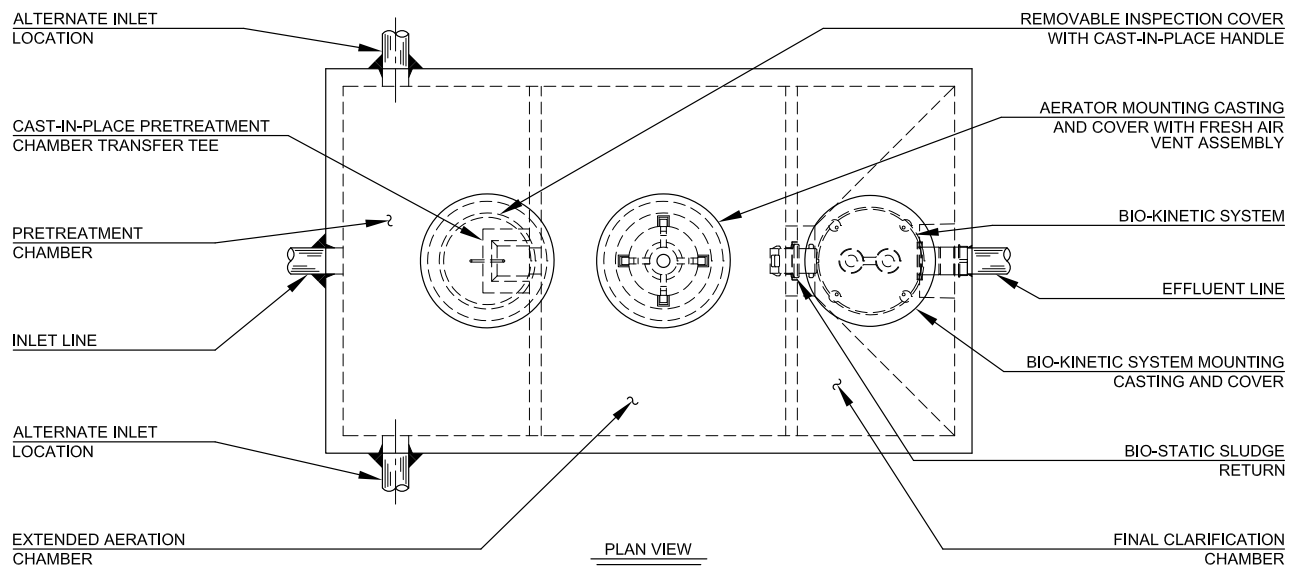
SINGULAIR®

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. System performance in compliance with the requirements of NSF Standard 245 shall be recognized by an ANSI accredited third-party laboratory and be 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

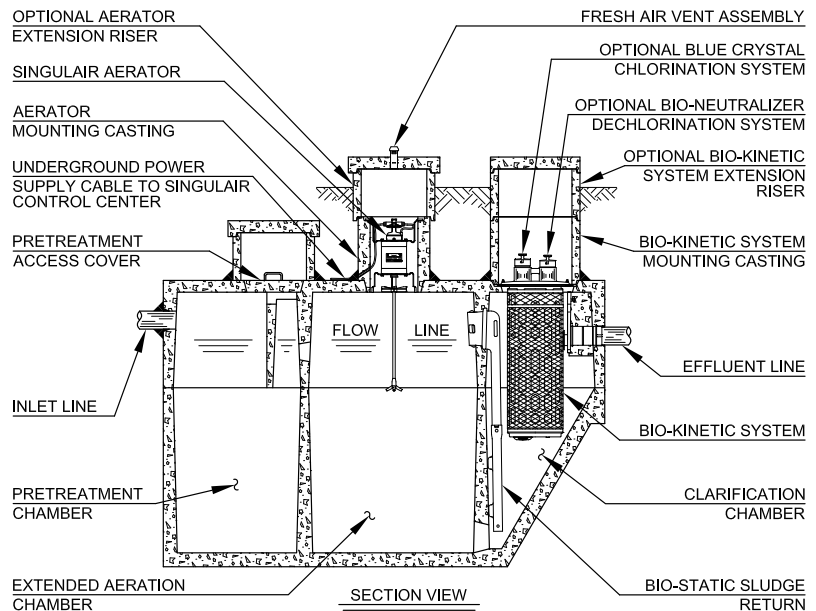
The extended aeration chamber shall provide in excess of 24 hour retention of the equalized daily flow. The chamber shall be of sufficient size to provide a minimum of 80 cubic feet of tank capacity per pound of applied BOD. The aeration chamber length-width-depth ratio shall be designed to insure uniform 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 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. 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. 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 5 independent zones, shall provide optimal settling and clarification.

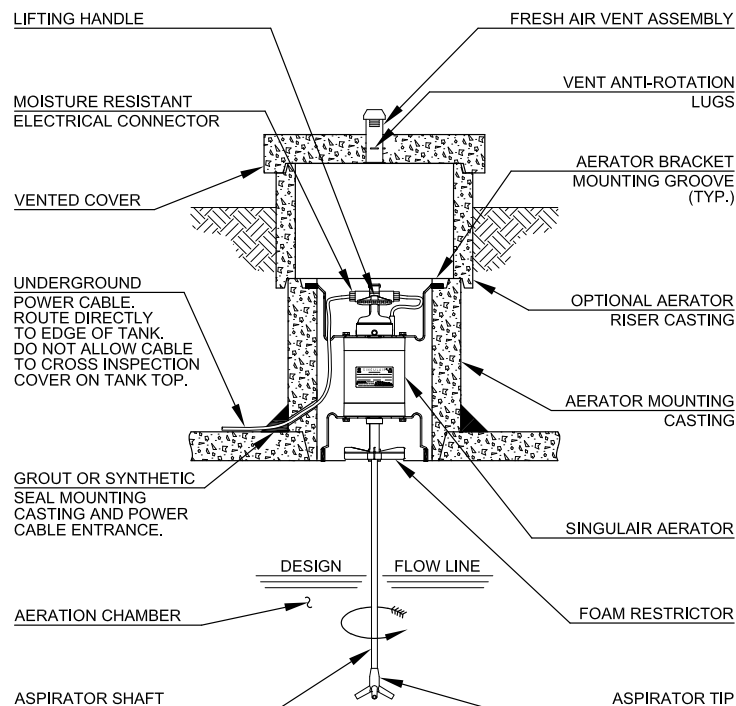
BIO-STATIC® SLUDGE RETURN

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. Aeration chamber hydraulic currents shall enter the sludge return(s) and be directed into the sludge return zone of the clarification 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.



MECHANICAL AERATOR

Each Singulair 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 Singulair aerator shall include plated mounting brackets, NEMA 6 rated electrical connector, UL recognized fractional horsepower motor, molded

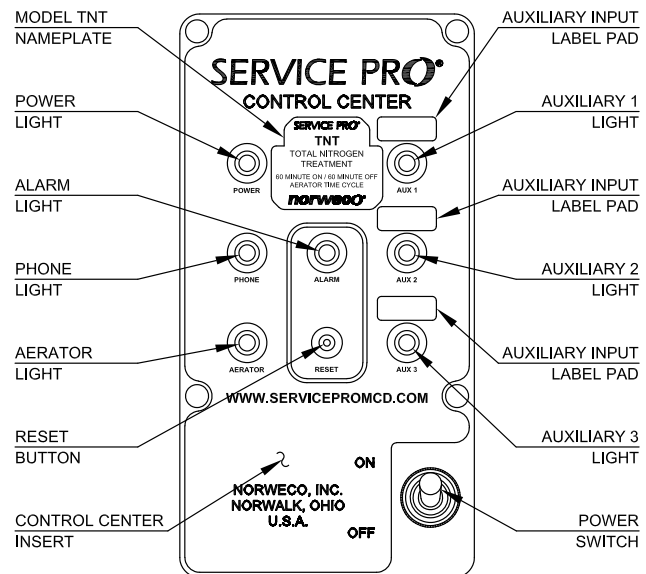


plastic lifting handle, molded plastic air intake screens, molded plastic foam restrictor, stainless steel aspirator shaft and molded glass-filled nylon aspirator tip. The motor shall contain precision manufactured o-ring type seals installed between the motor shell and the machined aluminum endbells 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. 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 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® CONTROL CENTER

The Service Pro electrical control center with MCD technology shall provide Monitoring, Compliance and Diagnostic functions for the Singulair 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 factory-programmed timer, 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.



AERATOR TIME CYCLE

A factory-programmed timer built into the Service Pro control center shall provide a total of twelve hours of aerator operation per day. The non-adjustable timer shall create a 60 minute aeration cycle followed by a 60 minute anoxic cycle during which the aerator shall be off. Use of an aerator timer can seriously affect system performance and operating cost. Systems that have not been performance certified, at a timed aeration cycle, by an independent ANSI accredited testing laboratory shall not be considered for this application.



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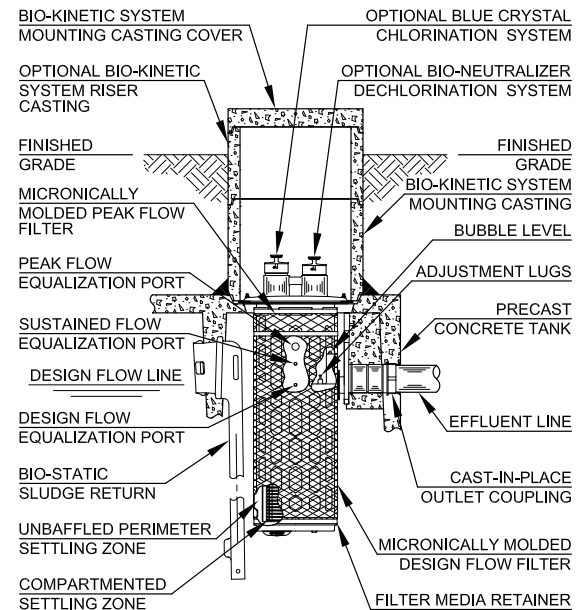
SERVICE PRO® MONITORING CENTER

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, maintain service records and grant regulatory agencies access to the information. Individual system owners shall be able to view information regarding their own wastewater treatment systems, as well as download and print 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 in the mounting casting(s) above 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. 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, optional chlorination feed tube, 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, optional dechlorination feed tube, 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. 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. The flow equalization rate shall be dependent upon the specific loading pattern and the duration of flow surges. At the 600 gallon per day design loading schedule of NSF Standard 40 and NSF Standard 245, minimum performance of the device shall equalize daily flow an average of 50%.

BLUE CRYSTAL® CHLORINATION SYSTEM (Optional)

The Singlair system shall be furnished complete with a tablet feeder and a six month supply of Blue Crystal disinfecting tablets. 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 contain a minimum of 70% available chlorine. Each tablet 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. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chlorine.

BIO-NEUTRALIZER® DECHLORINATION SYSTEM (Optional)

The Singlair system shall be furnished complete with a tablet feeder and a six month supply of Bio-Neutralizer dechlorination tablets. The dechlorination tablets shall contain active ingredients specially formulated to chemically neutralize both free and combined chlorine. Each tablet shall be 2⁵/₈" diameter, compressed to a 1³/₁₆" thickness, weigh approximately 5 ounces and be green in color for easy identification. The tablets shall dissolve slowly, releasing controlled amounts of chemical for the instantaneous removal of residual chlorine from the system effluent.

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 owners a lifetime 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 TNT DATA CHART

Designation: Model TNT	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)	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-)	7103	7065	7067	7068	7069

PROGRESS THROUGH SERVICE SINCE 1906

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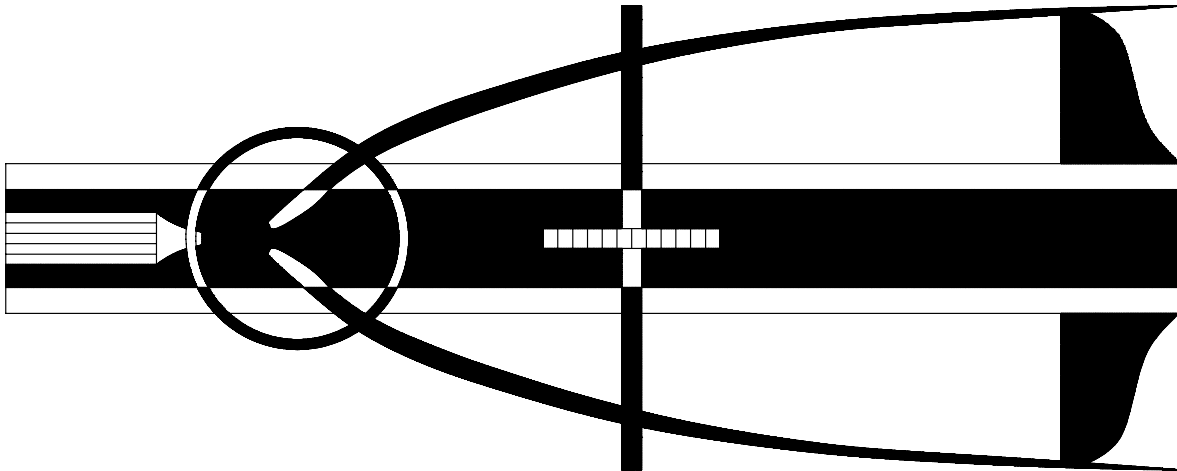
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SERVICE PRO[®]

CONTROL CENTER WITH MCD[®] TECHNOLOGY

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Service Pro control center with MCD technology as described in the following specifications. Monitoring, Compliance and Diagnostic (MCD) functions for the domestic wastewater treatment system and auxiliary equipment shall be accomplished by combining solid state microprocessor technology with advanced telemetry and web-based data acquisition. The control center shall operate the Singulair wastewater treatment plant and remotely monitor the entire system, including up to three auxiliary treatment components. Once commissioned, the telemetry system shall communicate with the Service Pro website and monitoring center to record all maintenance and alarm details. The website shall function as the user interface to manage all operational data with password protected access available to distributors, service providers, regulatory agencies and homeowners.



OPERATING CONDITIONS

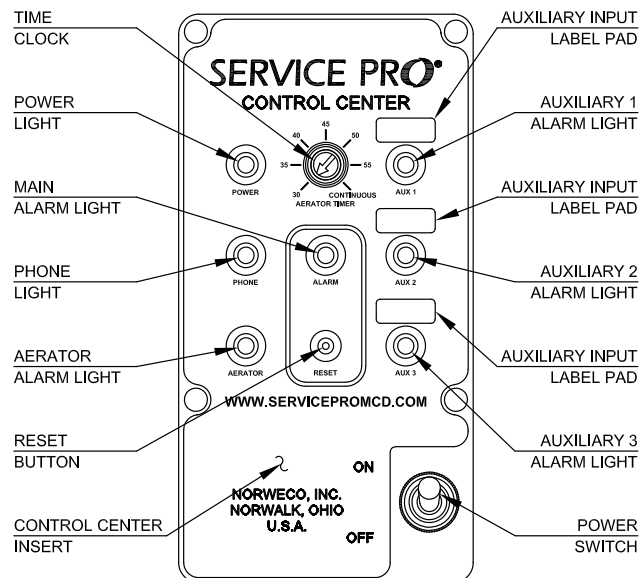
The Service Pro control center with MCD technology shall be UL Listed and provide Monitoring, Compliance and Diagnostic functions for the Singulair wastewater treatment plant and auxiliary equipment using a microprocessor based platform. The microprocessor shall contain nonvolatile memory to prevent loss of programming in the event of a power failure. When used with the Singulair Model 960 system, the programmed run cycle shall not permit the aerator to be "off" for more than thirty minutes per hour. When used with the Singulair Model TNT system, the programmed run cycle for the aerator shall be sixty minutes "on" and sixty minutes "off." The control center shall be housed in a NEMA rated electrical enclosure designed specifically for outdoor use. Control centers that do not include integral telemetry equipment require multiple enclosures with interconnecting wiring and shall not be considered for this application.

SPECIFICATIONS

SERVICE PRO®

MONITORING FUNCTIONS

The Service Pro control center shall monitor the operation of the Singulair system and up to three auxiliary treatment components. The performance of the Singulair aerator shall be constantly monitored to detect any aerator over current, aerator under current or open motor condition. If any one of these conditions is detected, power to the aerator shall be interrupted, a diagnostic sequence shall begin and the visual alarm shall activate. After a factory 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, if the telemetry system has been enabled, the control center shall report the specific condition to the Service Pro monitoring center. In the event that any of the auxiliary inputs detect an operational problem, the audible and visual alarms shall immediately activate and, if the telemetry system has been enabled, the control center shall report the specific alarm condition to the monitoring center. The distributor shall be automatically notified by the Service Pro monitoring center of the specific alarm condition using phone, fax or email.



**SERVICE PRO CONTROL CENTER
MODEL 960 SYSTEM**

COMPLIANCE FUNCTIONS

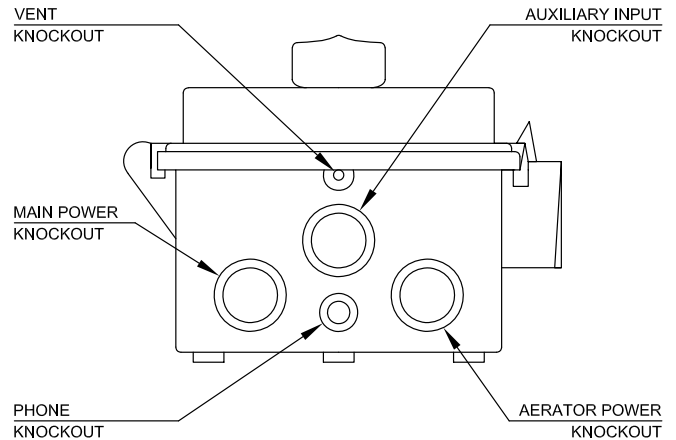
The Service Pro control center shall insure compliance with regulatory requirements by confirming normal system operation, providing remote system monitoring and automatically recording operating data and service visits. Distributors shall have the ability to grant regulatory agencies access to reports about installations in their jurisdiction that have been recorded on the Service Pro website. The integrated telemetry system shall enable the Service Pro control center to communicate with the monitoring center via any standard residential telephone service. By use of the alarm reset button, the monitoring center shall be notified of the beginning and end of any service visit. The monitoring center shall provide a time and date stamped record of each service visit and post the data to the Service Pro website. Every month, the control panel shall automatically contact the monitoring center and deliver a heartbeat call indicating proper system operation. If the heartbeat call is not received, the monitoring center shall provide notification to the service provider indicating the system has not confirmed proper operation and a site visit is required. Control centers and/or telemetry systems without the heartbeat feature do not provide proactive confirmation of system compliance and shall not be considered for this application.

DIAGNOSTIC FUNCTIONS

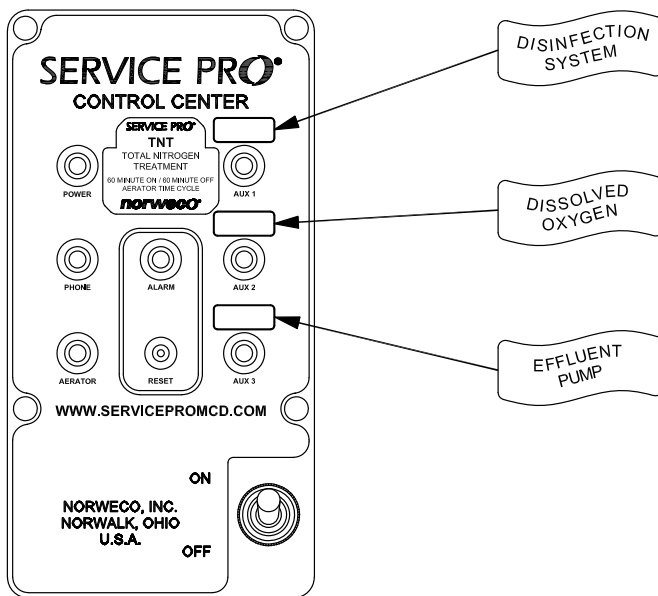
The diagnostic functions of the Service Pro panel shall insure automatic identification of any alarm condition from the Singulair system or accessory equipment. Excessive load on the aerator from any cause, including effluent pump failure, a Bio-Kinetic system requiring service or system high water, shall result in the control center visual alarm indicating an aerator over current condition. An open electrical circuit anywhere in the control center or aerator, a broken service wire between the control center and the aerator, open motor windings within the aerator or an aerator that has been left unplugged shall activate the visual alarm indicating an aerator under current condition. Any aerator alarm condition shall activate the diagnostic sequence during which the control center shall allow for a temporary condition to correct itself before a call is made to the remote monitoring center. The diagnostic sequence shall include up to 24 automatic restart attempts within a two hour period. During this diagnostic period when the control center is attempting to automatically restart the Singulair aerator, pushing the reset button shall result in a manual restart attempt. Any successful restart attempt shall return the system to normal operation and the visual alarm shall deactivate. If the condition has not been corrected after 24 manual or automatic restart attempts, the control center shall activate the audible alarm and, if the telemetry system has been enabled, notify the monitoring center of the specific alarm code. Any auxiliary equipment malfunction shall immediately activate the control center audible and visual alarms. If enabled, the telemetry system shall then call the monitoring center to identify the specific auxiliary alarm.

CONTROL CENTER COMPONENTS

The Service Pro control center shall use a microprocessor based platform to control and monitor the wastewater treatment system. Nonvolatile memory built into the solid state circuit board shall prevent programming loss in the event of a power failure to the facility being served. The pre-wired controls shall be mounted in a lockable NEMA rated enclosure designed specifically for outdoor use. The corrosion resistant enclosure shall have knockouts molded into the bottom surface to facilitate installation of electrical conduit and the system phone line. Each control center shall be a UL Listed assembly and shall include a time clock, main alarm light, reset button, power switch, power light, phone light, aerator alarm light and three auxiliary alarm lights. The power switch shall energize or de-energize power for all Service Pro control center and aerator functions. The green power light shall be lit when the Service Pro controls are energized and is the only light that will be illuminated during normal system operation. The yellow phone light shall be illuminated when the telephone line is in use by the control center. The red aerator alarm light shall be illuminated when normal operation of the aerator has been interrupted. The red auxiliary input lights shall illuminate only when the respective optional device requires service. The main alarm circuit of the Service Pro control center shall contain both visual and audible alarms and a reset button. Both the audible and visual alarms shall comply with the requirements of NSF/ANSI Standard 40 and Standard 245 regarding visual and audible signaling equipment. The main alarm light shall be visible through the closed door of the enclosure via a red weatherproof lens. When activated by either an aerator or auxiliary alarm, the main alarm light shall flash a programmed pattern to indicate the specific alarm condition. The reset button shall be centrally located on the control center and accessible from outside the enclosure via a weatherproof polyvinyl chloride (PVC) boot. Pressing the reset button shall cause a manual restart attempt of the aerator and re-initiate the programmed run cycle. If the audible alarm has been activated, pressing the reset button shall silence the alarm. The visual alarm shall remain active during the time the audible alarm is silenced. If the alarm condition has not been corrected after 48 hours, the audible alarm will reactivate. If connected to a phone line, the control panel shall automatically call the Service Pro monitoring center. Data transmitted by the control center shall be received by the monitoring center and recorded in the database maintained via the Service Pro website. The monitoring center shall automatically notify the distributor or service provider when a Service Pro panel reports an alarm condition or fails to initiate a monthly heartbeat call.



BOTTOM OF ENCLOSURE WITH KNOCKOUTS



**MODEL TNT CONTROL CENTER
WITH AUXILIARY ALARM LABELS**

MODEL 960 SYSTEM OPERATION

When a Service Pro control center is used with the Model 960 Singulair system, 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. The time clock shall be adjustable in 5 minute increments and designed so 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.

MODEL TNT SYSTEM OPERATION

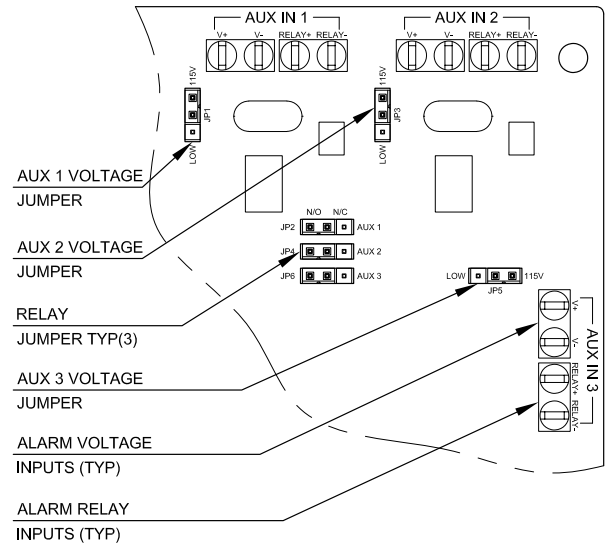
The Service Pro control center supplied with the Model TNT Singulair system shall be equipped with a factory programmed timer that controls aerator operation. The non-adjustable timer shall create a 60 minute aeration cycle followed by a 60 minute anoxic cycle during which the aerator shall be off. A total of twelve hours of aerator operation per day shall be provided.

MCD® TECHNOLOGY

AUXILIARY ALARMS

The control center shall contain three auxiliary alarm inputs to monitor accessory components. Each auxiliary input shall allow connection to a low voltage (5-24 VAC/DC) signal, a high voltage (115 VAC) signal, normally open relay contacts or normally closed relay contacts, using the appropriate input terminals and jumpers. Each set of voltage inputs shall be configured for low voltage (LOW) or high voltage (115V) by placing jumpers over the appropriate set of pins on the back of the Service Pro circuit board (labeled JP1, JP3 and JP5). In the same fashion, each set of relay inputs shall be configured for normally open (N/O) or normally closed (N/C) relay contacts by placing jumpers over the appropriate pins (labeled JP2, JP4 and JP6). Any auxiliary alarm signal shall activate that specific auxiliary alarm light and the main system alarm light, sound the audible alarm and call the remote monitoring center. Once connected to the remote monitoring center, the Service Pro panel shall identify which auxiliary alarm has been activated. Each auxiliary input shall be labeled in the space provided on the control center insert using the factory-supplied preprinted labels.

The auxiliary inputs shall be used to monitor wastewater treatment equipment only. Connection of household appliances, security systems or other unauthorized equipment is prohibited and shall void the limited warranty.

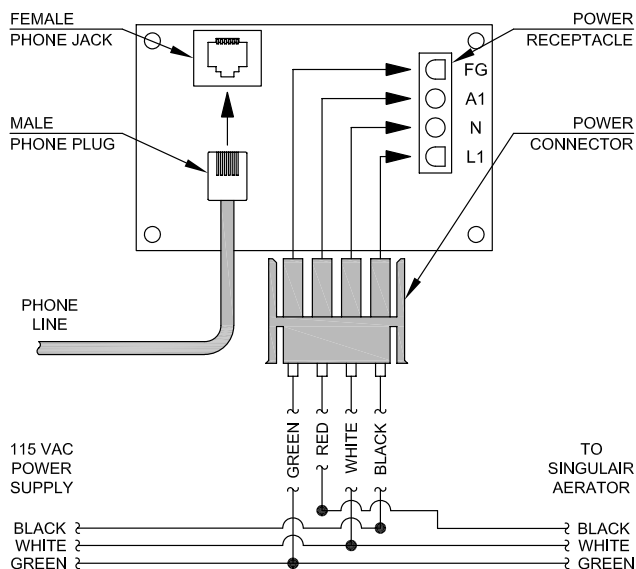


AUXILIARY ALARM INPUTS

TELEMETRY FUNCTIONS

Integrated telemetry shall permit interactive communication between the monitoring center and the Singlair system, including all auxiliary equipment. The panel shall be factory programmed to call the Service Pro monitoring center where the database of specific system information and a call record is maintained. The control center shall be shipped from the factory with the telemetry function disabled. Following panel installation and execution of the remote monitoring agreement, a commissioning process shall activate the telemetry function and establish communications with the Service Pro monitoring center via a toll-free telephone number. During normal operations, the heartbeat feature shall initiate a call to the monitoring center at monthly intervals. The panel shall also call the monitoring center to report alarm conditions. During each call, the control center shall

identify the individual installation and deliver the operational status or specific alarm code. The panel shall confirm receipt of the message before ending the call. If not confirmed, the panel shall repeat until successful. The system shall automatically sense whether the telephone service is pulse or tone and adjust accordingly. The telemetry system shall have the ability to share a phone line with the facility being served. A dedicated telephone line shall not be required. If the telephone line is shared, the Service Pro panel shall automatically check phone line availability before initiating a call. If the phone line is not available, the system shall check every 5 minutes until the line becomes clear. When a clear line is available, the panel shall connect with the monitoring center. If the telemetry system is in the process of communicating with the monitoring center and the telephone is picked up, the telemetry system shall immediately disconnect. The telephone shall be available for use after the person attempting to initiate a call momentarily hangs up to clear the phone line. The panel shall continue to monitor use of the telephone line. When the control center detects the telephone line is available for use, the telemetry system shall repeat the interrupted communication to the remote monitoring center.



POWER AND TELEPHONE CONNECTIONS

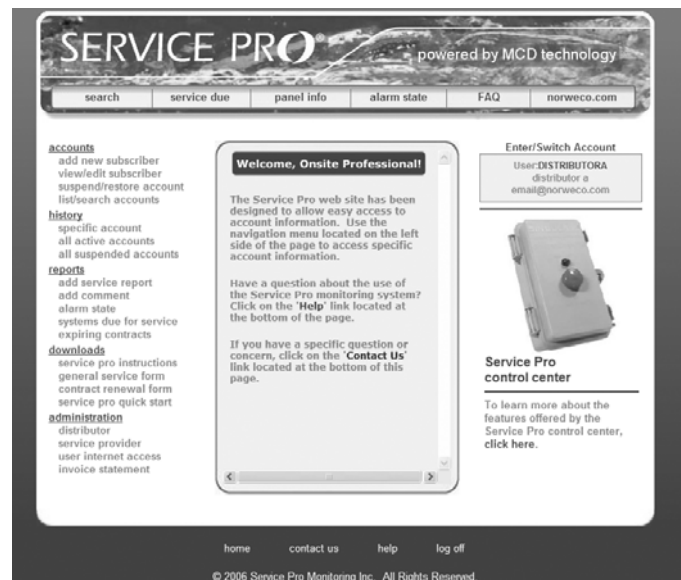
SPECIFICATIONS

SERVICE PRO® MONITORING CENTER

The Service Pro monitoring center shall include a 128 bit encrypted, password protected website for interface with the database of wastewater treatment system information. Access to the secure website shall be obtained through a unique user name and password that gives users tiered access to data from the wastewater treatment systems being monitored. Access levels shall include distributors, service providers, local regulatory agencies, state regulatory agencies and individual system owners. Distributors and service providers shall be able to create accounts, maintain service records and grant regulatory agencies access to the website. Individual system owners shall be able to view information regarding their own systems, as well as download instructional information. The monitoring center database shall contain the following information for each system registered: owner's name and system address, aerator serial number, control center serial number, system model number(s), auxiliary alarm information, accessory equipment information, permit information, service contract information, account status, service history and complete alarm history. Access to all wastewater treatment system information shall be password protected and limited exclusively to distributors, service providers, regulatory agencies and system owners. Integrity of stored data shall be maintained through the use of multiple servers operating in geographically isolated locations.

COMMISSIONING PROCESS

The Service Pro control center shall be programmed to initiate communications with the website and remote monitoring center via the commissioning process. Commissioning shall typically be initiated at Singulair system start-up and shall require no special tools or electronic equipment. The colored indicator lights on the face of the control center insert shall be used to confirm each step through the commissioning process. The Service Pro telemetry system shall send a communication to the monitoring center identifying the control panel and indicating that telemetry features have been enabled. If the control center has been correctly commissioned, the red alarm light in the center of the Service Pro panel shall flash for five seconds and then turn off. If commissioning is not performed, the telemetry features shall remain disabled, but all Singulair wastewater treatment system operating controls and diagnostic features shall be fully functional.



SERVICE MANAGEMENT MODULE

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All routine and emergency service shall be managed by the Service Pro monitoring center and shall be accessible through the password protected website. Systems where the telemetry functions are not activated shall be managed by manual entries into the website. When a Singulair installation is registered, the service frequency for the system shall be entered into the database. An online report shall constantly notify distributors and service providers of the systems that are due for service in the next 90 days, including both warranty and extended service contract inspections. All systems with service contracts expiring within the next 90 days in a given geographic area also shall be posted to an online report. Any system in the area that is currently experiencing an alarm condition shall be posted and viewable by the distributor and service provider. Distributors shall have the ability to grant regulatory officials access to system reports. These reports shall improve maintenance efficiency by allowing all service visits and installation inspections to be scheduled by date and grouped by physical proximity.

When service to the Singulair wastewater treatment system is performed, the date and time of the service visit as reported by the Service Pro telemetry system shall be posted on the website. If the telemetry system has not been commissioned, the website shall have the ability to receive manually entered service reports and post them with all inspection and compliance information. Manually completed service reports shall be automatically incorporated into the Service Pro website for electronic tracking. The service reports shall specify the inspection date, service performed and the condition of all equipment, including the Singulair aerator, Bio-Kinetic system, control center, optional disinfection system and effluent disposal system.

CERTIFICATION AND TESTING

The Service Pro control center shall be certified by internationally accredited, independent testing laboratories to verify product safety and performance. The control center shall meet the requirements of Underwriter's Laboratory (UL) Standard 508 and the Canadian Standards Association (CSA) Standard CAN/CSA-C22.2 No. 68-92 (R2004). The telemetry equipment shall be licensed by the Federal Communications Commission (FCC) under Standard 68. The circuit board shall be tested by an independent agency for certification and approval to ANSI C62-41 for 320 joules of intermittent electrical surge protection. The Service Pro control center shall be tested by an independent third party laboratory for electromagnetic compatibility per European Standard EN61000-6-1, including radiated and conducted radio frequency testing, electrostatic discharge testing and fast burst transient testing. To prevent corrosion from humidity or potentially harmful gasses associated with the treatment of domestic wastewater, the completed circuit board shall be conformal coated with a UL Recognized acrylic resin meeting military specification MIL-46058C.

The Service Pro control center shall be listed by NSF International and CSA for compliance with all applicable standards. The enclosure for the control center shall be certified as complying with NEMA standards for outdoor rated electrical enclosures. The current sensing circuit of the control center shall be tested to maintain accuracy to within 5% of the design parameters when operated in ambient temperatures from -20° to 160° Fahrenheit. The control center shall meet the requirements of NSF/ANSI Standard 40 and Standard 245 for use with Singulair wastewater treatment systems, including performance testing of the audible and visual alarms. Control centers not complying with applicable standards, certifications and testing have not been proven suitable for long term use and shall not be considered for this application.

WARRANTY PROGRAM

The manufacturer shall provide a two year limited warranty against defects in material and workmanship under normal use and service for each Service Pro control center with MCD technology. The warranty shall also cover any other Singulair components purchased from the manufacturer. The Singulair distributor shall provide warranty 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.

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BLUE CRYSTAL[®]

RESIDENTIAL DISINFECTING TABLETS

GENERAL SPECIFICATIONS

Blue Crystal tablets shall be formulated and produced to insure effective and dependable disinfection for wastewater systems subject to low, sustained, variable and intermittent flows. Blue Crystal tablets shall provide a sufficient dose of chlorine for positive disinfection of any residential wastewater system. The tablets shall be 2⁵/₈" diameter, compressed to 1" thickness with an approximate weight of 5 oz. and incorporate beveled edges to insure consistent dosage. Standard calcium hypochlorite or trichloroisocyanurate tablets do not provide a sufficient chlorine dose for complete disinfection in low flow systems and therefore shall not be considered for this application.

TABLET PROPERTIES AND USAGE

Blue Crystal disinfecting tablets shall be registered with the USEPA and all applicable State Departments of Agriculture as a wastewater microbiocide and disinfectant. The tablets shall have an active ingredient of 73% calcium hypochlorite and contain a minimum of 70% available chlorine. When used as directed, Blue Crystal disinfecting tablets shall provide a more economical, safe and convenient method of disinfection than ultraviolet or liquid based systems. The consistent dissolve rate of Blue Crystal disinfecting tablets shall provide an effective chemical dose and improved control over chlorine residual. Therefore, other tablets of similar composition shall not be considered for this application.

PRODUCT APPLICATION

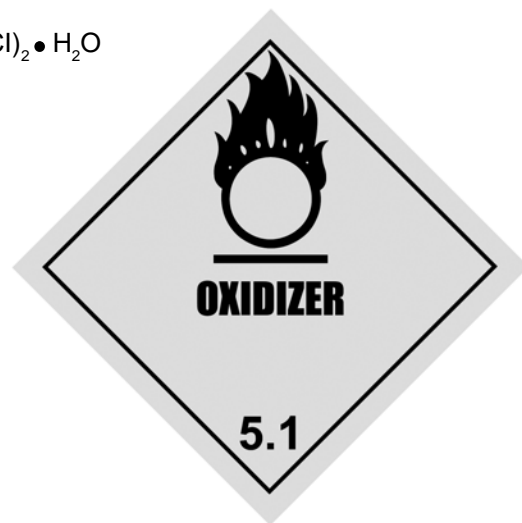
The 2⁵/₈" diameter by 1" thick Blue Crystal tablets shall be utilized for the disinfection of wastewater treatment systems. The tablets shall maintain a consistent chemical application rate at intermittent peak flow factors as high as four and shall provide reliable effluent disinfection even when the significant runoff period is six hours. Blue Crystal tablets shall effectively disinfect typical wastewater flows, providing a chlorine residual that dissipates quickly to protect the receiving environment. The following is a list of common applications where the tablets can be used: septic tanks, aerobic treatment systems, sand filters, spray irrigation systems, and marine sanitation devices.

DESIGN DATA

Tablet Size	2 ⁵ / ₈ " diameter, 1" thick
Approximate Tablet Weight	5 oz. (140 grams)
Active Ingredient	73% Calcium Hypochlorite – $\text{Ca}(\text{OCl})_2 \bullet \text{H}_2\text{O}$
Minimum Available Chlorine	70%
Inert Ingredient Content	27%
EPA Registration	63243-4
Appearance Characteristics	White Tablet with Blue Crystals
Special Design Features	Beveled Edges

SPECIAL INSTRUCTIONS

Blue Crystal disinfecting tablets are a strong oxidizing agent and highly corrosive. Contact with other chlorine compounds, oil or petroleum products is extremely dangerous – fire or explosion could result. Improper use of this product may cause personal injury or property damage. Tablets may be fatal if swallowed and tablet dust is irritating to the eyes, nose and throat. Keep out of the reach of children. Store only in sealed original container in a cool, dry, well-ventilated area. It is a violation of Federal Law to use Blue Crystal disinfecting tablets in a manner inconsistent with its labeling. Read the product container label and Blue Crystal disinfecting tablet Safety Instructions and Tablet Properties and Usage instructions before use. Always wear rubber gloves and either safety goggles or a face shield when handling Blue Crystal tablets.



CALCIUM HYPOCHLORITE,
HYDRATED MIXTURES
UN 2880

PRODUCT STORAGE

Blue Crystal disinfecting tablets are a strong and highly corrosive oxidizing agent. Blue Crystal tablets should be stored in a cool, dry, well-ventilated area, away from heat or flame. Stock should be rotated on a first-in, first-out basis. Store Blue Crystal tablets in their original container with the lid tightly closed. Store tablets away from combustible materials such as paper, petroleum products, chemicals, rags or cardboard. In case of contamination or decomposition, do not reseal container and notify fire department immediately. If possible, isolate container in open air or a well-ventilated area. Flood tablets and container with large volumes of water to dissolve all materials, then discard container. Do not reuse the empty container.

SAFETY INSTRUCTIONS

Before handling Blue Crystal tablets, carefully read the product container label and the Product Storage, Tablet Handling, Caution and First Aid sections of these instructions. Do not add Blue Crystal tablets to a feed tube containing the remnants of any other product, particularly oil and petroleum products or swimming pool chlorine – fire or explosion could result. Do not contaminate food or feed during the use, storage or disposal of Blue Crystal tablets or the cleaning of chemical feed equipment. Always wear rubber gloves and either safety goggles or a face shield when handling Blue Crystal tablets or working with any tablet chlorinator or chemical feed tube. Avoid contact with skin, eyes, mouth, respiratory system or clothing. Keep only in tightly closed original container. Store only in a cool, dry, well-ventilated area. Avoid moisture contamination.

TABLET HANDLING

It is a violation of Federal Law to use Blue Crystal tablets in a manner inconsistent with the container label. It is a violation of Federal Law to sell the tablets in a package other than the original container and in the quantity shown on the label. Read the entire Blue Crystal tablet container label and these instructions carefully before handling this product. Mix only with water. Use only clean, dry utensils made of metal or plastic. Do not add Blue Crystal tablets to any dispensing device containing remnants of any other product. Such use may cause a violent reaction leading to fire, explosion and/or the release of toxic gas.

FEED TUBE LOADING INSTRUCTIONS

1. Remove feed tube from dispenser housing.
2. Remove protective cap from feed tube; place cap in a clean, dry area.
3. Remove any tablet residue by gently tapping feed tube on concrete or stone surface. If tablets other than Blue Crystal have been used, rinse tube and cap with fresh water until clean and allow to dry before proceeding.
4. Hold tube, slotted end up, at a 45° angle and slide Blue Crystal disinfecting tablets into the tube, one tablet at a time.
5. Insure that all tablets lie flat, on top of one another, in the feed tube.
6. Use your gloved hand to retain tablets inside the open end of the inverted tube while filling.
7. Carefully return tube to upright position.
8. Replace the cap securely.
9. Place tube back into housing, slotted end down.
10. Be sure feed tube is fully engaged and rests evenly on the floor of the housing.
11. If the tablet feeder incorporates multiple feed tubes, consult the manufacturer's instructions to determine the correct number of tubes to be filled and their placement.



CAUTION

Blue Crystal disinfecting tablets are highly corrosive. Contact with other chlorine products or reducing agents, such as swimming pool chemicals or Bio-Neutralizer dechlorination tablets, is extremely dangerous – fire or explosion could result. Keep out of the reach of children. Avoid contact with skin, eyes, mouth, ears and nose or clothing – failure to do so will cause irritation on contact. Always wear rubber gloves and either safety goggles or a face shield when handling this product. Avoid breathing tablet dust; it is irritating to the eyes, nose and throat and potentially fatal. Wash contaminated clothing before reuse.

IN CASE OF EMERGENCY INVOLVING THIS PRODUCT, PHONE (800) 424-9300.

FIRST AID INSTRUCTIONS

If contact with skin occurs, remove clothing and wash with water for 15-20 minutes. If irritation occurs, seek medical attention. If eye contact occurs, hold eye open and flush with water for at least 15 minutes. Get immediate medical treatment. If swallowed, promptly drink large quantities of water. DO NOT induce vomiting. Avoid alcohol. Call physician immediately. If inhaled, move victim to fresh air and get immediate medical attention. In case of fire, immediately evacuate the area and notify the fire department.

MATERIAL SAFETY DATA SHEET

BLUE CRYSTAL® RESIDENTIAL DISINFECTING TABLETS

EMERGENCY TELEPHONE: (800) 424-9300

DATE PREPARED: JANUARY 2011

I. PRODUCT IDENTIFICATION

TRADE NAME	Blue Crystal®	IDENTIFICATION NUMBER	UN 2880
CHEMICAL NAME	Calcium Hypochlorite, Hydrated, Tablets	PACKING GROUP	II
CHEMICAL ABSTRACT SERVICE NO.	CAS #7778-54-3	REPORTABLE QUANTITY	10 pounds/4.5 Kg.
CHEMICAL FAMILY	Hypochlorite	HMIS/NFPA RATING	3/0/1
FORMULA	Ca (OCl) ₂ • H ₂ O	I.M.O. DESCRIPTION	Calcium Hypochlorite, Hydrated, Class 5.1, UN 2880,
U.S. DOT SHIPPING NAME	Calcium Hypochlorite, Hydrated		Packing Group II, IMDG
U.S. DOT HAZARD CLASS	5.1 Oxidizer		Code Page 5138

II. INGREDIENTS

CALCIUM HYPOCHLORITE (70% Available Chlorine)	73%	INERT INGREDIENTS (Includes 5.5-10% Moisture and colorant)	27%
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III. PHYSICAL DATA

BOILING POINT AT 760 mm Hg	Decomposes at 180° C	SOLUBILITY IN H ₂ O; % BY WEIGHT	217 g/l at 27° C
SPECIFIC GRAVITY OF TABLET	1.94 (H ₂ O = 1)	APPROXIMATE BULK DENSITY	61 lbs./ft ³
pH OF SOLUTION	Alkaline	HEAT OF SOLUTION	Slightly Exothermic
APPEARANCE AND ODOR	White with blue crystals and chlorine odor	VOLUME % VOLATILE	Not Applicable

IV. FIRE AND EXPLOSION DATA

FLASH POINT	None
EXTINGUISHING MEDIA	Water Only - Smothering Ineffective
SPECIAL FIRE FIGHTING PROCEDURES	NIOSH - Approved, positive pressure, self-contained breathing apparatus with full face piece for possible exposure to hazardous gas.
UNUSUAL FIRE & EXPLOSION HAZARD	Decomposes rapidly at 180° C, generating oxygen and heat. Containers may rupture. (Do <u>NOT</u> use dry extinguishers containing ammonium compounds).

V. HEALTH HAZARD DATA

ACUTE TOXICITY DATA (ANIMAL)		CLASSIFICATION	
LC 50 INHALATION	(Rat) No Mortality at 3.5 mg/l (1 hour)	INHALATION	Irritating
LD 50 ORAL	850 mg/kg (Rat)	SKIN	Corrosive
LD 50 DERMAL	(Rabbit) > 1000 mg/kg	EYE	Corrosive
LC 50 AQUATIC	TLM 96 Hr.: 10-1 ppm	INGESTION	Toxic
CAUSES BURNS TO EYES AND SKIN		AQUATIC	Highly Toxic
CHRONIC TOXICITY	There are no known or reported effects from repeated exposure.		

VI. EFFECTS OF OVEREXPOSURE

PERMISSIBLE	No permissible exposure limits have been established by OSHA.
ACUTE	
INHALATION	Inhalation of this material is irritating to the nose, mouth, throat, and lungs. It may also cause burns to the respiratory tract with the production of lung edema which can result in shortness of breath, wheezing, choking, chest pain, and impairment of lung function. Inhalation of high concentrations can result in permanent lung damage. Chronic (repeated) inhalation exposure may cause impairment of lung function and permanent lung damage.
EYE/SKIN	Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage. Contact with skin may cause severe irritation, burns, or tissue destruction.
INGESTION	Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration.
CHRONIC	There are no known or reported effects from chronic exposure.

VII. EMERGENCY AND FIRST AID PROCEDURES

INHALATION	Remove to fresh air. Give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Seek medical attention immediately.
EYE CONTACT	Immediately flush with large amounts of water for fifteen (15) minutes, rinsing eye thoroughly. Get medical attention.
SKIN CONTACT	Wash with plenty of soap and water for fifteen (15) minutes. Remove contaminated clothing and wash before reuse. If skin irritation occurs, get medical attention.
INGESTION	If conscious, drink a large quantity of water and common vegetable oil. Do <u>NOT</u> induce vomiting. Take immediately to hospital. Avoid alcohol. If unconscious, or in convulsions, seek medical attention immediately. Do not give anything by mouth to an unconscious person.

VIII. REACTIVITY DATA

STABILITY	Unstable.
CONDITIONS TO AVOID	Any form of contamination or excessive heat above 177° C.
INCOMPATIBILITY	Acids, combustible materials, organics, reducing agents, flammables, beverages, compounds containing nitrogen, dry powder fire extinguishers (containing mono-ammonium phosphate).
HAZARDOUS DECOMPOSITION PRODUCTS	Acids or ammonia contamination will release toxic gas. Excessive heat may cause decomposition and release chlorine gas.

IX. SPILL AND LEAK PROCEDURE

USE EXTREME CAUTION IN HANDLING SPILLED MATERIAL. CONTAMINATION WITH ORGANIC OR COMBUSTIBLE MATERIAL MAY CAUSE FIRE OR VIOLENT DECOMPOSITION. IF FIRE OR DECOMPOSITION OCCURS IN AREA OF SPILL, IMMEDIATELY DOUSE WITH PLENTY OF WATER. OTHERWISE, SWEEP UP ALL VISIBLE MATERIAL USING A CLEAN, DRY SHOVEL AND BROOM AND DISSOLVE MATERIAL IN WATER. CARE MUST BE TAKEN WHEN USING OR DISPOSING OF CHEMICAL MATERIALS TO PREVENT ENVIRONMENTAL CONTAMINATION. IT IS YOUR DUTY TO DISPOSE OF THE CHEMICAL MATERIALS AND/OR THEIR CONTAINERS IN ACCORDANCE WITH THE CLEAN AIR ACT, THE CLEAN WATER ACT AND RCRA REGULATIONS.

X. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION	If conditions are dusty, use NIOSH respirator with acid gas cartridge and dust pre-filter.
VENTILATION	Not required unless dusty conditions are encountered. Store and use in a well-ventilated area.
EYE PROTECTION	Chemical safety goggles.
GLOVES	Natural or synthetic rubber.
OTHER PROTECTIVE EQUIPMENT	Boots, aprons, or chemical suits as required to prevent skin contact.

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ADDITIONAL CHEMICAL PRODUCTS FROM NORWECO

BIO-DYNAMIC® TABLET FEEDERS

The Bio-Dynamic model LF 1500 tablet feeder is a technological advancement in dry tablet application for water or wastewater treatment. Designed for use in both residential and small commercial systems, the LF 1500 has a treatment capacity of up to



1,500 gallons per day. Inlet and outlet hubs are integrally molded components of the feeder that allow direct connection of the LF 1500 to standard Schedule 40 PVC piping. The LF 1500 tablet feeder may be installed at grade or by direct burial with in-line connection to treatment system piping up to 18" below grade. An internal safety/reinforcing strut prevents entry into the feeder and provides additional strength during direct burial installations. Optional riser assemblies and remote feed tube removal systems permit deeper direct burial installation without the need for a manhole or separate enclosure. Liquid entering the tablet feeder is automatically controlled by the tiered flow deck of the LF 1500. The flow deck insures superior performance throughout the range of flow rates that are typically generated by residential treatment systems. Incoming liquid is directed to the feed tubes during low flows and liquid velocity is dispersed during peak flows, resulting in a consistent application rate and virtually eliminating tablet wicking. Ten other models of Bio-Dynamic feeders are available with treatment capacities up to 200,000 gallons per day. All Bio-Dynamic tablet feeders have multiple installation options to serve a variety of system configurations, including direct burial, in-line and contact chamber mounting. Bio-Dynamic tablet feeders have no moving parts and require no electricity. The accuracy and dependability of

Bio-Dynamic feeders insure consistent tablet application is provided along with low installation costs, low operating costs and low maintenance. All Bio-Dynamic tablet feeders and risers are backed by a ten year limited warranty.

BIO-SANITIZER® DISINFECTING TABLETS

Bio-Sanitizer disinfecting tablets are uniquely formulated to provide efficient and reliable disinfection of water or wastewater treatment system flows. Bio-Sanitizer tablets provide treatment plant operators a consistent means to meet disinfection standards without exceeding new and stringent limits for total residual chlorine. Produced from a proprietary grade of calcium hypochlorite and containing a minimum of 70% available chlorine, Bio-Sanitizer tablets are registered by the U.S. Environmental Protection Agency and the Canadian Ministry of the Environment. With a unique beveled edge, Bio-Sanitizer tablets dissolve slowly and evenly, providing effective, economical bacteria killing power. Bio-Sanitizer disinfecting tablets are packaged in easy to open, resealable 10 lb., 25 lb., 45 lb. and 100 lb. Department of Transportation approved containers.

BIO-NEUTRALIZER® DECHLORINATION TABLETS

Bio-Neutralizer dechlorination tablets are formulated to effectively remove free and combined chlorine from water or wastewater treatment system flows. Containing 35% active sodium sulfite, Bio-Neutralizer tablets will reduce or remove chlorine and protect water quality without degrading environmental conditions. Research shows that higher concentrations of sodium sulfite will reduce beneficial dissolved oxygen in receiving environments, producing harmful effects on the ecosystem. The superior formulation of Bio-Neutralizer dechlorination tablets provides consistent reduction or elimination of residual chlorine without affecting water quality, dissolved oxygen or other discharge parameters. Bio-Neutralizer tablets are packaged in easy to open, resealable 25 lb. and 45 lb. Department of Transportation approved containers.

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and wastewater treatment*

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BIO-NEUTRALIZER®

DECHLORINATION TABLETS

GENERAL SPECIFICATIONS

Bio-Neutralizer dechlorination tablets shall be formulated and produced to chemically neutralize both free and combined chlorine in water, wastewater and process water treatment systems. Bio-Neutralizer tablets shall be engineered to dissolve slowly and evenly, maintaining effluent quality without any loss of dissolved oxygen or increase in BOD₅. The tablets shall be 2⁵/₈" diameter, compressed to ¹³/₁₆" thickness with an approximate weight of 5 oz. and incorporate beveled edges to stabilize chemical release and to minimize maintenance requirements. Sulfur dioxide gas or liquid sodium metabisulfite systems create serious health hazards and handling concerns and therefore shall not be considered for this application.

TABLET PROPERTIES AND USAGE

When used as directed, Bio-Neutralizer dechlorination tablets shall provide an environmentally safe dose of sodium sulfite capable of neutralizing free and combined chlorine present in treated water, wastewater or process water. Research shows that high concentrations of sodium sulfite will degrade beneficial dissolved oxygen in receiving environments, producing harmful effects on the ecosystem. Bio-Neutralizer tablets shall provide consistent reduction or elimination of residual chlorine without affecting water quality, dissolved oxygen or other discharge parameters. A unique combination of sustained release agents and sodium sulfite shall maintain a consistently uniform application rate regardless of flow, temperature or humidity. Bio-Neutralizer dechlorination tablets shall generally lower chemical consumption and provide reliable reduction of chlorine residual in a more thorough, safe and economical manner than simple compressed sodium sulfite. Therefore, the use of other tablets of similar composition shall not be considered for this application.

PRODUCT APPLICATION

The 2⁵/₈" diameter by ¹³/₁₆" thick Bio-Neutralizer tablets shall be effective in the reduction or elimination of residual chlorine without releasing excess quantities of sodium sulfite into the receiving environment. Bio-Neutralizer tablets shall maintain a consistent application rate at intermittent peak flow factors as high as four and shall provide reliable reduction of residual chlorine even when the significant runoff period is six hours. Bio-Neutralizer tablets shall be considered non-hazardous under U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (USEPA), RCRA, CERCLA and SARA Title III listings and consist solely of commercial grade or technical grade ingredients. The following is a list of some common applications where Bio-Neutralizer dechlorination tablets may be utilized: home wastewater treatment plants, municipal wastewater plants, septic tanks – sand filters, extended aeration plants, wastewater treatment lagoons, package wastewater treatment systems, spray irrigation systems, potable water filtration backwash, municipal water plants and water towers.

DESIGN DATA

Tablet Size	2 ⁵ / ₈ " diameter, ¹³ / ₁₆ " thick	Inert Ingredient Content	65%
Approximate Tablet Weight	5 oz. (140 grams)	U.S. DOT Hazard Class	Non-hazardous
Active Ingredient	Sodium Sulfite – Na ₂ SO ₃	Appearance Characteristics	Green Tablet with Mild Odor
Active Ingredient Content	35%	Special Design Features	Beveled Edges

SPECIAL INSTRUCTIONS

Read the entire product container label, the Material Safety Data Sheet and the Bio-Neutralizer Safety and Tablet Properties and Usage instructions before handling or use. Always wear rubber gloves and either safety goggles or a face shield when handling Bio-Neutralizer tablets or working with a tablet feeder or chemical feed tube. Refer to tablet feeder manufacturer's instructions to determine the correct number of tubes to fill with Bio-Neutralizer tablets. Store Bio-Neutralizer dechlorination tablets only in their tightly sealed original container. Do not store in direct sunlight or areas where temperature may exceed 140° F. Bio-Neutralizer dechlorination tablets are a strong reducing agent containing sodium sulfite. Contact with oil, petroleum products or oxidizing agents, such as Bio-Sanitizer disinfecting tablets or any tablet used for chlorination, is extremely dangerous. Do not mix with swimming pool chemicals. Bio-Neutralizer dechlorination tablets should be stored in a cool, dry, well-ventilated area for maximum shelf life. To prevent moisture contamination, exercise care when removing tablets from the container or filling feed tubes. Avoid contact with skin, eyes, mouth, respiratory system or clothing.

PRODUCT STORAGE

Bio-Neutralizer dechlorination tablets are a strong reducing agent. Tablets should be stored in a cool, dry, well-ventilated area, away from heat or flame. Avoid storage in areas subject to direct sunlight or temperature in excess of 140° F. Stock should be rotated on a first-in, first-out basis. Bio-Neutralizer dechlorination tablets must be stored in their original container with lid tightly closed. Do not allow moisture to enter the pail during storage or while removing tablets for use. Moisture contamination may affect tablet integrity and performance. Do not reuse the empty container.

SAFETY INSTRUCTIONS

Before handling Bio-Neutralizer tablets, carefully read the container label and the Product Storage, Tablet Handling, Caution and First Aid sections of these instructions. Do not add Bio-Neutralizer tablets to a feed tube containing any other product, particularly oil and petroleum products or swimming pool chlorine. Such action may cause a violent reaction leading to fire or explosion. Do not contaminate food or feed during the use, storage or disposal of Bio-Neutralizer tablets or the cleaning of chemical feed equipment. Always wear rubber gloves and either safety goggles or a face shield when handling Bio-Neutralizer tablets or working with any tablet feeder or feed tube. Avoid contact with skin, eyes, mouth, respiratory system or clothing. Keep this product only in its tightly closed original container. Store only in a cool, dry, well-ventilated area.

TABLET HANDLING

Use only clean, dry utensils. Do not add Bio-Neutralizer dechlorination tablets to any device containing remnants of any other product – contact with oxidizers, such as Bio-Sanitizer disinfecting tablets or any other tablets used for chlorination can cause fire and the release of toxic gas. Read the entire Bio-Neutralizer tablet container label and these instructions carefully before handling this product. Use only in well-ventilated areas. Bio-Neutralizer tablets are not rated a hazardous substance by the U.S. DOT or USEPA, but necessary care should be taken in the use and handling of the tablets. Collected material can be dissolved in water, exercising caution as the solution can get hot. Dispose of dissolved material in any appropriate industrial waste collection system. Consult local, state and federal regulatory agencies before disposing of any material.

FEED TUBE LOADING INSTRUCTIONS

1. Remove feed tube from dispenser housing.
2. Remove protective cap from feed tube; place cap in a clean, dry area.
3. Remove any tablet residue by gently tapping feed tube on concrete or stone surface. If tablets other than Bio-Neutralizer have been used, rinse tube and cap with fresh water until clean and allow to dry before proceeding.
4. Hold tube, slotted end up, at a 45° angle and slide Bio-Neutralizer dechlorination tablets into the tube, one tablet at a time.
5. Ensure that all tablets lie flat, on top of one another, in the feed tube.
6. Use your gloved hand to retain tablets inside the open end of the inverted tube while filling.
7. Carefully return tube to upright position.
8. Replace the cap securely.
9. Place tube back into housing, slotted end down.
10. Be sure feed tube is fully engaged and rests evenly on the floor of the housing.
11. If the tablet feeder incorporates multiple feed tubes, consult the manufacturer's instructions to determine the correct number of tubes to be filled and their placement.



CAUTION

Do not mix Bio-Neutralizer dechlorination tablets with acids or oxidizing agents such as Bio-Sanitizer disinfecting tablets or other tablets used for chlorination – fire or explosion could result. Keep out of the reach of children. Avoid contact with skin, eyes, mouth, respiratory system or clothing – failure to do so may cause irritation on contact. Wear rubber gloves and either safety goggles or a face shield when handling this product. Product will form sodium sulfide at 600° C. At 900° C sulfur dioxide is formed. Inert ingredients could support combustion. Use self-contained breathing apparatus for fire fighting.

FIRST AID INSTRUCTIONS

If contact with skin occurs, wash with water for 15 minutes. If irritation persists, seek medical attention.
If eye contact occurs, flush with water for at least 15 minutes. Get immediate medical treatment.
If swallowed, promptly drink large quantities of water or milk. Induce vomiting. Avoid alcohol. Call physician immediately.
If inhaled, move victim to fresh air. If difficulty in breathing persists, get immediate medical attention.
In case of fire, immediately evacuate the area and notify the fire department.

MATERIAL SAFETY DATA SHEET

BIO-NEUTRALIZER® DECHLORINATION TABLETS

EMERGENCY TELEPHONE: (800) 424-9300

DATE PREPARED: JANUARY 2009

NOTE: THIS PRODUCT IS NOT RATED A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY. THE FOLLOWING DATA IS FOR INFORMATIONAL PURPOSES ONLY.

I. PRODUCT IDENTIFICATION

TRADE NAME	Bio-Neutralizer®
CHEMICAL	Sodium Sulfite
CHEMICAL ABSTRACT SYSTEM NO.	CAS #7757-83-7
CHEMICAL DESCRIPTION	Reducer
FORMULA	Na ₂ SO ₃
U.S. DOT SHIPPING NAME	Non-hazardous tablets, Item NM503401
U.S. DOT HAZARD CLASS	Non-hazardous

II. INGREDIENTS

HAZARDOUS INGREDIENTS	None
NON-HAZARDOUS INGREDIENTS	Sodium Sulfite 35%
	Inert Ingredients 65% (Includes sustained release agents)

III. PHYSICAL DATA

BOILING POINT AT 760 mm Hg	Decomposes at 900° C
FREEZING/MELTING POINT	Not Applicable
SOLUBILITY IN H ₂ O; % BY WEIGHT	25% at 80° C
SPECIFIC GRAVITY OF TABLET	2.63 (H ₂ O = 1)
APPROXIMATE TABLET DENSITY	125 lbs./ft ³
pH OF SOLUTION	Alkaline
VOLUME % VOLATILE	Not Applicable
APPEARANCE AND ODOR	Green Tablet with Mild Odor

IV. FIRE AND EXPLOSION DATA

FLASH POINT	Not Applicable
FLAMMABLE LIMITS IN AIR	Not Applicable
EXTINGUISHING MEDIA	Use extinguishing media appropriate for burning material. Compatible with water fog, spray foam or CO ₂ .
SPECIAL FIRE FIGHTING PROCEDURES	NIOSH/MSHA-Approved, positive pressure, self-contained breathing apparatus with full face piece.
UNUSUAL FIRE & EXPLOSION HAZARD	At 600° C, Sodium Sulfide is formed. At 900° C, Sulfur Dioxide is formed. Inert ingredients could support combustion by burning, yielding carbon dioxide and water. Use self-contained breathing apparatus for fire fighting.

V. HEALTH HAZARD DATA

ACUTE TOXICITY DATA (ANIMAL)	
LC 50 INHALATION	See effects of overexposure.
LD 50 ORAL	2825 MG/KG (Rabbit)
LD 50 DERMAL	See effects of overexposure.
LC 50 AQUATIC	Very high concentrations will chemically deplete dissolved oxygen necessary for aquatic life.
CHRONIC TOXICITY	Sodium Sulfite may cause allergic reactions in sensitive individuals. Contact with strong acids or high temperatures may generate Sulfur Dioxide, which is toxic, corrosive, and hazardous.

VI. EFFECTS OF OVEREXPOSURE

PERMISSIBLE	No permissible exposure limits have been established by OSHA.
ACUTE	
INHALATION	Inhalation of product dust or solution may cause respiratory tract irritation.
EYE	Dust or solution may burn eyes on contact.
SKIN	Product dust or solution may result in skin irritation upon prolonged contact.
INGESTION	Ingestion may irritate gastrointestinal tract. Toxic if taken in large doses.

VII. EMERGENCY AND FIRST AID PROCEDURES

INHALATION	Remove to fresh air. If not breathing, resuscitate and administer oxygen if readily available. Seek medical attention immediately.
EYE CONTACT	Immediately flush with large amounts of water for fifteen (15) minutes, rinsing eye thoroughly. Get medical attention.
SKIN CONTACT	Wash with plenty of soap and water for fifteen (15) minutes. Remove contaminated clothing. If skin irritation occurs, get medical attention. Wash clothing before reuse.
INGESTION	If conscious, drink large quantities of water or milk and induce vomiting. Call a physician immediately. Avoid alcohol. If unconscious, or in convulsions, seek medical attention immediately. Do not give anything by mouth to an unconscious person.

VIII. STEPS FOR MATERIAL SPILL

Spills exceeding 100 pounds should be reported to the local authorities.

1. Contain all spilled material, wearing appropriate protective equipment.
2. Place spilled material in clean, dry containers for disposal. Do not flush to surface water.

WASTE DISPOSAL METHOD

Not rated a hazardous substance by USEPA. Collected material can be dissolved in water, exercising caution. Dissolved material may be discharged into an appropriate industrial waste collection system but consult local, state, and federal regulating agencies before disposing of any material.

IX. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION	If dusty conditions are encountered, use NIOSH/MSHA respirator with acid gas cartridge and dust pre-filter.
VENTILATION	Store and use in a well-ventilated area.
EYE PROTECTION	Chemical safety goggles.
GLOVES	Natural or synthetic rubber.
OTHER PROTECTIVE EQUIPMENT	Boots, aprons, or chemical suits as required to prevent skin contact.

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ADDITIONAL CHEMICAL PRODUCTS FROM NORWECO

BIO-DYNAMIC® TABLET FEEDERS

Bio-Dynamic tablet feeders are a technological advancement in self-contained tablet dosing systems for water or wastewater treatment. A low cost, low maintenance and effective method of chemical treatment, Bio-Dynamic feeders have no mechanical



components and require no electricity. The safety, accuracy and reliability of Bio-Dynamic feeders outperform gas, liquid and ultraviolet systems. With fifteen different models, Bio-Dynamic feeders accommodate a wide range of flows and plant conditions. Installation flexibility including direct burial, inline and contact chamber mounting provides many options for locating the feeder. Complete 24" riser assemblies are available for Series 2000 and 4000 tablet feeders, while the LF Series uses 4" PVC pipe and Norweco's remote removal system to allow service from grade. No model of Bio-Dynamic feeder will ever require confined space entry equipment under OSHA regulations. Molded inlet and outlet hubs allow the Bio-Dynamic feeder to be directly connected to treatment system piping without the need for a separate drop box. The tiered flow deck of the Bio-Dynamic feeder accommodates variable, intermittent and surge hydraulic flows into the system. The flow deck directs liquid to the feed tubes during low flows and disperses liquid velocity throughout the feeder during peak flows, resulting in consistent chemical application. In many models, chemical dosage is further controlled by interchangeable weir plates or an optional sluice that can be completely adjusted from a 1" to 3" outlet width. The sluice can be adjusted during tablet feeder operation using only a standard socket wrench with extension.

All models are backed by a ten year limited warranty. Standard components include one-piece feed tubes with twist lock caps, molded inlet and outlet hubs, molded mounting feet and Norweco's tiered flow deck.

BIO-SANITIZER® DISINFECTING TABLETS

Bio-Sanitizer disinfecting tablets are uniquely formulated to provide efficient and reliable disinfection of water or wastewater treatment system flows. Bio-Sanitizer tablets provide treatment plant operators a consistent means to meet disinfection standards without exceeding new and stringent limits for total residual chlorine. Produced from a proprietary grade of calcium hypochlorite and containing a minimum of 70% available chlorine, Bio-Sanitizer tablets are registered by the U.S. Environmental Protection Agency and the Ministry of the Environment. With a unique beveled edge, Bio-Sanitizer tablets dissolve slowly and evenly, providing effective, economical bacteria killing power. Bio-Sanitizer disinfecting tablets are packaged in easy to open, resealable 10 lb., 25 lb., 45 lb. and 100 lb. Department of Transportation approved containers.

BIO-GEM® ORGANIC DIGESTER

A blend of bacteria, enzymes and natural growth accelerators, Bio-Gem organic digester effectively digests grease, fats and oils in wastewater treatment systems, lift stations, septic tanks, sand filters, drain lines and commercial grease traps. When used as directed, Bio-Gem liquid will quickly and effectively convert common grease, fats and oils into carbon dioxide and water. This organic digestion process is much more effective and reliable than compounds that merely emulsify the grease, fats and oils, sending the problem to downstream treatment processes. Regular use of Bio-Gem liquid will reduce odors, stabilize effluent quality, reduce system maintenance and minimize tank pump-out frequency. Packaged in one or five gallon containers and 55 gallon drums, Bio-Gem organic digester is environmentally safe and works in aerobic or anaerobic conditions.

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and wastewater treatment*

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norweco[®]

BIO-PERC[®]

BIOLOGICAL REMEDIATION TABLETS

GENERAL SPECIFICATIONS

Bio-Perc biological remediation tablets shall improve the performance of new or failing wastewater treatment and disposal systems by naturally removing organic material. Bio-Perc tablets shall be engineered to dissolve slowly and evenly, providing a consistent dose of select bacteria regardless of variations in the hydraulic flow rate of the system. The tablets shall be 2⁵/₈" diameter, compressed to 1" thickness with an approximate weight of 5 oz. and incorporate beveled edges to insure consistent dosage. Liquid or powder bioaugmentation products do not provide consistent bacterial dosage during variable flow conditions and therefore shall not be considered for this application.

TABLET PROPERTIES AND USAGE

When used as directed, Bio-Perc tablets shall provide a long-term, flow proportional dose of select bacterial cultures that shall naturally digest organic material. As part of a general maintenance program, Bio-Perc tablets shall enhance the performance of aerobic or anaerobic wastewater treatment systems by reducing and eliminating organic solids. Bio-Perc tablets shall remediate failing sand filters or soil-based disposal systems, allowing the system to digest accumulated organic material and naturally recover its percolation capacity. The proprietary combination of sustained release agents, dissolve rate stabilizers, enzymes and bacterial cultures shall maintain a consistent application rate regardless of changes in flow, temperature, humidity, organic or hydraulic loading. Bio-Perc tablets shall be more effective than liquid or powder bacterial products and shall reduce long-term maintenance costs of an overloaded wastewater treatment or disposal system. Therefore, the use of other biological products or formulations shall not be considered for this application.

PRODUCT APPLICATION

The 2⁵/₈" diameter by 1" thick Bio-Perc tablets shall accelerate the digestion process that naturally occurs in wastewater disposal systems and shall extend the useful life of any biological treatment process. Bio-Perc tablets shall maintain a consistent application rate at intermittent peak flow factors as high as four and shall provide reliable dosage even when the significant runoff period is six hours. Bio-Perc tablets shall be considered non-hazardous under U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (USEPA), RCRA, CERCLA and SARA Title III listings. The following is a list of some common applications where Bio-Perc tablets may be utilized: septic tanks, leach fields, surface sand filters, subsurface sand filters, sand trenches, aerobic treatment systems, anaerobic treatment systems, cesspools, mounds, low pressure distribution systems, evapotranspiration beds, constructed wetlands, septic tank effluent pump (STEP) systems and any other system prone to failure from the buildup of organic material.

DESIGN DATA

Tablet Size	2 ⁵ / ₈ " diameter, 1" thick	Inert Ingredients	Dissolve Rate Stabilizers
Approximate Tablet Weight	5 oz. (140 grams)	U.S. DOT Hazard Class	Non-hazardous
Active Ingredient	Select Bacterial Cultures	Appearance Characteristics	Bronze Tablet with Mild Odor
Active Ingredient Content	220 Billion/Pound	Special Design Features	Beveled Edges

SPECIAL INSTRUCTIONS

Read the entire product container label, the Material Safety Data Sheet and the Bio-Perc Safety and Tablet Properties and Usage instructions before handling or use. Always wear rubber gloves and either safety goggles or a face shield when handling Bio-Perc tablets or working with a tablet feeder or feed tube. Refer to tablet feeder manufacturer's instructions to determine the correct number of tubes to fill with tablets. Store Bio-Perc tablets only in their tightly sealed original container. Do not store in direct sunlight or areas where temperature may exceed 140° F. Contact with oil, petroleum products or oxidizing agents, such as Bio-Sanitizer tablets, Blue Crystal tablets or any tablet used for chlorination, is extremely dangerous. Do not mix with swimming pool chemicals. Strong acids or alkali compounds may inactivate biological cultures or cause adverse chemical reactions. Store in a cool, dry, well-ventilated area. Exposure of immunocompromised individuals to this biological product is not recommended and should be avoided. To prevent moisture contamination, exercise care when removing tablets from the container or filling feed tubes. Avoid contact with skin, eyes, mouth, respiratory system or clothing.

PRODUCT STORAGE

Bio-Perc biological remediation tablets contain spore-forming microorganisms and dissolve rate stabilizers. Tablets should be stored in a cool, dry, well-ventilated area, away from heat or flame. Avoid storage in areas subject to direct sunlight or temperature in excess of 140° F. Stock should be rotated on a first-in, first-out basis. Bio-Perc tablets must be stored in their original container with the lid tightly closed. Do not allow moisture to enter the pail during storage or while removing tablets for use. Moisture contamination may affect tablet integrity and performance. Do not reuse the empty container.

SAFETY INSTRUCTIONS

Before handling Bio-Perc tablets, carefully read the container label and the Product Storage, Tablet Handling, Caution and First Aid sections of these instructions. Do not add Bio-Perc tablets to a feed tube containing any other product, particularly oil and petroleum products or swimming pool chlorine. Such action may cause a violent reaction leading to fire or explosion. Do not contaminate food or feed during the use, storage or disposal of Bio-Perc tablets or the cleaning of chemical feed equipment. Always wear rubber gloves and either safety goggles or a face shield when handling Bio-Perc tablets or working with any tablet feeder or feed tube. Avoid contact with skin, eyes, mouth, respiratory system or clothing. Keep this product only in its tightly closed original container. Store only in a cool, dry, well-ventilated area.

TABLET HANDLING

Use only clean, dry utensils. Do not add tablets to any device containing remnants of any other product – contact with oxidizers, such as Bio-Sanitizer tablets, Blue Crystal tablets or any other tablets used for chlorination may cause a hazardous chemical reaction. Read the entire Bio-Perc tablet container label and these instructions carefully before handling this product. Use only in well-ventilated areas. Bio-Perc tablets are not rated a hazardous substance by the USDOT or USEPA, but necessary care should be taken in the use and handling of the tablets. Collected material can be dissolved in water, exercising caution, as the solution can get hot. Dispose of dissolved material in any appropriate industrial waste collection system. Consult local, state and federal regulatory agencies before disposing of any material.

FEED TUBE LOADING INSTRUCTIONS

1. Remove feed tube from dispenser housing.
2. Remove protective cap from feed tube; place cap in a clean, dry area.
3. Remove any tablet residue by gently tapping feed tube on concrete or stone surface. If tablets other than Bio-Perc have been used, rinse tube and cap with fresh water until clean and allow to dry before proceeding.
4. Hold tube, slotted end up, at a 45° angle and slide Bio-Perc tablets into the tube, one tablet at a time.
5. Insure that all tablets lie flat, on top of one another, in the feed tube.
6. Use your gloved hand to retain tablets inside the open end of the inverted tube while filling.
7. Carefully return tube to upright position.
8. Replace the cap securely.
9. Place tube back into housing, slotted end down.
10. Be sure feed tube is fully engaged and rests evenly on the floor of the housing.
11. If the tablet feeder incorporates multiple feed tubes, consult the manufacturer's instructions to determine the correct number of tubes to be filled and their placement.



CAUTION

Do not mix Bio-Perc tablets with acids or oxidizing agents such as Bio-Sanitizer tablets, Blue Crystal tablets or other tablets used for chlorination – fire or explosion could result. Keep out of the reach of children. Avoid contact with skin, eyes, mouth, respiratory system or clothing – failure to do so may cause irritation on contact. Wear rubber gloves and either safety goggles or a face shield when handling this product. Avoid breathing tablet dust. Wash contaminated clothing before reuse. Inert ingredients could support combustion at elevated temperatures. Use self-contained breathing apparatus for fire fighting.

FIRST AID INSTRUCTIONS

If contact with skin occurs, remove clothing and wash with water for 15-20 minutes. If irritation develops, seek medical attention. If eye contact occurs, hold eye open and flush with water for at least 15 minutes. Get immediate medical treatment. If swallowed, promptly drink large quantities of water or milk. Induce vomiting. Avoid alcohol. Call physician immediately. If inhaled, move victim to fresh air. If difficulty in breathing persists, get immediate medical attention. In case of fire, immediately evacuate the area and notify the fire department.

MATERIAL SAFETY DATA SHEET

BIO-PERC® BIOLOGICAL REMEDIATION TABLETS

EMERGENCY TELEPHONE: (800) 424-9300

CHEMTREC #16012

DATE PREPARED: JANUARY 2012

NOTE: THIS PRODUCT IS NOT RATED A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY. THE FOLLOWING DATA IS FOR INFORMATIONAL PURPOSES ONLY.

I. PRODUCT IDENTIFICATION

TRADE NAME	Bio-Perc®
CHEMICAL	Bacterial Formulation
CHEMICAL ABSTRACT SYSTEM NO.	Not Applicable
CHEMICAL DESCRIPTION	Not Applicable
FORMULA	Compound Product
U.S. DOT SHIPPING NAME	Non-hazardous tablets, Item NM20400
U.S. DOT HAZARD CLASS	Non-hazardous

II. INGREDIENTS

HAZARDOUS INGREDIENTS	None
NON-HAZARDOUS INGREDIENTS	Viable non-pathogenic bacterial cultures Dissolve rate stabilizers

III. PHYSICAL DATA

BOILING POINT AT 760 mm Hg	Decomposes at 200° C
FREEZING/MELTING POINT	Not Applicable
SOLUBILITY IN H ₂ O; % BY WEIGHT	15% @ 20° C
SPECIFIC GRAVITY OF TABLET	2.00 (H ₂ O=1)
APPROXIMATE TABLET DENSITY	125 lbs./ft ³
pH OF SOLUTION	Alkaline
VOLUME % VOLATILE	Not Applicable
APPEARANCE AND ODOR	Bronze Tablet with Mild Odor

IV. FIRE AND EXPLOSION DATA

FLASH POINT	Not Applicable
FLAMMABLE LIMITS IN AIR	Not Applicable
EXTINGUISHING MEDIA	Use extinguishing media appropriate for burning material. Compatible with water fog, spray foam or CO ₂ .
SPECIAL FIRE FIGHTING PROCEDURES	NIOSH - Approved, positive pressure, self-contained breathing apparatus with full face piece.
UNUSUAL FIRE & EXPLOSION HAZARD	Inert ingredients could support combustion by burning, yielding carbon dioxide and water.

V. HEALTH HAZARD DATA

ACUTE TOXICITY DATA (ANIMAL)

LC 50 INHALATION	Limited toxicity-see effects of overexposure
LD 50 ORAL	Limited toxicity-see effects of overexposure
LD 50 DERMAL	Limited toxicity-see effects of overexposure
LC 50 AQUATIC	Limited toxicity

CHRONIC TOXICITY

May cause allergic reactions in sensitive individuals. Avoid prolonged contact. Contact with lime dust and moisture will produce Sodium Hydroxide, which is toxic, corrosive and hazardous.

VI. EFFECTS OF OVEREXPOSURE

<u>PERMISSIBLE</u>	No permissible exposure limits have been established by OSHA.
<u>ACUTE</u>	
INHALATION	Inhalation of product dust or solution may cause respiratory tract irritation.
EYE	Dust or solution may burn eyes on contact.
SKIN	Product dust or solution may result in skin irritation upon prolonged contact.
INGESTION	Ingestion may irritate gastrointestinal tract. Toxic if taken in large doses.

VII. EMERGENCY AND FIRST AID PROCEDURES

<u>INHALATION</u>	Remove to fresh air. If not breathing, resuscitate and administer oxygen if readily available. Seek medical attention immediately.
<u>EYE CONTACT</u>	Immediately flush with large amounts of water for fifteen (15) minutes, rinsing eye thoroughly. Get medical attention.
<u>SKIN CONTACT</u>	Wash with plenty of soap and water for fifteen (15) minutes. Remove contaminated clothing. If skin irritation occurs, get medical attention. Wash clothing before reuse.
<u>INGESTION</u>	If <u>conscious</u> , drink large quantities of water or milk and induce vomiting. Call a physician immediately. Avoid alcohol. If <u>unconscious</u> , or in convulsions, seek medical attention immediately. Do not induce vomiting or give anything by mouth to an unconscious person.

VIII. STEPS FOR MATERIAL SPILL

Spills exceeding 100 pounds should be reported to the local authorities.

1. Contain all spilled material, wearing appropriate protective equipment.
2. Place spilled material in clean, dry containers for disposal. Do not flush to surface water.

WASTE DISPOSAL METHOD

Not rated a hazardous substance by USEPA. Collected material can be dissolved in water, exercising caution. Dissolved material may be discharged into an appropriate industrial waste collection system but consult local, state and federal regulating agencies before disposing of any material. Contact with acids will release carbon dioxide gas. Material mixed with lime dust and water will produce corrosive Sodium Hydroxide (caustic soda).

IX. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION	If dusty conditions are encountered, use NIOSH approved respirator with acid gas cartridge and dust pre-filter.
VENTILATION	Store and use in a well-ventilated area.
EYE PROTECTION	Chemical safety goggles.
GLOVES	Natural or synthetic rubber.
OTHER PROTECTIVE EQUIPMENT	Boots, aprons or chemical suits as required to prevent skin contact.

THIS MATERIAL SAFETY DATA SHEET IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION. NORWALK WASTEWATER EQUIPMENT COMPANY PROVIDES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, AND ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREIN.

ADDITIONAL CHEMICAL PRODUCTS FROM NORWECO

BIO-DYNAMIC® TABLET FEEDERS

Bio-Dynamic tablet feeders are a technological advancement in self-contained tablet dosing systems for water or wastewater treatment. A low cost, low maintenance and effective method of chemical treatment, Bio-Dynamic feeders have no mechanical



components and require no electricity. The safety, accuracy and reliability of Bio-Dynamic feeders outperform gas, liquid and ultraviolet systems. With fifteen different models, Bio-Dynamic feeders accommodate a wide range of flows and plant conditions. Installation flexibility including direct burial, inline and contact chamber mounting provides many options for locating the feeder. Complete 24" riser assemblies are available for Series 2000 and 4000 tablet feeders, while the LF Series uses 4" PVC pipe and Norweco's remote removal system to allow service from grade. No model of Bio-Dynamic feeder will ever require confined space entry equipment under OSHA regulations. Molded inlet and outlet hubs allow the Bio-Dynamic feeder to be directly connected to treatment system piping without the need for a separate drop box. The tiered flow deck of the Bio-Dynamic feeder accommodates variable, intermittent and surge hydraulic flows into the system. The flow deck directs liquid to the feed tubes during low flows and disperses liquid velocity throughout the feeder during peak flows, resulting in consistent chemical application. In many models, chemical dosage is further controlled by interchangeable weir plates or an optional sluice that can be completely adjusted from a 1" to 3" outlet width. The sluice can be adjusted during tablet feeder operation using only a standard socket wrench with extension.

All models are backed by a ten year limited warranty. Standard components include one-piece feed tubes with twist lock caps, molded inlet and outlet hubs, molded mounting feet and Norweco's tiered flow deck.

BLUE CRYSTAL® RESIDENTIAL DISINFECTING TABLETS

Blue Crystal tablets are the first disinfectant that has been specifically developed for use in residential wastewater treatment applications. Formulated to maintain positive disinfection during the low, sustained, variable and intermittent flow rates that are common to residential systems, Blue Crystal tablets reduce 99% of bacteria within the first ten minutes of contact. Containing a minimum of 70% available chlorine, Blue Crystal tablets are registered by the U.S. Environmental Protection Agency for wastewater treatment. Produced with a proprietary beveled edge design, Blue Crystal tablets dissolve in direct proportion to the incoming hydraulic flow rate, providing effective, economical bacteria killing power. Blue Crystal residential disinfecting tablets are packaged in easy to open, resealable 1.9 lb., 10 lb. and 100 lb. Department of Transportation approved containers.

BIO-NEUTRALIZER® DECHLORINATION TABLETS

Bio-Neutralizer dechlorination tablets are formulated to effectively remove free and combined chlorine from water or wastewater treatment system flows. Containing 35% active sodium sulfite, Bio-Neutralizer tablets will reduce or remove chlorine and protect water quality without degrading environmental conditions. Research shows that higher concentrations of sodium sulfite will reduce beneficial dissolved oxygen in receiving environments, producing harmful effects on the ecosystem. The superior formulation of Bio-Neutralizer dechlorination tablets provides consistent reduction or elimination of residual chlorine without affecting water quality, dissolved oxygen or other discharge parameters. Bio-Neutralizer tablets are packaged in easy to open, resealable 25 lb. and 45 lb. Department of Transportation approved containers.

norweco®

*Engineering the future of water
and wastewater treatment*

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SINGULAIR® BIO-KINETIC®

WASTEWATER TREATMENT SYSTEM WITH SERVICE PRO® CONTROL CENTER

MODELS 960 AND TNT OWNER'S MANUAL

INTRODUCTION

The Singulair system is the finest equipment available and utilizes the most up-to-date wastewater treatment technology. It is a sound investment that protects you and the environment. Please take the time to familiarize yourself with the contents of this manual.

HOW THE SINGULAIR® SYSTEM WORKS

Developed to serve homes and small businesses beyond the reach of city sewers, the Singulair system employs the extended aeration process. Similar to the treatment method used by most municipal wastewater treatment facilities, this process involves a natural, biological breakdown of the organic matter in wastewater.

Wastewater enters the pretreatment chamber where anaerobic bacterial action combines with the effects of gravity to precondition the waste before it flows into the aeration chamber. Once in the aeration chamber, aerobic bacteria utilize the organic matter in the wastewater to biologically convert the waste into stable substances. Following aeration, flow is transferred to the clarification chamber where the effects of gravity settle out biologically active material. The Bio-Static sludge return, located in the clarification chamber, creates hydraulic currents that gently transfer settled particles back to the aeration chamber. As clarified liquids pass through the Bio-Kinetic system, they are filtered, settled and flow equalized. As a result, complete pretreatment, aeration, clarification and final filtration are assured. The Singulair system reliably protects you, your property and the environment.

FEATURES AND ADVANTAGES

Singulair tanks are reinforced precast concrete, manufactured by the licensed Norweco distributor. Internal walls and baffles are cast-in-place to insure uniformity and maximum strength. Risers and access covers are either heavy duty plastic or concrete construction. All components within the system that will contact the wastewater are constructed entirely of molded plastic, stainless steel or rubber.

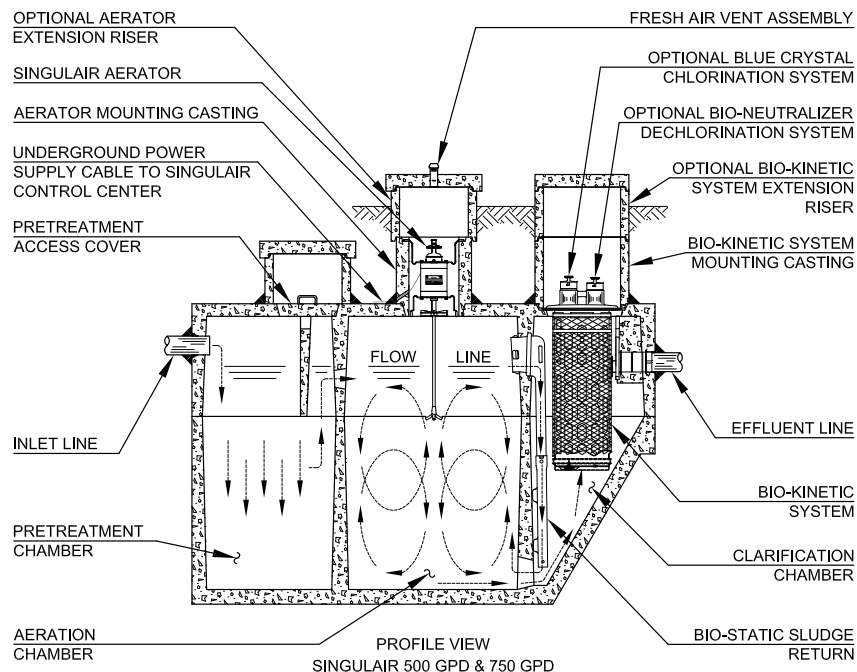
The Singulair aerator is powered by a 1725 RPM, 115 volt, 60 hertz, single-phase, fractional horsepower motor. It is the only electrically powered component in the Singulair

system. The aerator has been designed specifically for use in the Singulair system. It costs less to operate and consumes fewer kilowatt hours of electricity than most major appliances.

Singulair aerators are supplied with a Service Pro control center with MCD technology. The NEMA rated control center contains a power switch and time clock that control aerator operation. The local distributor's name, address and telephone number are displayed on the control center cover.

All system controls and necessary owner information are conveniently located at your fingertips.

Non-mechanical flow equalization and final filtration is accomplished within the Singulair tank by the Bio-Kinetic system. This revolutionary device is installed in the clarification chamber and connected to the system outlet. Optional chlorination and dechlorination may be included in the Bio-Kinetic system if required. All Singulair components work together to assure complete pretreatment, aeration, clarification and final filtration.



SINGULAIR® SYSTEM PERFORMANCE

Rivalling the performance of the most advanced wastewater treatment plants in the world, the Singulair system complies with USEPA wastewater treatment guidelines for secondary treatment systems and meets all requirements of NSF/ANSI Standard 40. In ecologically sensitive areas, the most stringent effluent standards are 10 mg/L CBOD and 10 mg/L TSS. Rated Class I after successfully completing the 7 month Standard 40 test protocol, the Model 960 system averaged effluent of 6 mg/L CBOD and 10 mg/L TSS. The Model TNT system averaged effluent of 4 mg/L CBOD, 9 mg/L TSS and 12 mg/L Total Nitrogen.

OPERATIONAL REQUIREMENTS

The Singulair system is designed to treat only domestic wastewater. Domestic wastewater is defined as the waste generated from a typical residence. This includes flows originating from: bathtubs, clothes washers, dishwashers, drinking fountains, water coolers, food grinders, kitchen sinks, lavatories, mop basins, service sinks, shower stalls, sinks, wash sinks, water closets and whirlpool baths. While the use of bio-degradable detergents is recommended, the Singulair system has been designed to handle any reasonable amount of bathroom, kitchen or laundry waste. However, some care should be exercised to insure that non-biodegradable and/or toxic materials are not disposed of via the domestic wastewater plumbing. Do not use the plumbing system for disposal of lint, cooking grease, scouring pads, diapers, sanitary napkins, cotton balls, cotton swabs, cleaning rags, dental floss, strings, cigarette filters, rubber or plastic products, paints and thinning agents, gasoline, motor oil, drain cleaners or other harsh chemicals. These items could plug portions of the plumbing, interfere with biological treatment, accumulate in the treatment system and adversely affect system performance. Never connect roofing down spouts, footer drains, sump pump piping, garage and basement floor drains or water softener backwash to the domestic wastewater plumbing or the treatment system. Water softener backwash will interfere with biological treatment and must be disposed of separately.

ELECTRICAL REQUIREMENTS

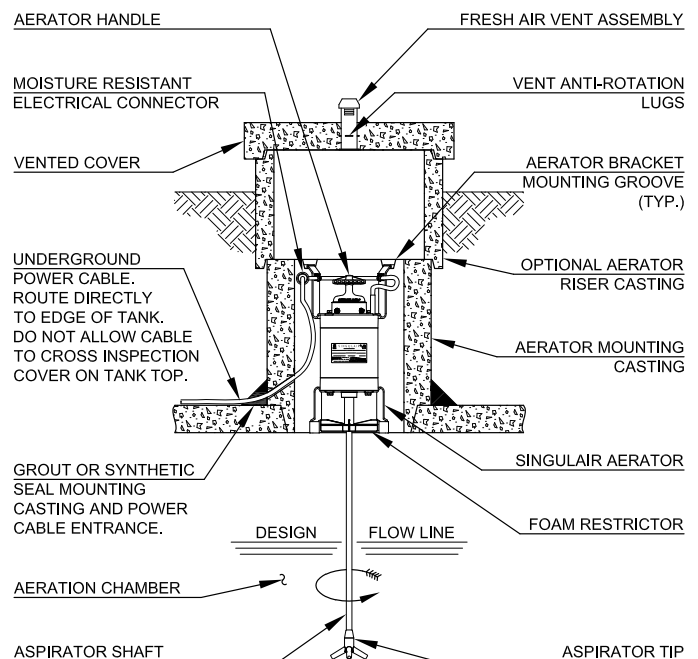
Each Singulair control center must be wired to a dedicated 115 VAC, single-phase circuit at the main electrical service panel. A 15 amp circuit is recommended (10 amp minimum). A pictorial wiring diagram is provided inside the control center enclosure. All electrical work must be performed in accordance with the requirements of the National Electrical Code and all applicable local codes. Electrical connections should be made only by a qualified electrician following proper procedures and using safe tools.

CAUTION: Any time service is required, first shut off the dedicated circuit breaker in the main electrical service panel. Next, shut off the power switch in the Singulair control center. Failure to do so could result in personal injury or equipment damage.

SINGULAIR® AERATOR

The aerator has been specifically designed for use in the Singulair system and includes special alloy and molded plastic parts to prolong aerator life. Aerator bearings are pre-lubricated and sealed. Singulair aerators are installed in a concrete mounting casting above the aeration chamber. Fresh air enters the aerator through four intake ports located under the aerator handle. The air is drawn down the hollow aspirator shaft where it is introduced below the liquid surface. Only the molded plastic aspirator and the lower portion of the stainless steel aspirator shaft are submerged.

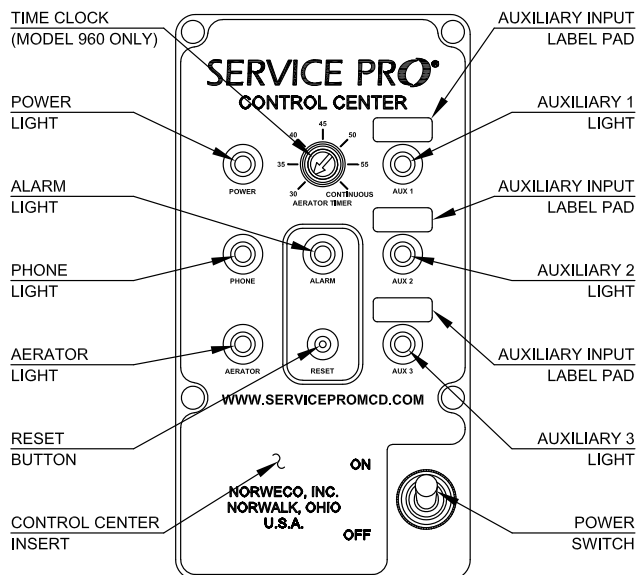
The aerator is not designed to run under water and will automatically shut off if a high water condition occurs. If the liquid rises to the level of the foam restrictor, the control center will shut off power to the aerator. Next, an automatic diagnostic sequence begins, as outlined in the section titled "Service Pro Control Center".



Each Singulair aerator is a precision engineered electro-mechanical device. Do not remove it from its installed position. Do not attempt any type of repair. Contact your Singulair service provider if service is needed. Unauthorized tampering or repair will void important provisions of the limited warranty and exchange program.

FRESH AIR VENTING SYSTEM

An aerator vent assembly is cast into the concrete access cover above each aerator. The vent assembly supplies fresh air to the aerator, which is drawn through the aspirator and into the wastewater. Finished landscaping should be maintained six inches below the top of the vented access cover and graded to drain runoff away from the cover. Do not allow plants, shrubbery, mulch or landscaping of any type to restrict the flow of air to the vent assembly or obstruct the access cover.



SERVICE PRO® CONTROL CENTER

Every Singulair aerator is supplied with a prewired UL Listed Service Pro control center featuring MCD technology to permit fully automatic aerator operation. The control center provides MONITORING, COMPLIANCE and DIAGNOSTIC functions complete with telemetry for communication with the Service Pro remote monitoring center. If an alarm condition occurs for any reason within the Singulair system or monitored auxiliary equipment, the red alarm light will flash. If aerator operation has been interrupted, the Service Pro control center will attempt to restart the aerator every five minutes for two hours. If the aerator does not restart after two hours, the audible alarm will sound. If the Singulair system is covered by a Service Pro monitoring agreement, the Singulair service provider will be automatically notified and the alarm condition will be displayed on the remote monitoring center website, www.servicepromcd.com. Each control center for the Model 960 treatment system is supplied with a time clock adjustable in five minute increments up to continuous run. This clock is factory preset to run 30 minutes per hour and should only be adjusted by an authorized Singulair service provider. Each control center for the Model TNT system is supplied with a non-adjustable time clock.

SERVICE PRO® MONITORING CENTER

When connected to a telephone line, the control center will automatically notify the Service Pro monitoring center of any service required by the Singulair system or accessory components. The Service Pro monitoring center will automatically record the time and date of any alarm condition and post this information to your system's history record accessible at www.servicepromcd.com. The monitoring center will also notify your Singulair service provider that the system needs attention and record the time and date when service is performed. All information regarding your system is available to you on the secure, password protected Service Pro website. Contact your Singulair service provider for your user name and password.

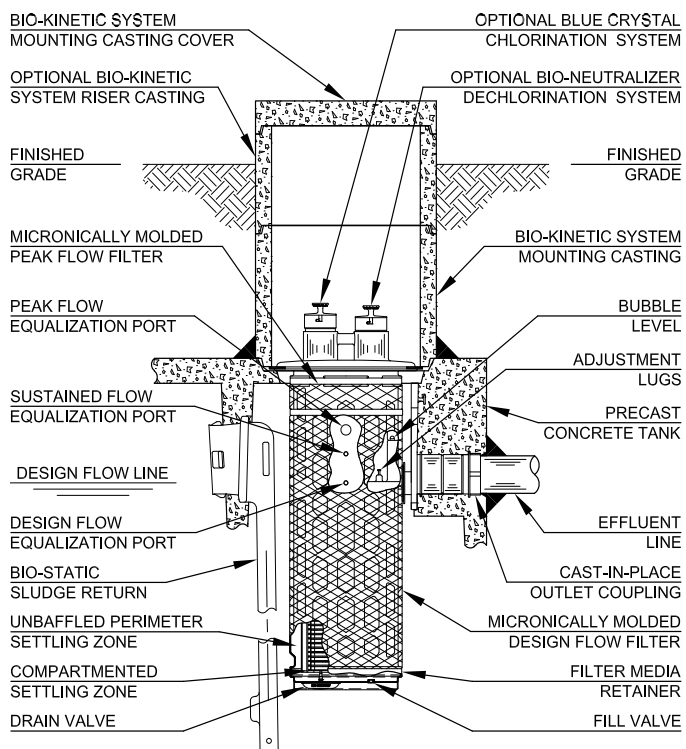
NOTE: The control center regularly communicates with the Service Pro monitoring center using your telephone line and a toll free number. If the control center is using the line when you attempt to place a call, a high pitched digital communication signal will be heard. Hang up all telephones sharing the line and wait a few seconds. This will automatically disconnect the control center and make the line available for use.

BIO-STATIC® SLUDGE RETURN

Each Bio-Static sludge return is installed in the aeration/clarification chamber wall. Aeration chamber hydraulic currents enter the sludge return(s) and transfer solids from the clarification chamber back to the aeration chamber for additional treatment. The Bio-Static sludge return accomplishes resuspension and return of settled solids without disturbing the contents of the clarification chamber.

BIO-KINETIC® SYSTEM

Bio-Kinetic systems provide non-mechanical flow equalization through all plant processes. The Bio-Kinetic system contains 3 separate filtration zones, 8 independent settling zones, optional chlorination and dechlorination tablet feed systems and serves as its own chlorine contact chamber. When used with Blue Crystal disinfecting tablets, the performance of the Bio-Kinetic system as a chlorination device is certified to NSF/ANSI Standard 46, Section 11. All components are manufactured from plastic or rubber. Your service provider has the necessary training, tools and equipment for removal and cleaning. If your Bio-Kinetic system is in need of service, contact your service provider. During each semi-annual service inspection, your service provider will remove and clean the Bio-Kinetic system or replace it with a unit from their service stock.



NON-MECHANICAL FLOW EQUALIZATION

The patented design of the Bio-Kinetic system provides non-mechanical flow equalization for the Singulair wastewater treatment plant. Equalization reduces incoming hydraulic surges (e.g. typical shower of 10 minutes duration, bathtub discharge of 5 minutes duration, clothes washer discharge of 2 minutes duration and dishwasher discharge of 2 minutes duration) throughout the system. The flow equalization provided by the Bio-Kinetic system causes wastewater to be held upstream of the final outlet during hydraulic surges, which preserves treatment integrity and enhances system operation. The actual rate of equalization varies and depends upon specific loading patterns and the duration of each flow surge. At the design loading pattern used during the NSF/ANSI Standard 40 performance evaluation, the Singulair system equalizes all flow an average of 48%. As a result, hydraulic surges and periods of high wastewater flow are automatically reduced to protect the environment and all treatment plant processes on a demand use, as needed, basis.

BLUE CRYSTAL® RESIDENTIAL DISINFECTING TABLETS

If local regulations require, an initial supply of Blue Crystal disinfecting tablets will be placed in the Bio-Kinetic system chlorine feed tube(s) at system start-up. Specifically formulated for use in the Singulair system, Blue Crystal disinfecting tablets provide efficient and reliable disinfection when effluent chlorination is desirable. Manufactured from calcium hypochlorite, Blue Crystal disinfecting tablets provide effective, economical bacteria killing power. Liquid entering the Bio-Kinetic system contacts the installed Blue Crystal disinfecting tablets, just downstream of the equalization ports. A fully charged feed tube will last an average of six months. During each semi-annual inspection, your Singulair service provider will check system operation, the rate of tablet consumption and install tablets during routine service inspections.

NOTE: USEPA guidelines state “On the average, satisfactory disinfection of secondary wastewater effluent can be obtained when the chlorine residual is 0.5 ppm after 15 minutes contact.” Retention time must comply with the controlling regulatory jurisdiction.

CAUTION: *The improper handling of Blue Crystal tablets may cause personal injury or property damage. Keep out of the reach of children and do not allow the tablets or feed tube to contact skin, eyes, or clothing. Tablets may be fatal if swallowed and tablet dust is irritating to the eyes, nose and throat. Do not handle the tablets or feed tubes without first carefully reading the product container label, MSDS information and the handling and storage instructions. Mixing of chemicals may cause a violent reaction leading to fire or explosion. For additional information about Blue Crystal tablets contact your Singulair service provider.*

BIO-NEUTRALIZER® DECHLORINATION TABLETS

In environmentally sensitive areas, environmental regulations may require the use of Bio-Neutralizer dechlorination tablets. Manufactured as an efficient and dependable means to chemically neutralize both free and combined chlorine, Bio-Neutralizer dechlorination tablets provide consistent reduction or elimination of chlorine residual without unnecessarily reducing the level of dissolved oxygen in the treatment system effluent. Bio-Neutralizer dechlorination tablets utilize a unique chemical mixture for chlorine reduction and environmental protection. As liquid passes through the final discharge zone of the Bio-Kinetic system, the flow contacts the installed Bio-Neutralizer tablets and residual chlorine is removed from the system effluent. A fully charged Bio-Neutralizer feed tube will last an average of six months. During each semi-annual inspection, your Singulair service provider will check system operation, the rate of tablet consumption and install tablets during routine service inspections.

CAUTION: *Bio-Neutralizer tablets or feed tubes should not be mixed with Blue Crystal tablets. Do not handle the tablets or feed tubes without first carefully reading the product container label, MSDS information and the handling and storage instructions. For additional information about Bio-Neutralizer tablets contact your Singulair service provider.*

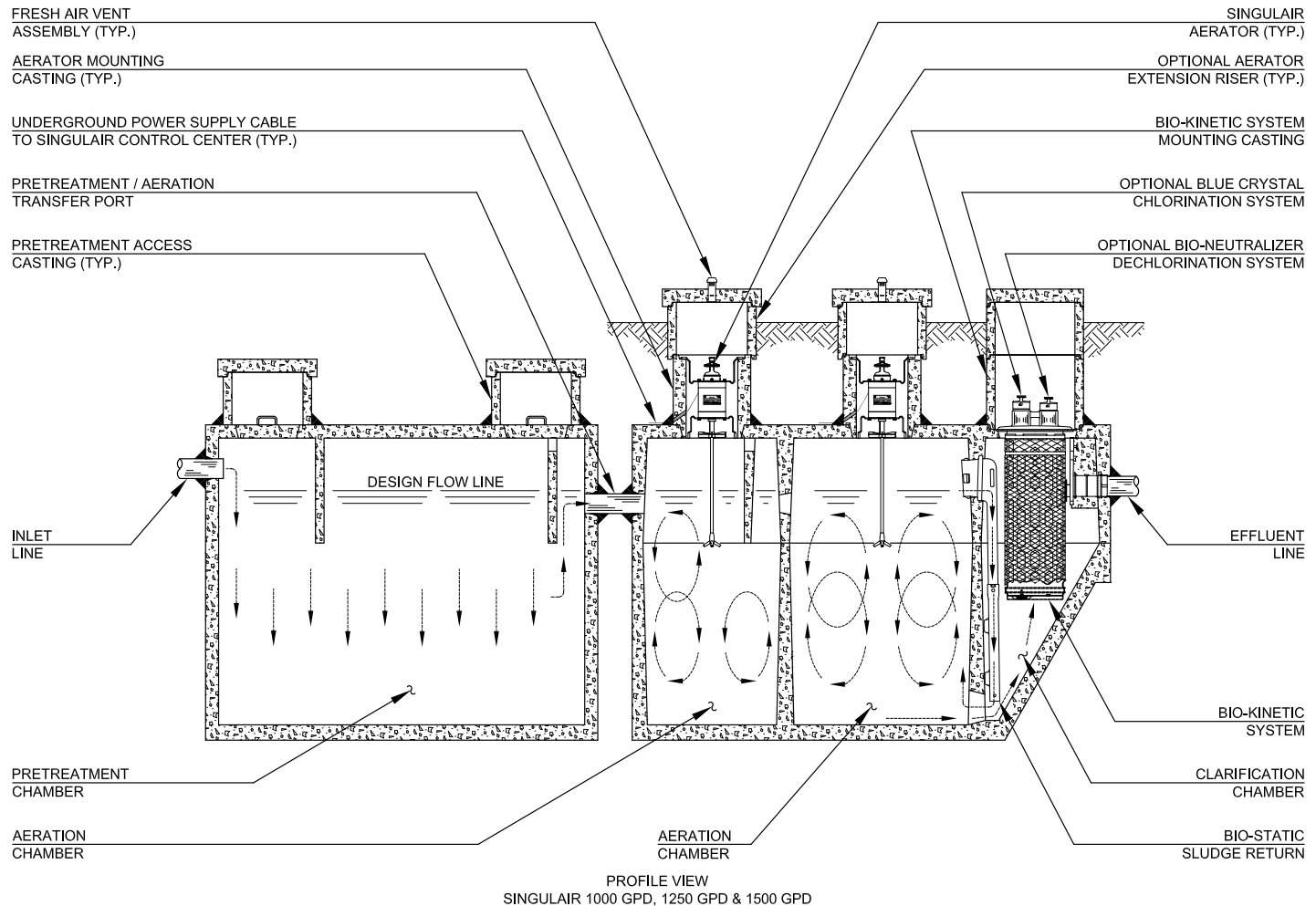
NO OWNER MAINTENANCE

The Singulair system is inspected and serviced by a local, factory-trained service provider, therefore, no owner maintenance is required during the warranty period. The Singulair system does not require pumping as often as a septic tank. Under normal use only the pretreatment chamber should be pumped. How often pumping is necessary depends on system use. The local Singulair service provider will inspect the aeration chamber contents and plant effluent at six month intervals to determine if the pretreatment chamber is discharging excessive solids. Every three years, the pretreatment chamber should be inspected. The pretreatment chamber will normally require pumping at three to five year intervals. Contact your local service provider prior to tank pumping for complete information on removal of equipment, access to individual chambers, coordination of services and proper disposal of tank contents. A tank pumping service licensed by the local regulatory agency must be used for removal and disposal of tank contents. The tank pumper should consult with local authorities to determine the proper disposal method.

If a period of intermittent use, or an extended period of non-use of the Singulair system is anticipated, contact your Singulair service provider for instructions. Your service provider has comprehensive Singulair service instructions and has been factory-trained in troubleshooting procedures. Contact your service provider if you require service or information regarding tank pumping.

SINGULAIR® SERVICE PROGRAM

Semi-annual service inspections, at six month intervals for the first two years of system operation, are provided by your local Norweco distributor and are included in the original purchase price of the Singulair system. Costs for travel and labor are not charged to the owner. During an inspection, each mechanical aerator, Bio-Kinetic system and other plant components are serviced as outlined in the Singulair Service Manual. After the initial two year service program is completed, the local service provider will provide continued service at the owner's option. The service program should be renewed by the owner to insure maximum system performance.



Ask your Singulair service provider about a renewable service contract. If you allow service coverage to expire, you can still obtain the professional assistance of a factory-trained technician. However, these special service calls will be performed on a time and materials basis. Professional service is important to proper system operation and should not be allowed to lapse. Be sure to consider the advantages of a renewable service contract.

The Singulair service provider will perform the following services during each service inspection:

- ✓ Check aerator operation
- ✓ Check aerator power consumption
- ✓ Check aerator air delivery
- ✓ Clean stainless steel aspirator shaft
- ✓ Clean aspirator tip
- ✓ Clean fresh air vent in concrete cover
- ✓ Inspect aeration chamber contents
- ✓ Check operation of control center
- ✓ Adjust time clock when required
- ✓ Remove the Bio-Kinetic system
- ✓ Scrape the clarification chamber
- ✓ Inspect the Bio-Static sludge return
- ✓ Inspect outlet coupling
- ✓ Install a clean Bio-Kinetic system
- ✓ Fill Blue Crystal feed tube
- ✓ Fill Bio-Neutralizer feed tube
- ✓ Inspect effluent quality
- ✓ Inspect outlet line
- ✓ Inspect ground water relief point
- ✓ Inspect effluent disposal system
- ✓ Complete 3-part service record
- ✓ Hang owner's record on front door
- ✓ Enter record into **www.servicepromcd.com**
- ✓ Mail health department notification

WARRANTY REGISTRATION

A Warranty Registration Card was included with the Model 206C aerator before it was shipped from the factory. If this card has not been returned to Norweco, complete and mail it immediately. If it is not returned within thirty days of the installation date, the three year limited warranty and lifetime aerator exchange program will begin on the date of component shipment from the factory.

Remove the aerator model number and serial number record card and store it in a safe location with this Owner's Manual for future reference. If it is necessary to call your service provider for service, make note of the information on the control center data plate and the aerator serial number before calling. Warranty and service records are cross-indexed by owner name, aerator serial number or control center serial number. Supplying the aerator serial number and control center serial number with the service request will give the service provider a ready reference so that changes in system ownership will not delay service.

SINGULAIR® LIMITED WARRANTY

The Singulair aerator enjoys the distinction of being the only aerator on the market today backed by a lifetime warranty and exchange program. Each Singulair aerator, Service Pro control center, Bio-Kinetic system and any other components manufactured by Norweco, are warranted to be free from defects in material and workmanship, under normal use and service, for a period of three years from the date of purchase. The three year limited warranty is included in the original purchase price of every Singulair system. The comprehensive aerator exchange program offers Singulair owners a lifetime of protection. Owners with a Singulair system may exchange any aerator of any age for a replacement unit at a prorated cost. If the Singulair aerator or Service Pro control center fails, do not use or dismantle the unit. The local, licensed distributor has detailed warranty and exchange information and should be contacted for service or replacement instructions.

SERVICE PRO® SECURITY LOG IN

For your convenience, record your **www.servicepromcd.com** access information here:

User name:	Password:
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SUPPLEMENTAL SERVICE RECORD

For your reference, please document service performed on the following chart:

DATE	DESCRIPTION



DISTRIBUTED LOCALLY BY:

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EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS

For various reasons, many wastewater treatment systems periodically require effluent sampling and characterization. Whether sampling is done to verify compliance with specific effluent limits or simply to indicate if the system is operating properly, effluent sampling must follow specific procedures and guidelines to insure accuracy. Analysis of improperly collected or contaminated effluent samples will result in data that could lead to an incorrect conclusion regarding treatment system operation. Conversely, laboratory analysis of properly collected effluent samples will generate data that can be used to evaluate actual treatment system performance. *"The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and yet large enough for analytical purposes while still accurately representing the material being sampled."*¹ Wastewater sampling is generally performed by one of two methods, grab sampling or composite sampling. Each method has specific limitations on what tests can be performed and how the data is used.

GRAB SAMPLING

A grab sample (sometimes called an individual discrete sample) indicates that all of the test material is collected at one time. Grab samples are collected by manually removing a quantity of effluent from the flow stream at a single point in time during the flow day. As such, a grab sample reflects the effluent conditions only at the point in time the sample was collected. Therefore, by definition, a single grab sample can never be used for long term performance evaluation of a wastewater treatment system. However, there are a number of very specific places where grab sampling must be used. *"Grab samples serve to characterize variations of the waste stream over time. They also allow analysis of unstable parameters soon after sample collection. Examples of such parameters include pH, dissolved oxygen (DO), chlorine residual [and] temperature."*²

COMPOSITE SAMPLING

Composite sampling consists of collecting, at specific time or volume intervals, a number of individual samples in one single container. Composite samples are almost always collected by the use of automated sampling and storage equipment, which will refrigerate the sample over the entire time of collection. A composite sampler withdraws a small volume of effluent periodically throughout the sampling period, usually 24 hours. This equipment is designed to automatically purge the sampling pump, transfer a programmed amount of effluent into a single storage container and purge the sampling apparatus again to remove material that could affect the results. Usually, refrigeration of the composite sample must continue during the entire time of collection and transportation to the laboratory. In order to prepare the sample for analysis, the total volume of composited effluent is thoroughly and completely mixed. Collected and analyzed in this manner, the blended composite sample represents the wastewater characteristics over the entire time or the specific volume of flow.

GRAB SAMPLING VS. COMPOSITE SAMPLING

Monthly operating reports, performance evaluations or compliance monitoring forms (used by municipal treatment systems) usually record performance data as individual daily values. In most cases, these data points represent the analysis of a composite effluent sample collected over a 24 hour period. As these results are shown by a single value, individual daily data points are frequently confused with data from grab samples. However, a composite sample consisting of a quantity of programmed individual collection events is not the same as one or more grab samples. A proper composite sample will result in one data point that represents the effluent quality over the time of collection or volume of flow. Even when the data from grab samples is averaged, that one data point represents the effluent flow only at specific moments in time when the samples were collected. Due to the differences in how the samples are typically collected and analyzed, an average of multiple grab samples does not provide valid information regarding system operation and performance the way composite sampling does.

The analysis of grab samples is necessary for certain effluent parameters, but the primary indicators of system performance including CBOD₅ (carbonaceous five day biochemical oxygen demand), TSS (total suspended solids) and TN (total nitrogen) require the collection and analysis of 24 hour composite samples. The cost and logistics of proper composite sample collection make it tempting to use grab samples for all evaluations. Performance testing by grab sampling is a blatant misapplication of technology and has no basis for use with treatment systems of any size. However, it is even more inaccurate when used with residential treatment systems. The residential sewage characteristics and flow patterns compound the degree of error when residential treatment system performance is judged by the use of a grab sample. The table on page six lists specific effluent parameters and whether grab or composite sampling is required for proper evaluation.

EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS (Page 2 of 6)

MUNICIPAL FLOW PATTERNS

Municipal wastewater treatment systems receive their flow over a 24 hour period, and the volume and strength characteristics of the incoming waste vary over the daily flow pattern. By their nature, biological treatment systems fluctuate slightly in their performance due to the growth and lag phases of the microorganisms, particularly if there are large fluctuations in the volume and strength of the influent during different periods of loading. Both of these factors result in a varying amount of impurities contained in the effluent discharged from these treatment systems over the course of the day. In municipal systems, these variations are minimized by the blending of incoming waste from a number of different homes or sources combined into one treatment system of very large capacity. Even so, the Water Environment Federation recommends that all of the primary performance indicators for municipal systems be evaluated by using composite effluent samples.

RESIDENTIAL FLOW PATTERNS

Residential treatment units receive a frequent number of short hydraulic surges throughout the day followed by intermittent periods of no flow whatsoever. Additionally, the wastewater characteristics range from nearly potable water characteristics (i.e. rinsing fresh vegetables), to graywater from doing laundry and dishes, to full strength sewage. There is little opportunity for these individual flows to be blended into a homogenous flow stream of average characteristics. The changing volume and strength of the wastewater will maximize normal fluctuations in the effluent produced by the treatment system. For example, flow surges that are present in most individual home flows will often create a washout of substantial amounts of treatment system suspended solids.

Therefore, a grab sample of the effluent taken at only one specific time throughout the daily flow pattern is not representative of system performance over the entire day. *"Failure to obtain a representative sample can produce invalid data, leading to erroneous process control decisions."*² The type and quantity of samples collected should be determined by the data required. For example, the Code of Federal Regulations stipulates that the performance of secondary treatment systems should be evaluated by tabulating 30-day averages of system effluent. As it is impossible to judge long term treatment system performance by a single discrete grab sample, or even a single 24 hour composite sample, a 30-day regimen of proper samples must be collected, analyzed and tabulated before system performance can be evaluated.

It is wholly inaccurate, bad science and irresponsible to evaluate system performance by the analysis of data collected from one, or even several, effluent grab samples. The most widely used performance evaluation for residential treatment units (NSF/ANSI Standard 40) evaluates performance by tabulating data collected via composite

sampling techniques. Each individual daily composite sample is collected over 24 hours by withdrawing an aliquot (a measured volume of sample) of effluent at 80 separate times throughout the day. If samples were collected every calendar day, each 30-day average applied to the pass/fail criteria would actually represent 2,400 individual sampling events, collected over an entire month.

Statistically, this could present some interesting possibilities for any program requiring 30-day averages. Theoretically, an individual daily composite sample could have test results as high as 871 mg/L TSS and still compute to a 30-day average of 30 mg/L. Within the single composite sample analyzed at 871 mg/L, an individual aliquot (the equivalent of a grab sample) could contain as high as 69,601 mg/L and still be analyzed as a daily composite sample of 871 mg/L. Of course, this is a practical impossibility. However, it does demonstrate that an individual grab sample parameter could test excessively high, and yet the system could still be operating in compliance with federal standards or better. Considered individually, a number of grab samples taken from a residential treatment unit might appear to indicate a system that is not operating properly, when in reality, the average effluent could actually be of very high quality. Composite samples, while requiring electromechanical equipment and more complex sampling methods, will provide the only accurate indicator of system performance. For these reasons, professional wastewater treatment system operators and third party certifiers continue to rely on composite sampling in order to conduct evaluations that accurately measure system performance.

SAMPLING PROCEDURES

Proper collection of an effluent sample, by either technique, requires specific procedures to be followed. A grab sample of effluent must be a free falling sample, collected from a cleaned effluent pipe, in a proper sample bottle, stabilized during transport, stored for a limited period of time and analyzed by specific laboratory methods. When using a composite sampler, follow the manufacturer's instructions to insure an accurate, representative sample is collected. An automatic sampler may require withdrawing the sample from a pipe or channel that is cleaned daily. Samples should be collected *"at points where the sample stream or tank is well mixed."*³ This insures the effluent is moving with enough velocity to prevent the settling out and accumulation of solids. If solids are allowed to settle and accumulate, as would occur in any effluent sump, sampling previously accumulated solids mixed with the effluent is not representative of either past or current operating conditions.

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EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS (Page 3 of 6)

Whether collecting a grab sample or preparing a composite sample for analysis, proper procedures must be followed:

- 1) Personal safety should be the first consideration in any sampling protocol. The same safety precautions exercised in any area of wastewater treatment should be taken during effluent sample collection. Proper eye protection and disposable gloves should be worn. Always wash hands thoroughly following any sample collection and especially before handling any food. The use of hand sanitizing lotion is recommended.
- 2) A properly sized and cleaned sampling bottle must be prepared before going to the site. The bottle, cap and sampling equipment must be sterilized if the sample is to be analyzed for bacteriological activity.
- 3) The effluent sample should be tested at the time of collection for the presence of chlorine. If the testing laboratory needs to analyze chlorinated effluent, the presence of chlorine should be noted on the sample bottle. Prior to analysis, only sufficient dechlorination agent should be added to reach the chlorination endpoint. In past practice, many laboratories used prepared sample bottles with a dechlorination agent already present in the bottle. It has since been discovered that if the amount of dechlorination agent exceeds the chlorine demand in the effluent, false positive BOD₅ and CBOD₅ readings can result.
- 4) For the parameters that require collection of a grab sample, several considerations must be followed:
 - a) The location of sample collection is extremely important. A grab sample must be free falling from the end of the effluent pipe or taken at a point where the flow stream is uniform with enough velocity to prevent the deposition of solids in the line. *"Where samples are to be collected from flowing pipes, keep the sample line as short as possible."*²
 - b) The effluent pipe in a gravity flow residential treatment system will rarely flow full of effluent. Typically, the effluent flows through only a small section of the bottom of the pipe. The remainder of the pipe above the normal flow line is exposed to all types of environmental factors. Dust, leaves, plant spores, insects and small animals may have access to a partially full effluent pipe. This foreign material can, and routinely does, collect in the pipe during a low flow/no flow period and could be washed into the sample bottle when routine flow is present. For this reason, the interior and exterior of the pipe in the vicinity of the sampling area must be cleaned and sterilized prior to collection of an effluent sample. This will include removal of grass or weeds around the effluent pipe and cleaning the inside and outside of the pipe with soap and water followed by a disinfectant (i.e. bleach or peroxide).
 - c) A residential treatment system can be effectively sampled only when there is an effluent flow. Due to intermittent residential flow patterns, there may not be effluent flow at the time designated to collect a grab sample. Hydraulic flow may be induced into the treatment system in order to generate effluent for grab sampling. With detention time designed into any wastewater treatment system, water flow introduced into the system inlet or pretreatment chamber in order to generate effluent, will undergo full treatment before reaching the system outlet. Remember that the effluent grab sample is not representative of the average flow and therefore can not be used to evaluate long term system performance. Also, keep in mind that the induced flow must be typical of the normal incoming flow rate. A surge flow into most wastewater treatment systems will create a washout of solids that can be carried into the sample container. This effect will skew certain test results dramatically.
 - d) Once the effluent is free flowing and the prepared sample bottle is in position to collect the effluent, carefully place the mouth of the sample bottle directly into the falling stream of effluent and collect the sample. Be careful not to touch the effluent pipe with the mouth of the sample bottle. Fill the sample bottle nearly to the top. Leave an airspace above the sample liquid of approximately 1% to 5% of the container volume to allow for thermal expansion during shipment.
- 5) Extreme care must be used when handling an open sample bottle to prevent contamination from environmental factors. Airborne dust, insects, blades of grass or any material coming in contact with the sample bottle or cap, other than free falling effluent, will contaminate the sample. Even a properly collected sample can easily become contaminated if the container is allowed to touch the sides of a basin or access riser, or if dirt or other material is allowed to enter the bottle.
- 6) The volume of sample required for proper analysis varies according to the test performed. Refer to the table on page six for sample volume guidelines.
- 7) Minimum sample sizes are recommended by Standard Methods for the Examination of Water and Wastewater, and other sources. However, laboratory experience, familiarity with the treatment system being tested and the number of analyses required for a given effluent may allow collection and submittal of smaller volume samples. The minimum sample size indicated in the table on page six considers only the volume required for an individual parameter. Confer with a local laboratory to establish the volume requirements needed based on the total number of parameters requiring analysis.

EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS (Page 4 of 6)

- 8) Once the sample has been collected, carefully remove the bottle. Be sure not to touch the mouth of the bottle against any other surface. The sample can then be analyzed for field parameters, if required, or capped and stored as necessary.
- 9) The sample bottle containing the grab or composite sample should be carefully labeled to include the following information:
 - a) A unique sample identification number
 - b) The source/location of sample collection (i.e. final effluent, discharge pipe, etc.)
 - c) The date and time the sample was collected
 - d) The name of the technician who collected the effluent sample
 - e) The name of the treatment system owner where the sample was taken
 - f) Whether a grab or composite effluent sample was collected
 - g) The presence or absence of chlorine in the effluent sample
 - h) All parameters requiring analysis, such as CBOD₅, TSS, etc.
 - i) Listing of any required preservative added (see the table on page six)
 - j) The results of any analysis that needed to be performed onsite
- 10) For parameters not requiring immediate testing, the analysis should be performed as soon as possible, using proper storage and sample preservation during transport. This almost always involves cooling the sample to inhibit further biochemical reactions occurring during transport and storage. Chilling the liquid to the required temperature and maintaining it during all transport and storage time is essential for sample integrity. Icing down the sample is preferred as rapid chilling takes place without expensive mechanical refrigeration equipment, and there is no danger of over-chilling and freezing the sample.
- 11) Invalid data will result if the sample is held for a longer period of time than the guidelines permit. For this reason, travel time, laboratory operating hours, weekend or holiday schedules all need to be considered with any sampling program.
- 12) Sampling for the level of chlorine, coliform bacteria or for the performance of dechlorination equipment requires some special considerations:
 - a) Due to the unstable nature of chlorine, samples collected for this parameter must be analyzed immediately. Storing samples in an open container allows the chlorine to volatilize into free air. Samples stored in a closed container can continue chemical reactions that can change the chlorine into other compounds.
 - b) Samples collected to test for the presence of coliform or other bacteriological examinations must be collected in a sterile bottle and immediately checked for the presence of chlorine. Any chlorine present must be removed or stabilized prior to storage or transport of the sample. Storing a bacteriological sample with chlorine present allows additional "contact time" and may result in a false positive indication of disinfection efficiency. Conversely, stabilizing or removing the chlorine allows the process of bacterial regrowth to begin. Therefore, stabilized samples must be immediately cooled to 4° C and stored for a maximum of 6 hours, before significant bacterial regrowth occurs.
 - c) The point of sample collection is also critical. If a contact chamber is designed for effective bacteriological reduction and is followed by a dechlorination system at the contact tank outlet, bacteria regrowth due to environmental exposure can begin to occur in a long outlet pipe and could be significant in a downstream component, such as a post-aeration chamber. Therefore, samples for bacteriological analysis must be taken at the end of contact time, but upstream of any other treatment or storage process.
- 13) Special precautions and record keeping are required for any samples taken for compliance with an NPDES (National Pollutant Discharge Elimination System) permit or other regulatory requirement. Be sure to have the analysis performed by a laboratory certified for the specific testing required. Analytical data must be logged in the required format and on the form appropriate to the proper agency.
 - a) Where legal action or other serious considerations are dependent on the results of sampling to determine system performance, chain-of-custody procedures to track possession of the sample are required. These procedures usually require a sample bottle to be closed with a tamper-evident seal immediately after collection. A written record on the chain-of-custody form requires each person transporting or handling the sample to certify the specific period of time that the sample is in their possession. The completed form insures that proper handling of the sample has been documented. The chain-of-custody record should remain with the sample during laboratory analysis and be filed with the permanent log of lab results.

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EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS (Page 5 of 6)

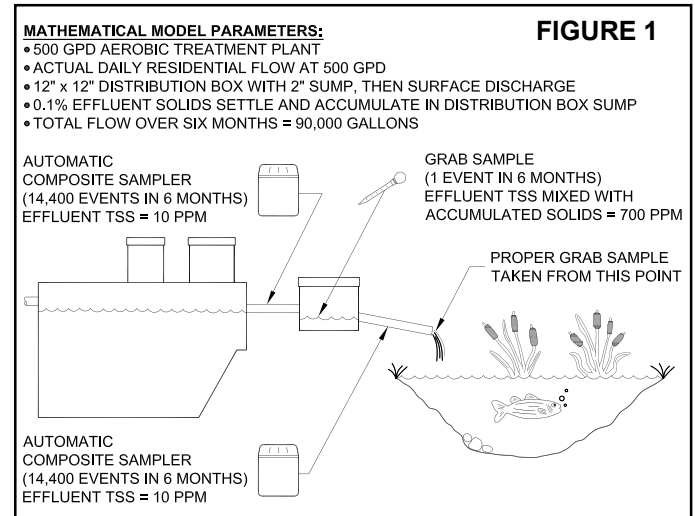
LOCATION OF SAMPLE SITE

While the limitations of analyzing effluent collected by grab sampling have been discussed, the use of grab samples for evaluation of a residential treatment unit is further compromised if the grab sample is not collected from effluent with sufficient velocity to keep solids in suspension. *“Avoid taking samples at points where solids settling occurs or floating debris is present. These situations occur normally in quiescent areas, where the velocity of the flow has decreased.”*³ For this reason, under no circumstances should system performance be evaluated by a grab sample of effluent taken from a pump chamber, distribution box or any device that contains a sump. Especially due to the intermittent flow patterns that are typical of individual residences, effluent solids tend to settle out in a sump when allowed enough time and a low velocity. Even the few solids present in a high quality treatment system effluent can settle out in a sump during a no flow period. If only a very few solids settle out in the sump during a no flow period today, they can remain and accumulate with additional solids settling out over successive days. This will result in an amount of solids accumulated in the sump that are a gross misrepresentation of what the treatment system effluent has in suspension during any given flow day.

Using a mathematical model will allow us to put these considerations into perspective (see Figure 1). At 500 GPD, a residential treatment unit will discharge approximately 90,000 gallons of effluent over the six month period between routine service inspections. In our mathematical model, this treatment system is generating a high quality effluent of 10 mg/L CBOD₅ and 10 mg/L TSS. In the flow path of this model, the treatment system effluent passes through a common 12" by 12" distribution box containing a 2" sump below the effluent discharge pipe.

In our mathematical model, we will assume that due to the intermittent flow pattern of a residential treatment unit, 0.1% (0.001) of the total effluent suspended solids will settle out and accumulate while effluent passes through the sump. (While it is likely that a higher percentage of solids will settle out, especially during an overnight period of no flow, we will consider that on the average, only 1 out of each 1,000 effluent solids will settle out in the distribution box. Therefore, 999 out of every 1,000 effluent solids will stay in suspension and are carried out with the flow.) In this model, these parameters will remain in a steady state for six continuous months, corresponding to the period between service visits. After six months of operation, the sump in the bottom of the distribution box has accumulated 1 out of each 1,000 effluent solids that were contained in the 90,000 gallons of high quality effluent that has passed through the distribution box. If the contents of the sump in the bottom of the distribution box are then mixed, collected and analyzed as a grab sample, the data will show an effluent containing more than 700 mg/L of total suspended solids. This obviously erroneous data would seem to indicate that

the effluent contains more suspended solids than typical residential influent flow. In reality, this treatment system is actually discharging an effluent of 10 mg/L total suspended solids. With this model, it is easy to understand that judging treatment system performance by dipping into any effluent sump and stirring the contents (effluent and accumulated solids) is totally invalid.



It is understood that under absolute conditions, some degradation of the accumulated solids will occur during the length of time the solids are retained in the sump. Also, some of the organic material processed in the treatment system is converted into suspended solids, prohibiting an exact solids mass balance to be performed. While it would be scientifically impossible to ascertain the exact degree of bio-degradation or conversion of organic matter, neither process will be of enough significance to affect the conclusion. It is absolutely certain that stirring or mixing the contents of a sump and analyzing this mixture will result in data showing effluent solids that are hundreds, if not thousands, of times greater than data from samples collected by proper composite sampling techniques. These same principals hold true whether the effluent sample is taken directly from a distribution box, a pump chamber, a chlorine contact chamber, a post-aeration chamber, a roadside ditch or any structure that retains effluent below the flow line. Even a small sump, such as a 4" diameter pipe cross capped at the bottom, will accumulate effluent solids over a short period of time. Use of this pipe cross in conjunction with a composite sampler designed for automatic operation will still require the cross to be flushed clean each day. This is usually done when the operator is collecting the daily sample and checking the equipment operation.

When properly performed, effluent sampling is the most important tool available to evaluate treatment system performance, make operational adjustments, protect the environment and insure the health and safety of all. However, the proper techniques for collecting and analyzing any effluent sample must be followed before an accurate, informed conclusion can be made.

EFFLUENT SAMPLING FOR RESIDENTIAL TREATMENT SYSTEMS (Page 6 of 6)

GUIDELINES FOR SAMPLE COLLECTION, STORAGE AND ANALYSIS

EFFLUENT PARAMETER	MINIMUM SAMPLE SIZE	SAMPLE TYPE	PRESERVATION REQUIRED	MAXIMUM HOLDING TIME
Carbonaceous 5 Day Biochemical Oxygen Demand (CBOD ₅)	1,000 mL	Composite	Refrigerate, 4°C	6 hrs./48 hrs.*
Total Suspended Solids (TSS)	200 mL	Composite	Refrigerate, 4°C	7 days
pH	50 mL	Grab	Analyze immediately	0.25 hrs.
Dissolved Oxygen	300 mL	Grab	Analyze immediately	0.25 hrs.
Temperature	N/A	Grab	Analyze immediately	0.25 hrs.
Total Residual Chlorine	500 mL	Grab	Analyze immediately	0.25 hrs.
Ammonia Nitrogen	500 mL	Composite	Analyze as soon as possible or add H ₂ SO ₄ to pH <2, refrigerate	7 days/28 days*
Nitrate Nitrogen	100 mL	Composite	Analyze as soon as possible, refrigerate	48 hrs. (28 days for chlorinated samples)
Total Kjeldahl Nitrogen (TKN)	500 mL	Composite	Add H ₂ SO ₄ to pH <2, refrigerate	7 days/28 days*
Oil & Grease	1,000 mL	Grab	Add H ₂ SO ₄ to pH <2, refrigerate	28 days
Total Phosphorus	100 mL	Composite	Add H ₂ SO ₄ to pH <2, refrigerate	28 days
Fecal Coliform	N/A	Grab	Add 0.008% Na ₂ S ₂ O ₃ **, cool to 4°C. All collection utensils and techniques must be sterile	6 hrs.

*First value is maximum storage time recommended by "Standard Methods." Second value is maximum holding time allowed by Code of Federal Regulations⁴, but the code also indicates that samples should be analyzed as soon as possible after collection. In any case, the second value listed is the maximum time that samples may be held prior to analysis and still be considered valid.

**Should only be used in the presence of residual chlorine.

REFERENCES

1. American Public Health Association, American Waterworks Association, Water Environment Federation. *Standard Methods for the Examination of Water and Wastewater*. 20th Ed.
2. Water Environment Federation. *Operation of Municipal Wastewater Treatment Plants*. Manual of Practice No. 11, 5th Ed.
3. Water Environment Federation. *Wastewater Sampling for Process and Quality Control*. (1996) Manual of Practice No. OM-1.
4. U.S. Environmental Protection Agency. *Rules and Regulations 40CFR*. (1998) Part 136.3.

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COMMERCIAL, MUNICIPAL, INDUSTRIAL AND RESIDENTIAL FLOW EQUALIZATION FOR WASTEWATER TREATMENT SYSTEMS

In the past 50 years many advances have been made in the nature and extent of pollution control through the use of improved commercial, municipal, industrial and residential wastewater treatment facilities. Each new refinement and process, while improving overall treatment efficiency, has been hampered by the widely varying nature of wastewater types, strengths and fluctuations in volume. Just in the last 25 years, serious efforts have been undertaken to develop new systems, equipment and components designed to reduce or eliminate the negative effects of volume and strength variations in wastewater. These effects have led to the development and widespread use of flow equalization equipment.

Flow equalization is the process of controlling hydraulic velocity, or flow rate, through a wastewater treatment system. The equalization of flow prevents short term, high volumes of incoming flow, called surges, from forcing solids and organic material out of the treatment process. Flow equalization also controls the flow through each stage of the treatment system, allowing adequate time for the physical, biological and chemical processes to take place.

Published in 1974, the USEPA TECHNOLOGY TRANSFER REPORT states *"The cyclic nature of wastewater flows in terms of volume and strength is well recognized."* It goes on to say *"improved efficiency, reliability and control are possible when physical, biological and chemical processes are operated at or near uniform conditions. For this reason, flow equalization is employed."* Since the mid-1970's, flow equalization has been widely used for commercial, municipal and industrial wastewater treatment systems, both in the design of new facilities and also to modernize and upgrade existing systems.

This technology has only recently begun to be used in residential treatment systems. The flow patterns of residential treatment systems are intermittent and variable in nature, generating frequent hydraulic and organic surges. These surges can result in large quantities of solids being washed out of the system. The SEPTIC SYSTEM OWNER'S GUIDE, published in 1999 by the University of Minnesota Extension Service, states *"for complete and uniform treatment of wastes, the system needs time to work. The ideal situation would be to have wastewater enter the system as evenly as possible throughout the day and week."* The GUIDE continues to explain that when a surge occurs *"suspended solids are carried into the soil treatment system, clogging soil pores and preventing adequate treatment."* In 1970, the National Sanitation Foundation developed a model of daily residential flow patterns for use in testing onsite treatment systems. This model flow pattern, which is still in use today, consists of three periods of concentrated flow, alternating with varied periods of no flow.

This pattern was purposely structured to reflect the most severe flow rate fluctuations that are typical of individual residences. In 1982, a separate test procedure was completed to include stress sequences. These stresses consisted of prolonged no flow periods combined with surge flows several times the daily loading rate. In 1990, the stress sequences were incorporated into the residential flow pattern to reflect the less frequent but more harmful variations in flow that systems may very well experience. A residential treatment system that can reduce these surges and properly process the wastewater will consistently have higher quality effluent and longer operational life.

When flow equalization is incorporated into a wastewater treatment system, numerous benefits are produced:

1. In the case of a septic tank or pretreatment tank, gravity separation of solids is greatly enhanced. This prevents short-circuiting and eliminates excess solids from being carried downstream into the secondary treatment facility or disposal system.
2. When a secondary biological or chemical treatment system is used, elimination of hydraulic surges guarantees adequate process retention time and a much higher degree of treatment.
3. Clarifiers following secondary treatment will have greater solids separation and improved effluent quality. If an internal filtration device is used, solids loading to the filtration device will be reduced, resulting in longer filter life and higher effluent quality.
4. The operation of a downstream sand filter, media filter or constructed wetland is enhanced by more consistent loading, the equalization of surge flows and the removal of excess solids.
5. All types of effluent disposal systems, including tile fields, mounds, irrigation systems, etc., will operate longer and more efficiently because organic and hydraulic surges are eliminated and system overloading is prevented.

FLOW EQUALIZATION FOR WASTEWATER TREATMENT SYSTEMS (Cont.)

Norweco's patented Bio-Kinetic System incorporates non-mechanical flow equalization, effluent filtration, settling, solids storage and chemical addition in one easily installed assembly that is serviceable from grade. The system provides flow equalization for wastewater treatment systems without the use of pumps or holding tanks, with no moving parts and no electricity required. This is accomplished by storing incoming flow surges in the upstream treatment tank. Six flow control ports in the Bio-Kinetic System meter the stored liquid through all treatment processes at a controlled rate. In a typical septic system, daily residential flow is equalized an average of more than 50% when a Bio-Kinetic System is used. This revolutionary device is an integral component of the Singular Wastewater Treatment Plant. In addition, the Bio-Kinetic System can be easily incorporated into any onsite treatment and disposal process through the use of a Bio-Kinetic Wastewater Management System.

EFFECTS OF FLOW EQUALIZATION ON TREATMENT PROCESSES UTILIZING TYPICAL HYDRAULIC LOADING PATTERNS WITH A BIO-KINETIC SYSTEM

TREATMENT COMPONENT	RATED CAPACITY (GPD)	ACTUAL HOLDING CAPACITY	AVG PROCESS FLOWRATE WITHOUT FLOW EQUALIZATION	AVG PROCESS FLOWRATE WITH FLOW EQUALIZATION	AVG EQUALIZATION PERCENT	AVG DETENTION TIME WITHOUT FLOW EQUALIZATION	AVG DETENTION TIME WITH FLOW EQUALIZATION	AVG INCREASE IN COMPONENT DETENTION TIME PERCENT
SEPTIC TANK	500	1,500 gallons	0.926 GPM	0.457 GPM	50.6%	27.0 HRS	54.7 HRS	102%
SEPTIC TANK	1,000	2,500 gallons	1.852 GPM	0.814 GPM	56.0%	22.5 HRS	51.2 HRS	127%
SEPTIC TANK	1,500	4,000 gallons	2.778 GPM	1.158 GPM	58.3%	24.0 HRS	57.6 HRS	140%
SEPTIC TANK	2,000	5,000 gallons	3.704 GPM	1.468 GPM	60.3%	22.5 HRS	56.8 HRS	152%
DOWNSTREAM TILE FIELD (typical)	500	500 lineal feet	0.926 GPM	0.457 GPM	50.6%	5.9 HRS (theoretical)	11.9 HRS (theoretical)	102%
DOWNSTREAM MOUND (typical)	500	50 lineal feet	0.926 GPM	0.457 GPM	50.6%	0.6 HRS (theoretical)	1.2 HRS (theoretical)	100%
DOWNSTREAM SUBSURFACE SAND FILTER	1,000	870 square feet	1.852 GPM	0.814 GPM	56.0%	234.2 HRS (theoretical)	533.0 HRS (theoretical)	127%
DOWNSTREAM SURFACE SAND FILTER	1,500	60 square feet	2.778 GPM	1.158 GPM	58.3%	8.1 HRS (theoretical)	19.4 HRS (theoretical)	139%
AEROBIC SYSTEM	600	1,300 gallons	1.111 GPM	0.553 GPM	50.2%	19.5 HRS	39.2 HRS	101%
AEROBIC SYSTEM	1,000	2,200 gallons	1.852 GPM	0.767 GPM	58.6%	19.8 HRS	47.8 HRS	141%
AEROBIC SYSTEM	1,500	2,400 gallons	2.778 GPM	1.125 GPM	59.5%	14.4 HRS	35.5 HRS	146%
AEROBIC SYSTEM	2,000	4,300 gallons	3.704 GPM	1.399 GPM	62.2%	19.3 HRS	51.2 HRS	165%
AEROBIC SYSTEM PRETREATMENT	600	450 gallons	1.111 GPM	0.553 GPM	50.2%	6.7 HRS	13.5 HRS	101%
AEROBIC SYSTEM AERATION	600	600 gallons	1.111 GPM	0.553 GPM	50.2%	9.0 HRS	18.1 HRS	101%
AEROBIC SYSTEM CLARIFICATION	600	250 gallons	1.111 GPM	0.553 GPM	50.2%	3.7 HRS	7.5 HRS	103%
DOWNSTREAM CHLORINE CONTACT	600	50 gallons	1.111 GPM	0.553 GPM	50.2%	0.7 HRS	1.5 HRS	114%
DOWNSTREAM CHLORINE CONTACT	1,000	100 gallons	1.852 GPM	0.767 GPM	58.6%	0.9 HRS	2.2 HRS	144%
DOWNSTREAM CHLORINE CONTACT	1,500	150 gallons	2.778 GPM	1.125 GPM	59.5%	0.9 HRS	2.2 HRS	144%

The above chart clearly demonstrates the important role flow equalization plays in wastewater treatment. Incorporating flow equalization into residential onsite treatment systems makes any system perform better and prevents premature failure. Hydraulic surges are produced in the home every day through the combined use of bathtubs, dishwashers, disposals, clothes washers, shower facilities and a variety of other water using appliances. When these surges occur, a residential treatment system without flow equalization is compromised and often will not provide adequate treatment. Flow equalization allows commercial, municipal, industrial and residential wastewater systems to deliver the treatment they were designed to provide.

PROGRESS THROUGH

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***norweco*® SINGULAIR® BIO-KINETIC®**

WASTEWATER TREATMENT SYSTEM

TANK PUMPING INSTRUCTIONS

These instructions provide a general guideline concerning when and how to pump out the Singulair system. This literature supplements other instructional materials included in the Singulair Bio-Kinetic System Service Manual.

In order to maximize performance, protect system components and insure protection of the surrounding environment, the Singulair system should be thoroughly checked every six months by a factory-trained Norweco service technician. An initial service program that provides a minimum of four service inspections during the first two years of system operation is included in the system purchase price. Renewable service contracts to extend these routine inspections after the initial program expires are available from the local licensed Norweco distributor.

The pretreatment chamber of the Singulair system will periodically require pumping. Because the Singulair system is a biological treatment device, the time frames listed within these instructions are estimates. Actual pumping frequency will depend on the amount and strength of the wastewater being treated.

Handling and disposal of pretreatment chamber contents, referred to as septage, or the contents of the aeration and clarification chambers, referred to as biosolids, are regulated by local, state and federal authorities. Disposal options may include land application, lagoon treatment, municipal wastewater treatment or landfill disposal. Prior to arranging for tank pumping, contact the Norweco distributor to obtain complete information on access to chambers, removing equipment, coordination of services and disposal of tank contents.

During Singulair system installation and backfilling, do not allow dirt or mud to enter the system. Once in the system, dirt or mud will form a heavy sludge which will affect settling characteristics, interfere with filtration and degrade effluent quality. If dirt or mud enters the system, it must be removed to insure proper system operation. Removing the dirt or mud may require repeated flushing and tank pumping. For additional details refer to Singulair Tank Delivery and Setting instructions.

INTRODUCTION

The Singulair system is a biological treatment device and should not require pumping as frequently as a septic tank. Septic tanks are designed to store solids and perform limited biological treatment. Frequent pumping of a septic tank is mandatory to remove and dispose of these solids before they discharge from the tank. The Singulair system is designed to biologically treat all incoming wastewater and return only a high quality effluent to the environment. The multiple operating processes contained within the plant accomplish primary, secondary and tertiary treatment in each Singulair system. The pretreatment chamber of the Singulair system is designed to retain non-biodegradable solids and allow biodegradable solids to flow into the aeration chamber. The aerobic treatment process in the Singulair system utilizes these biodegradable solids to convert the wastewater into carbon dioxide and water. This natural biological process minimizes the accumulation of solids and eliminates the need to pump the system as frequently as a septic tank. Because the Singulair system utilizes the biodegradable material found in wastewater to perform biological treatment, pumping the system more often than needed will not improve operational performance. Removal of the solids in the Singulair system will be required when indicated by an inspection or evaluation as outlined herein.

WHEN TO PUMP

Norweco distributors provide maintenance and service inspections free of charge at regular six month intervals during the initial warranty period. These routine service inspections will determine if a pretreatment chamber evaluation is necessary. The pretreatment chamber should be evaluated by a factory-trained technician at least every three years to determine if pumping is required. Pumping of this chamber by a licensed tank pumping and disposal service will likely be necessary at 3 to 5 year intervals, based on variations in system occupancy, usage and loading.

ROUTINE SERVICE INSPECTIONS

Semi-annual service inspection procedures are outlined in detail in the Singulair Bio-Kinetic System Service Manual. These routine service procedures include inspection of the aeration chamber, clarification chamber and effluent line to determine if the pretreatment chamber should be evaluated. A brief outline of these routine service procedures, as well as the detailed steps required to perform a comprehensive pretreatment chamber evaluation, are listed here. The results of the routine service inspection, pretreatment chamber evaluation and tank pumping (when performed) should be noted on the Service Inspection Card.

AERATION CHAMBER INSPECTION

A summary of the aeration chamber inspection procedure is listed below. For complete details on aeration chamber service, refer to the Singulair Service Manual.

CAUTION: Any time an aerator or service pump is connected or disconnected, first shut off the selector switch in each Singulair control center. Failure to do so could result in personal injury or equipment damage.

1. Remove the vented concrete aeration chamber access cover and set aside.
2. Unplug the aerator and secure the closure cap in position to protect the electrical connector.
3. Lift the aerator straight up out of the access opening and lay it flat on the vented cover. DO NOT bump the aspirator shaft or rest the aerator on the aspirator shaft.
4. Perform a settleable solids test using a graduated cone or other clear container. For this test, make sure the aerator has been running for at least 10 minutes. Collect an aeration chamber sample immediately after turning off and removing the aerator. Refer to the "Settleable Solids Test" section of these instructions for additional details.
5. Loosen the two set screws on the bottom of the intermediate shaft and remove the aspirator shaft.
6. Clean any debris from the aspirator shaft and flush the inside of the shaft with a hose.
7. Visually check the aeration chamber surface for the presence of grease or oil. An accumulation of these materials indicates the pretreatment chamber should be evaluated.
8. Check the aeration chamber contents for the presence of non-biodegradable materials, paper, mop fibers, hair, grease or oil. A significant accumulation of these materials in the aeration chamber indicates the pretreatment chamber should be evaluated.

Repeat steps 1-8 for Singulair systems with multiple aeration chambers and aerators.

NOTE: Do not replace the aerator(s) until the Bio-Kinetic system(s) have been removed from the clarification chamber and properly serviced.

SETTLEABLE SOLIDS TEST

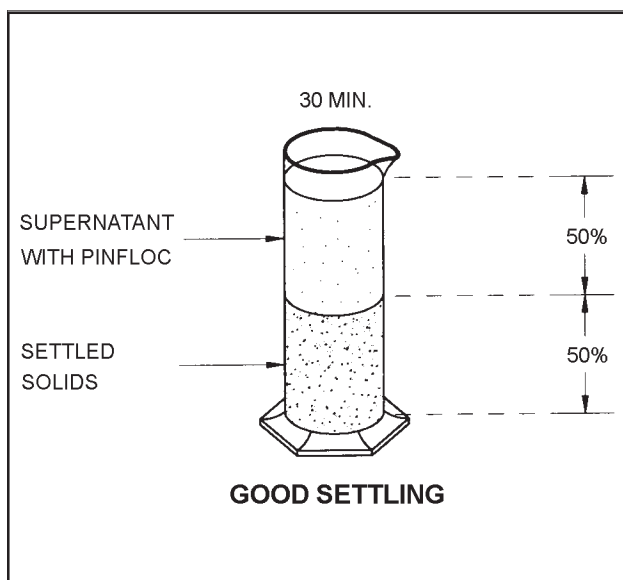
A settleable solids test should be conducted as part of the aeration chamber evaluation during each routine service inspection to monitor system performance.

To insure a well mixed sample is collected for the settleable solids test, make sure the aerator has been running for at least 10 minutes. Collect the sample immediately after turning off and removing the aerator and before the aeration chamber contents begin to settle. Using a graduated cone or other clear container, dip the container into the aeration chamber to a depth of 2½ feet. Set the container on a level surface and allow the solids to "settle" for 30 minutes while you complete the service inspection. Do not disturb the container during the test.

After 30 minutes, read the level of solids and compare it with the total liquid volume in the container. Calculate the

percentage of settled solids volume (i.e. ½ full of solids equals 50%). If the settled material contains large pockets of clear liquid, estimate the volume of these pockets and reduce the settled solids reading by that amount. A settled solids reading of up to 75% indicates no adjustments are necessary.

NOTE: The solids should settle and compact within the 30 minute test. System start-up, or periods of low organic loading will result in solids that are too light to settle, and will appear as a full container with no clear separation. This should not be interpreted as having excess solids and system operation can continue without adjustment.



A settled solids level greater than 75% indicates excessive solids in the aeration chamber and that the pretreatment chamber may need to be pumped. In this case, a pretreatment chamber evaluation must be performed. Refer to the "Pretreatment Chamber Evaluation" section of these instructions for more details. If the pretreatment chamber evaluation indicates pumping is not required, the aerator operating cycle should be increased. Consult the local regulatory agency and the Singulair Time Clock Setting instructions before adjusting the aerator operating cycle.

In Singulair systems with more than one aerator, the settleable solids test should be conducted for each aeration chamber. The results of all tests should be averaged to determine the appropriate action. If test results indicate an aerator time cycle adjustment is necessary, adjust each time clock to operate on identical run cycles.

The results of the settleable solids test, and any adjustment made to the system time cycle, should be recorded on the Service Inspection Card.

CLARIFICATION CHAMBER INSPECTION

A summary of the clarification chamber and Bio-Kinetic service inspection procedure is listed below. For complete details on clarification chamber service, refer to the Singulair Bio-Kinetic System Service Manual.

1. Remove the system access cover and set aside.
2. Remove the optional Blue Crystal and Bio-Neutralizer feed tubes. Do not allow the tubes to touch.
3. Install the Outlet Sealing Tool into the receiving flange to prevent loss of liquid from the Singulair system during service.
4. Remove the Singulair aerator and place the service funnel over the aerator mounting casting.
5. Using the universal tool, remove the flow deck and chamber plate assembly from the Bio-Kinetic system. Place the assembly on the service funnel for cleaning.
6. Using the universal tool, disengage all four black locking lugs to allow for removal of the outer chamber.
7. Lower the fixed handle of the universal tool into the upper lip of the Bio-Kinetic system outer chamber. Turn the handle until the lifting tool is engaged into the lifting rib.
8. The outer chamber is equipped with a drain valve and fill valve to allow for easy removal and reinstallation during service. Begin lifting the outer chamber from the tank. The drain valve will automatically open as the outer chamber is lifted out of the clarification chamber. Remove the outer chamber from the mounting casting and set it on the upside down lid of the service container.

NOTE: Repeat steps 1-8 for clarification chambers with multiple Bio-Kinetic systems.

9. Reinstall the Singulair aerator(s) as outlined in the Singulair Aerator Service Instructions. The aerator(s) must be in operation while the remaining clarification chamber service is performed.
10. Check the surface of the clarification chamber for the presence of grease or biologically untreatable material. A significant accumulation of these materials would indicate that the pretreatment chamber should be evaluated.
11. With the aerator running, use the hopper scraping tool to gently scrape all areas of the clarification chamber hopper side walls.
12. Complete the clarification chamber service as outlined in the "Clarification Chamber" section of the Singulair Bio-Kinetic System Service Manual.
13. Make appropriate notations on the Singulair Service Inspection Card and on the Owner's Manual.

EFFLUENT LINE INSPECTION

Check the groundwater relief point installed in the effluent line to make sure it is free of obstruction. An accumulation of paper, fibers, hair or grease indicates that the Singulair system needs to be pumped. If there is a surface discharge point, make sure that it is free of debris, foam, mud, etc. Make appropriate notations on the Service Inspection Card.

PRETREATMENT CHAMBER EVALUATION

The pretreatment chamber must be evaluated within three years of system start-up or the most recent tank pumping. An evaluation must also take place any time a routine service inspection indicates the chamber may be discharging excessive solids. This evaluation includes measuring the depth of the floating scum and settled sludge layers to determine if pumping is required. If the pretreatment chamber evaluation indicates the chamber does not require pumping, these evaluations should be repeated annually until pumping is necessary.

PRETREATMENT CHAMBER INSPECTION

A complete pretreatment chamber inspection procedure is listed below. The results of the inspection should be noted on the Service Inspection Card.

1. If the pretreatment chamber access opening is not equipped with a riser and cover at grade, dig down to the access opening in the top of the tank. The opening is in line with the access opening for the aeration chamber and the system outlet. The access cover should not be more than 12" below grade.
2. Remove the cover(s) and be careful not to allow dirt or mud to enter the tank.
3. Visually examine the surface of the pretreatment chamber for a significant accumulation of grease, oil or non-biodegradable materials.
4. Using the hopper scraping tool, gently probe the surface of the chamber to determine the thickness of the scum mat. Force the tool down through the scum mat, rotate the tool one quarter turn, then raise it until the bottom of the mat is felt. If the depth of the floating scum layer has reached the bottom of the discharge tee, the chamber should be pumped.
5. To check the depth of the settled sludge layer, secure a rough white towel to the handle of the hopper scraping tool and lower it to the bottom of the chamber.

Lower the tool behind the discharge tee (baffle) to avoid floating particles. Push the tool through the settled sludge layer to the bottom of the tank. Wait several minutes and carefully remove the tool. The depth of the settled sludge layer will be shown by a dark line on the towel. If the settled sludge layer has accumulated to the bottom of the discharge tee, the chamber should be pumped.

Review the “Operational Requirements” section of the Owner’s Manual with the owner. If lint, grease, scouring pads, diapers, sanitary napkins, cotton balls, cotton swabs, cleaning rags, dental floss, strings, cigarette filters, rubber or plastic products, paints, thinning agents or other harsh chemicals are discovered in the system, the owner should be cautioned regarding proper use of the system.

WHAT TO PUMP

When pumping is required, normally it is necessary to pump only the pretreatment chamber if the Singulair system has been serviced at regular 6-month intervals. If service has been interrupted for an extended period of time, or if mud or toxic material is present, it may be necessary to pump out the entire system. When pumping, it is not necessary to wash down the compartments unless significant quantities of grease, hair, fibers, mud, toxic substances or biologically untreatable materials are present. The following chart provides volumetric capacities within each Singulair system:

SYSTEM CAPACITY		
Singulair Model	Pretreatment Chamber	Total System
500 GPD	450 Gallons	1300 Gallons
750 GPD	550 Gallons	1600 Gallons
1000 GPD	1000 Gallons	2300 Gallons
1250 GPD	1250 Gallons	2850 Gallons
1500 GPD	1500 Gallons	3400 Gallons

HOW TO PUMP THE SINGULAIR SYSTEM

A complete Singulair system pumping procedure is listed below. Prior to tank pumping, contact the Norweco distributor to obtain complete information on equipment removal and reinstallation.

1. If any portion of the Singulair system requires pumping, contact a tank pumping service licensed by the local regulatory agency. The septage or biosolids from the system must be removed and disposed of in a manner consistent with federal, state and local regulations.

2. Refer to the “System Capacity” table and advise the pumping service what volume of liquid is to be removed from the system.
3. For pumping the pretreatment chamber only, remove the pretreatment chamber access cover and insert a suction hose into the chamber. Lower the hose until it contacts the bottom of the tank. Withdraw the hose approximately 2" and connect the opposite end to the pump being used to evacuate the chamber.
4. Break up the scum mat to facilitate pumping. Activate the pump and remove the pretreatment chamber contents. It is not necessary to wash down the sidewalls or tank bottom.
5. If the solids in the chamber are so concentrated that the suction hose cannot withdraw them, tank contents may be back-flushed to break up the solid matter.
6. If special circumstances require the total system to be pumped, contact the local Norweco Singulair distributor. Each aerator and Bio-Kinetic system must be removed for full access to all chambers and to prevent damage to components.
7. A Singulair system that has been inactive for an extended period of time or that has accumulated mud or dirt during installation may have to be washed down with fresh water and pumped out. This process may have to be repeated for proper system operation.

NOTE: Access to the contents of the aeration and clarification chambers of Singulair systems should be made only through an aerator mounting casting. Never insert the hose through the Bio-Kinetic system mounting casting.

8. After pumping, fill all chambers to capacity with water. Return all aerators, Bio-Kinetic systems and access covers to their proper locations, as outlined in the Singulair Service Manual. Be sure each control center selector switch is in the “automatic” position, and each enclosure is secured with a tamper evident seal.

Following tank pumping, no other system adjustments are necessary for proper biological treatment to continue. Semi-annual service inspections by a factory-trained Norweco service technician should be conducted to insure long term system performance.



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SINGULAIR®

THREE YEAR LIMITED WARRANTY

Norweco, Inc. warrants every new aerator, control center, Bio-Kinetic system, Singulair Green tank and any other Singulair component manufactured by Norweco to be free from defects in material and workmanship under normal use and service for a period of three years from the date of installation, as provided herein. Norweco will repair or replace the warranted component which in the sole judgement of Norweco shows evidence of manufacturing defect, provided that the defective component is returned to the factory, freight prepaid, by a licensed Singulair distributor, licensed service center or authorized dealer. This limited warranty shall be recognized in effect for three years from the date of Singulair system installation, if a warranty registration card has been properly registered with the factory, according to the terms of this warranty. If the warranty registration card has not been registered upon installation of the Singulair system, the limited warranty shall be recognized in effect for three years from the date the warranted component was shipped from the factory.

Norweco reserves the right to revise, change or modify the construction or design of the Singulair system or component parts without incurring any obligation to make such changes or modifications in earlier model components. Norweco reserves the right to furnish new or rebuilt component parts which, in Norweco's judgement, are the equivalent of the parts being replaced.

Service may occasionally be required for the Singulair system due to damage resulting from accident, improper use, voltage fluctuations greater than $\pm 5\%$ of the aerator nameplate rating, abuse, tampering, act of God, improper installation, vandalism or failure to follow operating procedures. As this damage has not resulted from defects in workmanship or material, it shall not be covered by this warranty. Service charges incurred in these cases, including parts and labor, shall not be assumed by Norweco and shall be the responsibility of the customer.

This Singulair three year limited warranty does not include any portion of the customer's wiring, plumbing, drainage, disposal system, or tankage not manufactured by Norweco, nor does it include freight charges (round trip) required to return the warranted component for factory replacement. Norweco shall not be responsible for damages of any kind or character resulting from or caused directly or indirectly by any defective component, inaccuracy, weakness, failure or delay. The warranty shall not apply to any missing components or to any items which have been disassembled, repaired, altered or tampered with, prior to their return to the factory. Therefore, if a Singulair component part fails to meet Norweco's manufacturing standards or product representations stated herein, do not use or dismantle it, contact the local licensed Singulair distributor, licensed service center or authorized dealer. The distributor, service center or dealer will arrange to have the component part returned to Norweco. Norweco's liability is limited solely to the replacement of the defective component part. Norweco shall not be liable for any labor involved during the removal or replacement of equipment, nor for charges for equipment, freight, transportation, inspection or handling of any component part. In no case will Norweco be liable for loss incurred because of interruption of service or for consequential damages, contingent liabilities or other similar expenses.

This limited warranty is, and the owner agrees that it shall be, in lieu of all other warranties whether expressed or implied. No distributor, service center, dealer or person is authorized or permitted to make any contract or assume any other obligations or liabilities for Norweco. Laws governing limited warranties vary in some states and although this warranty gives the owner specific legal rights there may be additional rights not contained herein.

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SINGULAIR®

LIFETIME WARRANTY AND EXCHANGE PROGRAM



OWNER PROTECTION PROGRAM

Norweco's comprehensive exchange program offers Singulair owners a lifetime of protection. The chart below reflects the customer's cost for a replacement Singulair aerator, as a percentage of the aerator list price in effect at the time of the exchange.

Today's Answer for the Protection of Tomorrow's Environment

SYSTEM AGE	OWNER EXCHANGE
0-3 Years	In Warranty
3-5 Years	50 Percent
5-8 Years	60 Percent
8-15 Years	65 Percent

SYSTEM AGE	OWNER EXCHANGE
15-20 Years	70 Percent
20-30 Years	75 Percent
30-50 Years	85 Percent
50 + Years	90 Percent

AVAILABLE ONLY THROUGH FACTORY-TRAINED DISTRIBUTORS, LICENSED SERVICE CENTERS OR AUTHORIZED DEALERS

The Singulair aerator enjoys the distinction of being the only aerator on the market today backed by a lifetime exchange program. After the initial Singulair aerator three year warranty has expired, the owner is entitled to a lifetime of aerator protection with the exchange program.

Customers with a Singulair system may exchange any aerator, any age, for a replacement unit. The three year limited warranty starts over again on the replacement unit installation date. Norweco is proud to be able to offer a lifetime of protection to its Singulair customers. To qualify for the exchange program the conditions outlined below must be met.

Aerators can be accepted by Norweco for exchange if they are returned, freight prepaid, to our factory by a licensed Norweco Singulair distributor, licensed service center or authorized dealer. Collect shipments, or units returned directly from customers cannot be accepted. If aerator parts are missing or the aerator has been disassembled by unauthorized persons or tampered with in any way, it will be remanufactured on a time and materials basis rather than at a fixed exchange cost. Norweco cannot guarantee that the current exchange program will always be available, however, that is our goal, and we are happy to offer it at this time.

Singulair installations are also protected with an initial two year service program included in the cost of the system. A series of service and adjustment inspections by our local factory-trained personnel are prescheduled for the first two years of operation and included in the purchase price. "Progress through service since 1906" sums it up nicely. A quality product - serviced by a local expert - has earned Norweco a reputation for excellence.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

SINGULAIR® SYSTEM AND CONTROL CENTER SERVICE

To maximize owner protection, the Singulair Bio-Kinetic wastewater treatment system is backed by a three year limited warranty on system components and a lifetime aerator exchange program. The initial selling price includes a series of four prescheduled service inspections at six month intervals which cover the first two years of system operation. These inspections should completely familiarize the owner with the Singulair Bio-Kinetic wastewater treatment system and answer any questions that arise. Carefully check all component parts of the Singulair system to insure proper operation and overall wastewater treatment quality. Regular service inspections by qualified technicians establish an excellent relationship with the owner as well as with local health officials. They must be performed faithfully to keep you up-to-date on the performance of each Singulair system you have installed.

While making service inspections during the initial two year period, be sure to explain to the owner that they are being performed at no charge and that the same coverage can be renewed on a continuing basis at a nominal charge following the initial two year program. Point out the advantages of continuous protection with the service contract. Be sure to remember that service contract sales have advantages for the distributor as well. They result in more efficient service inspection scheduling with more actual "service time" and less "travel time" per day. These savings can be passed on to the owner through more attractive renewal contract fees in future years.

All of the equipment and tools needed for Singulair system service work are contained in the Singulair field service cart and Tool Kaddy. You will also need exchange Bio-Kinetic systems, a supply of Blue Crystal disinfecting tablets and a supply of Bio-Neutralizer dechlorination tablets. Bio-Kinetic systems may be supplied with or without Blue Crystal and Bio-Neutralizer chemical feed systems. Therefore, check your Distributor Service and Warranty Record Card carefully to be sure you have selected exchange Bio-Kinetic systems with correct flow distribution decks.

SINGULAIR SYSTEM SERVICE PROVIDES CONTINUOUS OWNER PROTECTION WITH THESE ADVANTAGES

- Travel and labor costs during service inspections are provided at no charge to the owner.
- Special service calls that may be necessary during the program are performed at no charge to the owner.
- Owner's investment, property and the environment are fully protected.
- Guaranteed response to emergency service requests is made within forty-eight hours.
- Local health department is automatically notified of system condition by the distributor.
- Owner has an up-to-date, written record of the condition of the Singulair aerator, control center and Bio-Kinetic system.
- Owner is continuously informed of the treatment quality provided by the system.
- Routine maintenance is performed by factory-trained service technicians; no owner maintenance is required.
- Owner can expect maximum aerator life and minimal power consumption costs due to regular, qualified service visits.

These instructions are designed to cover the important points of Singulair Bio-Kinetic system operation which should be checked during each service inspection. They have been arranged in normal service order to assure that you make the most efficient use of your time. While a visual check is normally sufficient to be certain that each item is in proper working order, several items listed in this manual are indications of potential problems. If anything unusual is encountered, refer to the Singulair Troubleshooting Guide.

NORWECO PRESCHEDULED SERVICE INSPECTIONS (Cont.)

Before you leave your plant

- Be sure you have a complete list of service needs in the area you are going to work.
- Check to see that you have detailed directions to each installation.
- Be sure your service vehicle is fully stocked.

When you arrive at the site

- Meet the owner. Introduce yourself and present your business card.
- Explain the service inspection program and outline what you will do. Mention that your services are at no charge.
- Ask for permission to inspect the Singulair control center and tankage.
- Make sure the owner has a copy of the Owner's Manual, serial number tag and previous Service Inspection Record Cards.
- Suggest that the owner record the information from the Service Inspection Record Card in the Supplemental Service Record Section of the Owner's Manual.
- Ask if there are any questions concerning the system or its operation.

CONTROL CENTER SERVICE

CAUTION: If your visual inspection of the Singulair control center reveals a problem, be sure to shut off the appropriate circuit breaker in the main service panel - then test all circuits with the electrical multi-meter to be sure they are de-energized before proceeding.

1. If there is no evidence of an electrical problem, check the main service panel to see that the circuit breaker for each Singulair system is turned on.
2. Make sure the panel is turned on and the power indicator light is on. If there are any alarm lights activated, refer to the Singulair quick start guide for further diagnostic instructions.
3. See that your company's identification label is affixed to the Singulair control center and is legible. Replace the label if necessary.
4. Make sure that the aerator model number and serial number tag is attached to the control center or has been stored by the owner in a secure location. If it has been misplaced, provide a new one and fill in the appropriate information.
5. See that the Owner's Manual has been stored by the owner in a secure location. If it has been misplaced, supply the owner with a new one.
6. Inspect the wiring from the control center to the aerator, as far as it is visible, and notify the owner if you see any damaged areas.
7. As you leave, make sure the Singulair control center is turned on and there are no active alarms. Secure the Singulair control center with a new tamper evident seal.
8. Make appropriate notations on the condition of the electrical control center on the Service Inspection Record Card.

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INTEGRATED SYSTEM CONTROLS

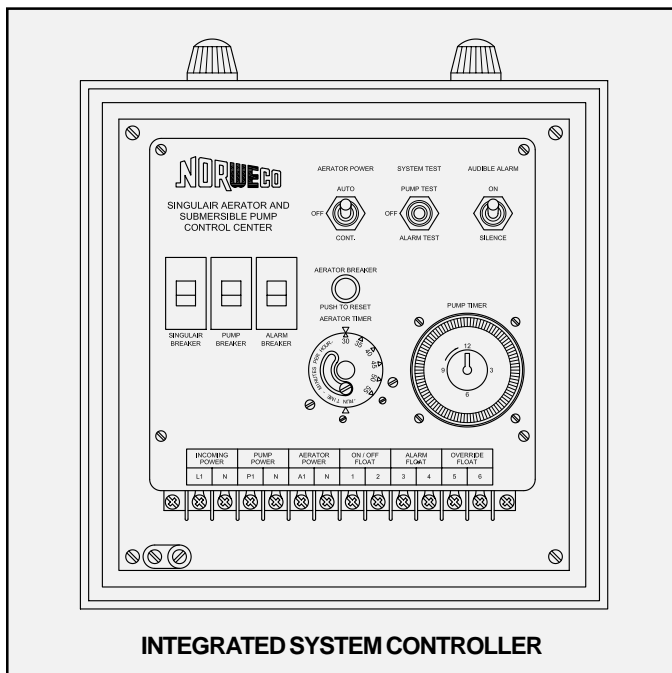
SINGULAIR® SYSTEM AND CONTROL CENTER SERVICE

The integrated system controls are designed to accommodate installations where a Singulair wastewater treatment system is used in conjunction with an effluent disposal systems that requires pumping. Integrated system controls allow both the Singulair aerator and the pump used in the associated effluent disposal system to be controlled from a single panel. These control systems are backed by the same two year limited warranty that is associated with the Singulair wastewater treatment system.

These instructions are directed to the specific requirements of servicing integrated system controls. They are not intended to cover all aspects of service for the Singulair System. Additional instructions are contained in Bio-Kinetic wastewater treatment system Singulair system and control center service.

CONTROL CENTER SERVICE

CAUTION: If your visual inspection of the Singulair control center reveals a problem, be sure to shut off the appropriate circuit breaker in the main service panel, then test all circuits with the electrical multi-meter to be sure they are de-energized prior to proceeding.



While the power to the panel is off check the terminal strip screws to insure that they are tight and securely connecting the wires at each connection. Also check the connection to the grounding lug to insure the ground wire is securely fastened to the grounding lug. Loose connections can result in system malfunction.

Control center service should be performed during each service inspection and should follow all parameters outlined in the Singulair Service Manual.

NOTE: The performance of the Singulair system has been tested and certified with the aerator(s) operating on a minimum cycle of 30 minutes per hour. No adjustment should be made to the factory preset time clock setting without following the detailed steps outlined in the "Time Clock Setting and Service Instructions".

1. If there is no evidence of an electrical problem, check the main service panel to see that the circuit breaker is in the "on" position.
2. Check to see that all circuit breakers within the integrated control center are in the "on" position.
3. Check to see if the aerator breaker is in the "on" position by pressing on the pop out indicator. If this breaker is tripped it will snap back into the run position.
4. Check the aerator selector switch in the Singulair integrated system controls to make sure that it is set to "automatic" operation.
5. Activate the alarm test switch to insure the audible and visual alarms are functioning properly. While the audible alarm is sounding test the alarm silence switch to verify proper operation.
6. Return the alarm test switch to the "off" position and the audible alarm switch to the "on" position after it has been determined that the alarm features are properly functioning.
7. Verify that your company's identification label is affixed to the Singulair system controls and is legible. Replace the label if necessary.
7. Inspect wiring from the control center to the aerator(s) and pump(s) as far as it is visible, and notify the owner if you see any damaged areas.
8. Check the functionality of the pump by using the pump test switch. If the pump fails to activate see the aerator troubleshooting section of this document.
8. As you leave, make sure that the Singulair integrated system controls are set for "automatic" operation for all aerators and pumps.
9. Make appropriate notations on the electrical control center condition on the service inspection record card.

SINGULAIR® SYSTEM AND CONTROL CENTER SERVICE (Cont.)

AERATOR TROUBLESHOOTING

ELECTRICAL TROUBLESHOOTING

CAUTION: Before initiating any electrical component inspection or repair, turn off all power to the Singulair system by switching off the dedicated circuit breaker in the main electrical service panel and then test with the electrical multi-meter. Repairs should always be made by a qualified electrician using proper procedures and safe tools. Make sure that all circuits are properly grounded. Do not stand in damp locations when making electrical system tests. Always use tools with insulated handles for electrical repairs.

NO ELECTRICAL POWER FROM ELECTRICAL SERVICE PANEL TO CONTROL CENTER

Integrated system controls terminal L1 and N read zero voltage

Follow instructions detailed in "Electrical Troubleshooting" section of Singulair Service Manual

NO ELECTRICAL POWER FROM CONTROL CENTER TO AERATOR

Integrated system controls terminal A1 and N read zero voltage

Follow instructions detailed in "Electrical Troubleshooting" section of Singulair Service Manual

NO ELECTRICAL POWER FROM CONTROL CENTER TO PUMP

Integrated system controls terminal P1 and N read zero voltage

Check to see that pump circuit breaker is in the "on" position

Pump selector switch in "automatic" position, but pump does not run

Check to see that "on" float in pump station wet well is elevated to its "closed" position

Pump selector switch in "hand" position, but pump does not run

Check all wiring from control center to pump

AERATOR WILL NOT START

Aerator selector switch in "hand" position, but aerator does not run

Follow instructions detailed in "Electrical Troubleshooting" section of Singulair Service Manual

PUMP WILL NOT START

Proper voltage at terminals P1 and N, but pump does not run

See instructions contained in Pump Operation and Maintenance Manual

Pump does not run when proper float inverted

Replace defective float

AERATOR DRAWING EXCESSIVE CURRENT

Foam restrictor partially under water

See Singulair System Flooded

Debris on aspirator shaft

Remove debris with knife

Motor failure

Return aerator to factory

Insufficient voltage (less than 103 volts)

Report condition to power company

Excessive voltage (greater than 126 volts)

Report condition to power company

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CONTROL CENTER WITH MCD TECHNOLOGY

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS

The design of the Singlair system incorporates 48 hour retention and non-mechanical flow equalization to provide continuous treatment. The performance of the Singlair system has been tested and certified with the aerator operating on a minimum run cycle of 30 minutes per hour and no adjustment should be made to the factory preset time clock setting without following the detailed steps outlined in these instructions.

INTRODUCTION

The biological processes in the aeration chamber of the Singlair system convert wastewater to microorganisms, carbon dioxide and water. The Singlair system is designed so that the aerator will operate 30 minutes out of each hour. Under typical organic loading conditions, this run cycle will maintain a balance between organic loading and the level of microorganisms in the aeration chamber. If an increase in organic loading occurs, increasing the aerator run time will result in additional aerobic digestion and allow the biological balance to be maintained. Prior to adjusting the aerator run cycle, a complete Singlair system service inspection, including pretreatment chamber evaluation, aerator service and measurement of air delivery must be performed. Whenever the pretreatment chamber is pumped, the system should be given time to achieve a biological balance before considering time cycle adjustment. Adjustments to the aerator run cycle should not be made within one week of any other system process changes, including system pump out or extended vacation.

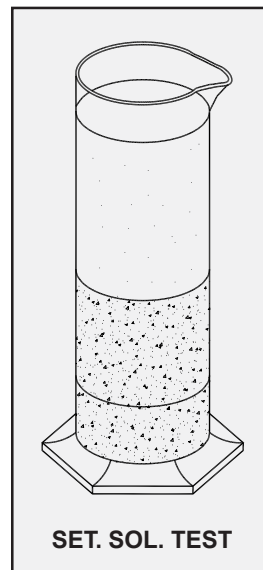
NITRIFICATION AND DENITRIFICATION

Nitrification is the oxidation of nitrogen compounds (primarily ammonia) that results in the production of nitrates. This process improves the quality of the effluent returned to the environment and is an important step in wastewater treatment. Nitrification is routinely performed by the Singlair system and the level of performance is directly linked to biological balance within the system.

Denitrification will only occur if nitrification has already taken place. Denitrification is the process of breaking down nitrates into oxygen and nitrogen. The Bio-Static sludge return prevents denitrification (sludge bulking) in the clarification chamber by continuously returning solids to the aeration chamber. Denitrification will occur in the aeration chamber if the aerator time cycle is properly adjusted. To accomplish denitrification, the aerator off cycle must be long enough to allow the aerobic bacteria to consume the available dissolved oxygen and the nitrate bound oxygen, thereby returning the nitrogen to its natural state. It is important that the aerator have a long enough off cycle to deplete dissolved oxygen levels in the aeration chamber in order to achieve partial or total denitrification.

SETTLABLE SOLIDS TEST

To determine if an adjustment to the aerator run cycle is required, a Settleable Solids Test must be conducted. See Singlair Tank Pumping Instructions for details on performing this test. Too much air being introduced to the system (overaeration) will negatively affect operating characteristics. This condition is indicated by finely divided particles and/or crisp, white foam floating in the Settleable Solids Test or aeration chamber. The supernatant will be turbid (cloudy) with fine suspended particles (pin floc). Solids will be lighter brown, almost white, in color. Overaeration will not allow proper settling of the treated wastewater and may adversely affect system performance. Likewise, too little air being introduced to the system (underaeration) will cause the system to operate at less than its maximum efficiency. Underaeration is indicated by darker and more coarse solids in the Settleable Solids Test or aeration chamber and may have a dark, thick foam or scum layer



on the top. This condition is similar in appearance to organic overloading and the system may have a foul or septic odor. The supernatant will have a grey, almost dishwater, appearance. Solids will have a grainy appearance and will settle more compactly due to their thickness and greater density.

To check for nitrification during the Settleable Solids Test, allow the sample to sit undisturbed for 2 to 3 hours. The nitrogen (fine bubbles) being released should cause all or a portion of the solids to float to the top. This process is called sludge bulking and is actually denitrification occurring in the sample container. The solids may then break up and settle to the bottom of the sample. For Singlair systems with more than one aerator, the Settleable Solids Test should be conducted on a sample from each aeration chamber. The results of all tests should be averaged to evaluate system operation.

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

The results of the Settleable Solids Test should be evaluated using the following chart:

Settleable Solids Test Result			Condition Indicated	Adjustment Required
Color of Solids and Liquids	Settled Solids Volume	Additional Observations		
Very light brown solids with gray cloudy liquid.	Less than 25%.	Some surface foam. Poor separation and settling of solids.	Hydraulic overloading, organic underloading, or system has not yet reached process maturity.	No adjustment until process maturity is reached. If mature and properly loaded, decrease aerator run time. DO NOT decrease run time to less than 30 minutes per hour.
Light to medium chocolate brown solids with clear liquid.	25% to 50%.	No foam.	Proper operation.	None.
Medium to dark chocolate brown solids with clear liquid.	50% to 75%.	No foam.	Proper operation.	None.
Very dark brown solids with cloudy brown liquid.	Greater than 75%.	Dense sludge with rapid settling.	Organic overloading.	Evaluate pretreatment chamber. Increase aerator run time if required.
Black solids with gray liquid.	In any volume.	Foul odor and finely divided particles.	Toxic material in influent.	Evaluate system per Singulair Service Manual. Review Owner's Manual with owner.

DISSOLVED OXYGEN TEST

A dissolved oxygen (DO) test can be conducted on the aeration chamber contents to confirm overaeration or underaeration. The DO test can be performed on site using a properly calibrated portable DO meter with probe. The DO level can also be accurately determined through the use of an inexpensive colormetric test performed on a properly filtered sample from the aeration chamber. DO in the aeration chamber typically ranges from 0.5 mg/L to 9.5 mg/L and fluctuates according to cycle time and other factors including temperature and solids level. Comparison samples must be taken at the same point during the aerator run cycle because DO levels will vary according to cycle time. DO levels in the aeration chamber must be greater than 2.0 mg/L at the end of the aerator run cycle to accomplish nitrification and less than 0.5 mg/L at the end of the aerator off cycle to accomplish denitrification. A properly balanced system will have more than sufficient air during the run cycle to allow nitrification to take place and will deplete DO during the off cycle sufficiently to allow partial or complete denitrification.

Some areas have specific DO requirements for effluent returned to the environment and the same tests can be conducted on final effluent samples. The treatment processes of the Singulair system will cause effluent DO to differ from aeration chamber DO levels. Typical effluent DO will range from 1.0 mg/L to 6.0 mg/L depending on location, temperature and time of year.

HYDRAULIC OVERLOADING

Hydraulic overloading of the Singulair system is an indication that too much liquid is coming into the plant. This situation can adversely affect biological treatment and should be corrected immediately. Leak testing should be performed on toilets, faucets and other fixtures that discharge into the domestic wastewater plumbing to be sure that they shut off completely when not in use. Confirm that roofing down spouts, sump pump piping and other improper connections are not discharging into the Singulair system. Crushed or leaking influent sewer lines can cause groundwater to enter the system and should be thoroughly checked by a qualified contractor.

ORGANIC OVERLOADING

The Singulair system is designed to handle typical domestic waste. Occasionally, a specific application may result in excessive organic loading to the system. If you encounter an organic overload, the aerator run cycle can be adjusted in five minute increments up to continuous run. Instruct the owner regarding proper use of the system as described in the Singulair Owner's Manual.

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CONTROL CENTER WITH MCD TECHNOLOGY

TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

HIGH ALTITUDE INSTALLATIONS

The Singlair aerator delivers more than 150% of the air required by nationally recognized wastewater treatment design standards. This abundant supply of air allows the Singlair system to be installed at high elevations without special consideration. At an elevation of 6,500 feet above sea level, the available oxygen is approximately 23% less than at sea level. In high altitude installations, adjustment to the aerator run cycle should be made based on the same evaluation procedures used for all Singlair systems.

INTERMITTENT USAGE

When the Singlair system is to be used intermittently (one day per week or a few days per month), the aerator run cycle should be adjusted to the minimum setting. When low usage or non-use periods are expected, precautions should be taken to insure the protection of system components. If an extended period of non-use (four months) is anticipated, the distributor should suggest complete system shut down and removal of components. This may only be done with the full knowledge and approval of the local regulatory agency. The final decision to shut down the system rests with the owner. The decision should be based on the same criteria as other seasonal or non-occupancy arrangements, such as care of hot water tanks, water pipes, refrigerators or freezers. The owner should arrange for the local distributor to remove and store the aerator and chemical feed tube(s) after vacancy. The service technician should place the control center selector switch in the "off" position. Arrangements must be made for the distributor to re-install Singlair system components before the site is to be re-occupied. Normal installation procedures, as outlined in the Singlair Service Manual, should be followed by the distributor when re-starting a system.

COMPLIANCE WITH REGULATIONS

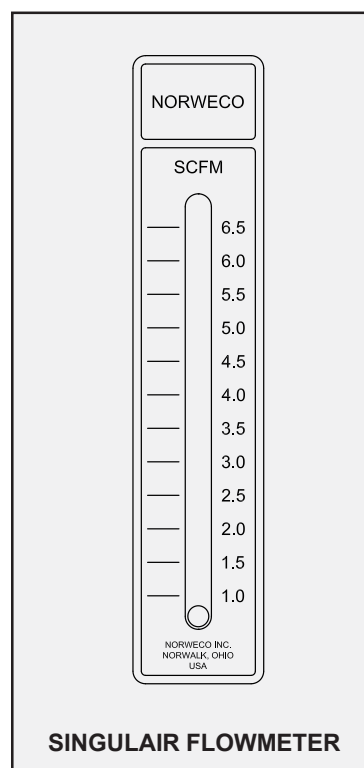
Local regulatory officials must be informed whenever a time cycle adjustment is made. Regulatory agencies should participate in the adjustment decision and standard procedures should include consultation with regulators before any adjustment is made. Norweco distributors and service personnel should attempt to build and maintain a close relationship with regulatory officials. Consulting with regulators and owners before adjusting a Singlair time clock should strengthen communication and keep all parties properly informed. In instances where a close working relationship already exists with local regulatory officials, regulators may allow service personnel to submit notification after an adjustment has been made. Such a practice should only occur when a strong relationship exists between distributor and regulator and with the full knowledge and approval of the regulatory agency.

PRIOR TO SYSTEM ADJUSTMENT

The Service Pro control center is designed and manufactured to provide an aerator run cycle of at least 30 minutes per hour. The aerator run cycle can be adjusted, but in no case can the aerator operate less than 30 minutes per hour.

Use the Singlair flowmeter to determine that the proper amount of air is being introduced into the system. If the

flowmeter confirms that the Singlair aerator is infusing the proper amount of air, proceed with the Settleable Solids test. Should the Settleable Solids or Dissolved Oxygen tests indicate that a time cycle increase is desirable, turn the Service Pro control center time clock dial to the "continuous" position. Allow the system to operate on "continuous" run for a few weeks until the service technician is available to check the system and speak with the owner. If the system has not returned to normal operation, the system is experiencing a problem other than with the time cycle and



alternatives must be investigated. Refer to the "Hydraulic Overloading" and "Organic Overloading" sections of these instructions.

If the change to "continuous" run has solved the operational problem, the time clock should be adjusted to bring the system into biological balance. When the service technician returns to the site, and operation has returned to normal, the technician should adjust the time clock to reflect the deviation in loading from the original time clock setting. Adjust the aerator run cycle to half way between "continuous" run and the original time clock setting (e.g. if the original setting was 30 minutes, adjust the time cycle to 45 minutes out of each hour). Instruct the owner to monitor the system and notify you of any problems. After at least one month, when a service technician is available and in the geographic area, check the system again. Additional adjustments may be necessary to completely balance the system.

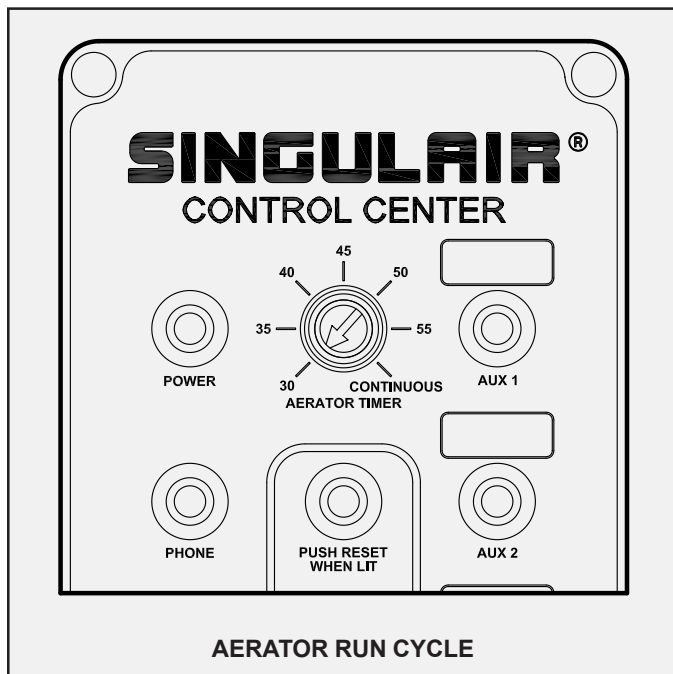
TIME CLOCK SETTING AND SERVICE INSTRUCTIONS (Cont.)

TIME CLOCK ADJUSTMENT

NOTE: Use a small blade screwdriver to rotate the time clock dial to the desired position. Do not use excessive force when turning the time clock dial.

Singularair systems with more than one aerator must have all control centers set for the aerators to operate on identical run cycles. Follow these steps to adjust the time clock:

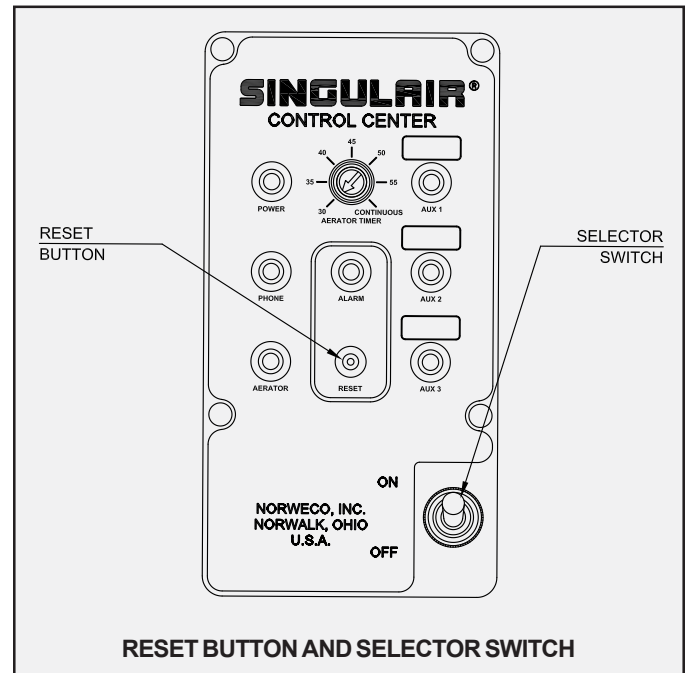
1. Open the control center enclosure and place the selector switch in the "off" position.
2. Rotate the time clock dial clockwise until the arrow molded into in the dial is aligned with the desired run time setting.
3. Place the selector switch in the "on" position.



4. Close the control center cover and secure it with a tamper evident seal.
5. Record the new aerator run cycle on the Service Inspection Card.

SERVICE INSTRUCTIONS

The operation of the Service Pro control center can be verified on site through a series of tests. Before testing the Service Pro control center operation, insure the aerator is installed in the Singularair tank and the watertight electrical connector is plugged into the aerator power cord. To restart the aerator time clock cycle, place the selector switch in the control panel momentarily in the "off" position. Return the selector switch to the "on" position. The aerator should now be operating.



Allow the aerator to operate for 60 seconds before proceeding. If the aerator turns off or the alarms on the control center activate, an aerator over current condition has been detected or a problem has been detected in the Service Pro control center.

To test the aerator under current detection feature, simply unplug the watertight electrical connector from the aerator power cord. The visual alarm indicator on the control center should begin to flash within five seconds. Plug the electrical connector into the aerator power cord. The aerator should resume normal operation within five minutes and the visual alarm indicator on the control center will turn off.

To test the audible and visual alarms, hold the reset button in for five seconds. The alarms will activate for a five second period and then turn off.

Should the Service Pro control center require any service, replace the entire control center insert.

CAUTION: Be sure to shut off the Singularair circuit breaker in the main electrical service panel before any repairs are made. Confirm that the incoming electrical service reads zero volts before proceeding with control center insert replacement. Refer to Control Center Wiring and Installation Instructions for details on replacement of the control center insert.

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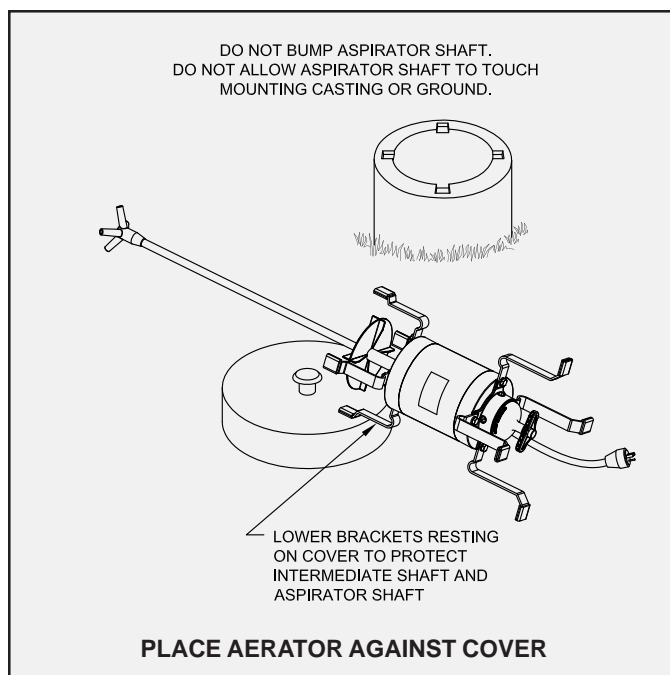
norweco® SINGULAIR®

BIO-KINETIC® WASTEWATER TREATMENT SYSTEM SINGULAIR® AERATOR SERVICE

The Singulair aerator has been specifically designed for use in the Singulair system and is the only electro-mechanical component. It provides maximum air introduction, thorough mixing and assures reliable, economical wastewater treatment. For Singulair systems requiring more than one aerator, follow these instructions for each aerator and aeration chamber. The Singulair aerator is factory lubricated for the life of the unit. No service inside the aerator is required. Unauthorized disassembly will void the warranty.

CAUTION: *Any time an aerator or test equipment is connected or disconnected, first shut "off" the selector switch in each control center. Failure to do so could result in personal injury or equipment damage.*

1. Open the control center and push the reset button on the Service Pro panel.
2. As you approach the Singulair tank, listen for excessive noise before removing the vented cover.
3. Remove the vented access cover located above the aeration chamber and place it aside. The aerator should be operating normally.
4. Make sure the debris screens are in place in the air intake ports. Manually check the aerator brackets for excessive vibration.
5. Check the aeration chamber for odor. A musty odor indicates the presence of aerobic conditions essential for good treatment. A septic odor indicates inadequate aeration, suggesting that the passage of air into the tank contents has been restricted.
6. Carefully remove the debris screens from the air intake ports. Wipe the aerator air intake ports with a damp cloth being careful not to allow dirt or debris to enter the intake openings.
7. Using the Singulair flowmeter, check the air delivery. It should read approximately 3 CFM. Refer to the Singulair Aerator Flowmeter instruction sheet for complete details.
8. Inspect the outside of the electrical connector assembly for worn spots. Uncouple the connector and check for any evidence of moisture inside. Secure the closure cap over the female half of the connector to keep it clean and dry while you work.
9. Within 2-3 minutes after turning off the aerator, perform a settleable solids test of the aeration chamber contents. Refer to Singulair Tank Pumping instructions for details.
10. Remove the aerator from the mounting casting. BE CAREFUL when removing the aerator to see that the aspirator shaft does not come in contact with the mounting casting. The aspirator shaft is straightened to a critical tolerance before it is shipped from the factory. Excessive vibration can greatly shorten aerator life and could also cause the unit to consume more electrical power than necessary.
11. Check the rubber shock absorbers on each bracket for wear. Replace any that are missing or worn.
12. Check the power cord from the moisture resistant electrical connector to the aerator. Be sure it is free of nicks or worn spots.
13. Lay the aerator on its side against the aerator mounting casting or vented cover. Check to see if there is a water mark on the outside of the aerator and notify the owner if one is found. The aerator is flood proof and mechanically designed so that it can return to normal operation unharmed after being subjected to intermittent high water. However, a high water mark on the outside of the aerator does indicate there is a problem in the effluent disposal line, disposal field or elsewhere in the installation. If the problem is left uncorrected, wastewater could back up into the tank, void the aerator warranty and eventually flood the facility.



SINGULAIR® AERATOR SERVICE (Cont.)

14. Carefully loosen the two stainless steel set screws on the bottom of the intermediate shaft and remove the aspirator shaft. Remove any internal deposits from the four aspirator orifices with the aspirator shaft cleaning tool. Connect the aspirator shaft to the shaft cleaning hose and outside water faucet to flush the inside of the aspirator shaft clean. Use full water pressure. Remove the shaft from the cleaning hose and inspect the bore to see that it is clean.
15. Push the stainless steel brush with extension handle through the stainless steel intermediate shaft and hollow motor shaft to dislodge any residue that may have accumulated. **NOTE:** Do not flush the motor shaft with water. Remove any debris from the air intake openings.
16. Thoroughly clean both the bottom and the top surfaces of the foam restrictor.
17. Reinstall the aspirator shaft into the intermediate shaft. Match the permanent alignment marks on the aspirator and intermediate shafts to maintain the original factory balance. Tighten the set screws with a tee-handle allen wrench, finger tight only. Too much pressure may dish the side of the aspirator shaft and compromise the straightness tolerance.
18. Visually check the aeration chamber surface for the presence of grease or oil. An accumulation of these materials indicates the pretreatment chamber should be evaluated. Refer to Singulair Tank Pumping instructions for details.
19. Check the aeration chamber for the presence of non-biodegradable materials, paper, mop fibers, hair, grease or oil. A significant accumulation of these materials in the aeration chamber indicates the pretreatment chamber should be evaluated. Refer to Singulair Tank Pumping instructions for details.
20. Inspect the underground power cable in the aerator mounting casting for breaks or scars in the insulation. Examine the inside of the mounting casting and riser for evidence of ground water entry.
21. Carefully reinstall the aerator in the mounting casting. Do not allow the aspirator shaft to touch the mounting casting side walls. Make sure the weight of the aerator is evenly distributed on the upper end of all four mounting brackets.
22. Using a multi-meter, check the voltage at the electrical connector. The meter should read 115 volts \pm 5% for systems equipped with electro-mechanical control centers and zero volts for systems with Service Pro controls. Record the voltage on the Service Inspection Card.
23. Wipe the aerator electrical connector with a clean, dry cloth to remove moisture or dirt accumulated during service. Plug the electrical test pigtail in between the male and female electrical connectors and check the amperage of the newly serviced aerator. The aerator should not draw more than 3.8 amps. Record the amperage on the Service Inspection Card. **NOTE:** When the aerator is started for the first time, the break-in period may cause the amp draw to be as high as 4.2 amps for the first 48 hours of operation.
24. Clean or replace the four air intake debris screens. Make sure one screen is placed in each intake opening to prevent debris from entering the aerator.
25. Inspect the vent cap in the aerator access cover and clear the fresh air openings of any debris to insure unrestricted passage of air. Reinstall the access cover on the mounting casting.
26. Make the appropriate notations regarding the aerator, the results of the settleable solids test and related items on the Service Inspection Card.
27. Proceed with clarification chamber service as outlined in Clarification Chamber and Bio-Kinetic Service instructions. When the routine service is complete, return to the control center and restore the Singulair system to the proper operating time cycle for this installation. Close the control center cover and secure it with a new tamper evident seal.

IF AN AERATOR MUST BE REMOVED

The service technician should be able to restore most installations to full operation during the initial service call. If the aerator is no longer eligible for the three-year limited warranty, the aerator should be removed and replaced with a remanufactured and fully warranted exchange unit from your rotating stock. This will become the permanent aerator in service at the facility and your company's service records should be updated to reflect the new aerator serial number. If the serial number portion of the Warranty Registration Card is still attached to the control center, be sure to fill in the new serial number for the owner. When you have accumulated several aerators requiring factory service, return them to Norweco. This reduces administrative time and the cost of shipment per unit. When remanufactured aerators are returned to you, add them to your rotating stock. In this way, the installation is restored to full service with a fully warranted unit in only one service trip.

EXCHANGE AERATOR COSTS

You may compute exact costs for exchange aerators during your service inspection since the cost is determined by system age, regardless of condition. Exchange rates are given on the Singulair Warranty and Exchange Program data sheet. In cases where the aerator has failed under warranty, you should replace it with a loaner unit to insure continued operation of the system and protect effluent quality. Return the warranted unit to the factory immediately for replacement and schedule reinstallation with the owner at the earliest possible convenience when it is returned to you.

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CLARIFICATION CHAMBER AND BIO-KINETIC® SERVICE

Check operation of the Service Pro control center and complete all Singulair Aerator Service instructions to the point of aerator reinstallation before proceeding with clarification chamber service. Do not reinstall the aerator in the mounting casting until all Bio-Kinetic systems have been removed from the Singulair tank. For Singulair systems requiring more than one Bio-Kinetic tertiary treatment device, follow these instructions for each Bio-Kinetic system installed.

CAUTION: Anytime an aerator or service pump is connected or disconnected, first shut off the selector switch in each control center. Failure to do so could result in personal injury or equipment damage.

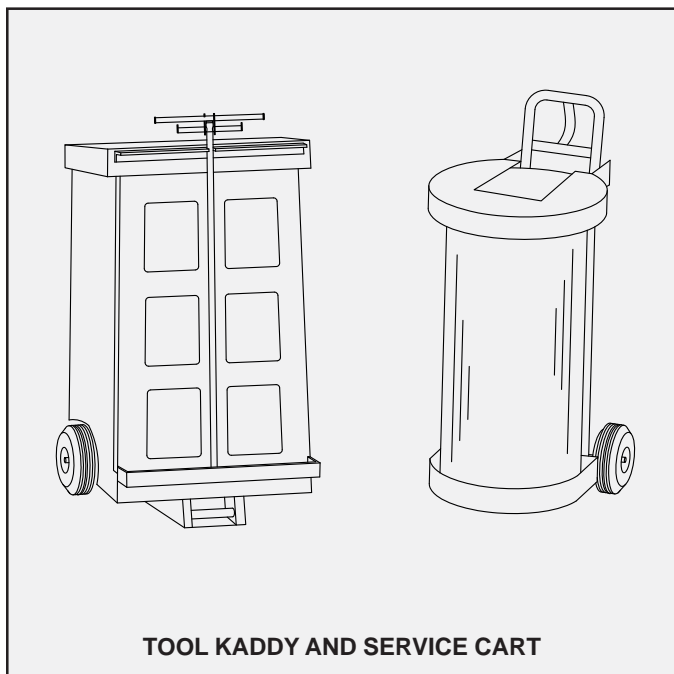
1. Move the Singulair field service cart with exchange Bio-Kinetic system and Tool Kaddy near the clarification chamber access cover. Remove the service container from the field service cart, unscrew the wing nuts holding the service container cover and set them aside. Remove the service container cover and place it upside down along side the clarification chamber access riser. Remove the exchange Bio-Kinetic system from the service container and set it aside. Remove the universal tool from the front of the Tool Kaddy and open the doors.

Bio-Kinetic system and the liquids in the tank for color and odor. Note the condition of the system on the Service Inspection Card.

NOTE: Attached to the Bio-Kinetic system service cover is a red tag listing the Singulair system model number, classification and daily treatment capacity. This service cover and tag must remain with the installation and be reinstalled after exchanging the Bio-Kinetic system.

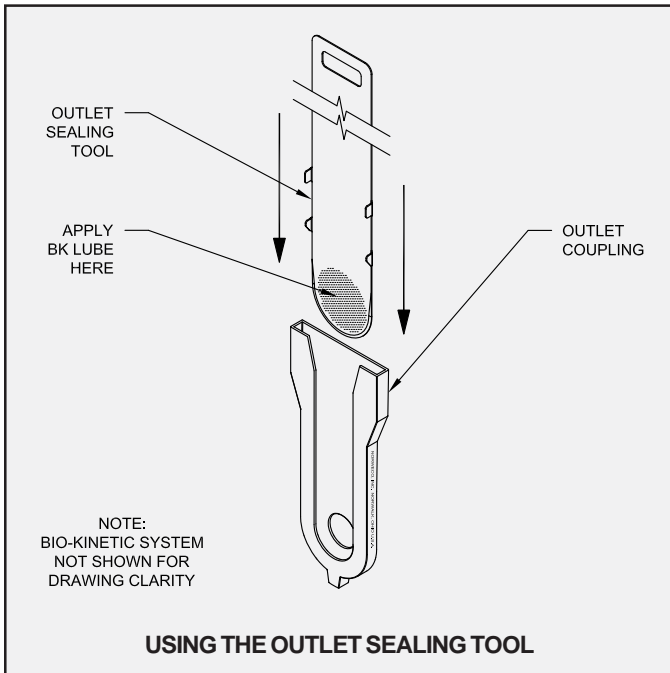
CAUTION: Chemicals or liquids from the Bio-Kinetic system feed tubes should not be allowed to contact skin or clothing. Refer to the Blue Crystal and Bio-Neutralizer handling instructions and container labels for safety procedures and first aid. Liquids or chemicals from the feed tubes may cause grass or landscaping to discolor.

3. To prevent loss of liquid from the Singulair system during service, use the Bio-Kinetic System Outlet Sealing tool. Thoroughly lubricate both sides of the tool below the tabs to the rounded end with Bio-Kinetic lubricant. With the tabs facing toward the Bio-Kinetic system, insert the tool in between the Bio-Kinetic outlet flange and the cast-in-place receiving flange of the tank. Completely insert the tool to the bottom of the outlet coupling.
4. Using the disassembly tool, remove the internal components from the Bio-Kinetic system. The internal components should be set aside while the remainder of the Bio-Kinetic system is removed.
5. The Bio-Kinetic system is equipped with a drain valve and a fill valve to allow for easy removal and reinstallation during service. The locking lugs must be disengaged to allow for removal. Using the locking lug tool, rotate each of the four round black locking lugs clockwise from beneath the access riser. Insert the universal tool lifting handle into the upper lip of the Bio-Kinetic system outer chamber bucket.

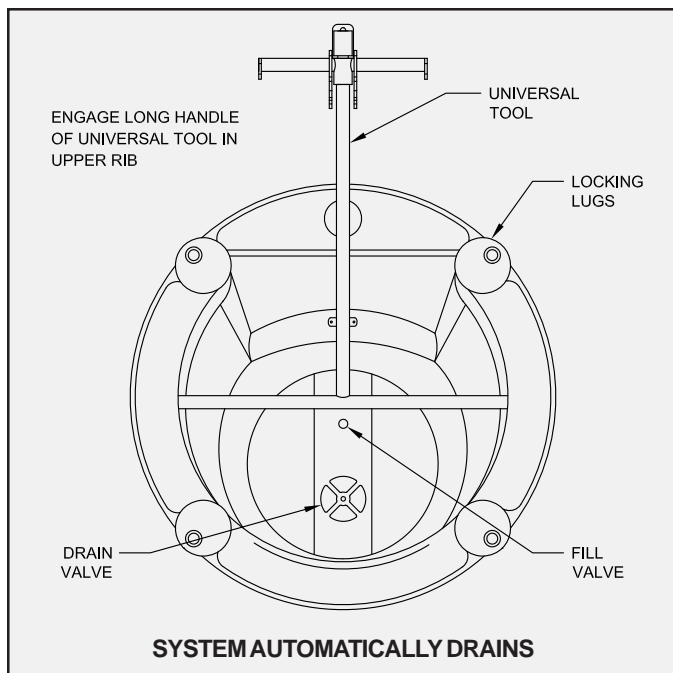


2. Lift off the concrete clarification chamber access cover(s) and turn it (them) upside down near the access riser. If the unit is equipped with Blue Crystal or Bio-Neutralizer feed tubes, carefully remove each tube, one tube at a time. Lay each feed tube down on the concrete access cover. Remove the Bio-Kinetic system service cover and check the condition of the

CLARIFICATION AND BIO-KINETIC® SERVICE (Page 2 of 6)

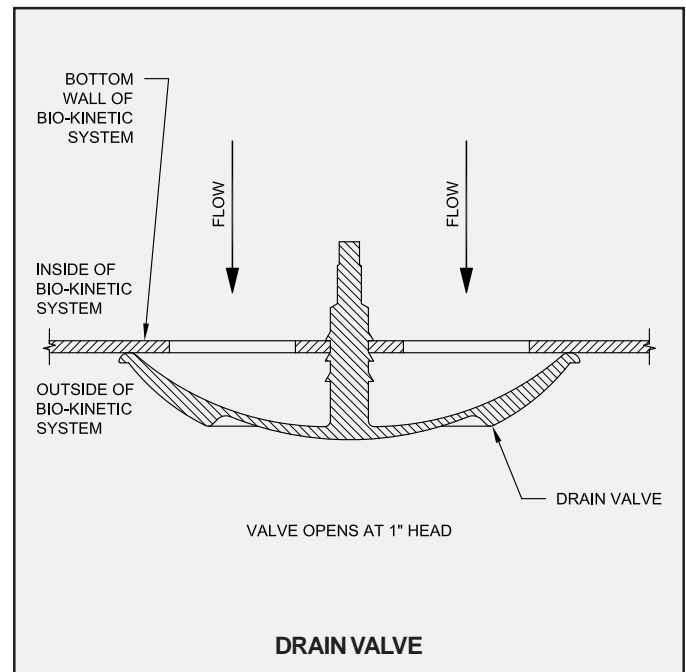


6. While standing over the riser, begin lifting the system from the tank. The self drain valve will automatically open as the system is lifted out of the riser. Continue lifting until the majority of the water has drained out of the system. Remove the Bio-Kinetic system from the mounting casting. Set the Bio-Kinetic system on the upside down lid of the service container
7. Record the color and condition of the Bio-Kinetic system on the Service Inspection Card and on the "Supplementary Service" section of the Owner's Manual. Make appropriate notations on the condition of the clarification chamber. Also note the liquid level on the filter media. The peak flow filter media should



be clean in appearance if the hydraulic loading has never been great enough to cause the liquid level in the clarification chamber to rise above the design flow filter media. If a temporary hydraulic surge has occurred, a dark line will be visible on the peak flow filter media. Note the system water level on the Service Inspection Card.

8. Unscrew the discharge flange assembly and remove both pieces. It may be necessary to hold the inside threaded flange to unscrew the two pieces. After both pieces of the discharge flange are removed, place the internal components back into the Bio-Kinetic system.



9. Place the Bio-Kinetic system into the service container. The outlet of the Bio-Kinetic system must align with the flat panel in the container. Thread the discharge flange assembly together and place it on the flow deck. Now put the service container cover in place.
10. Reinstall the Singulair aerator as outlined in the Aerator Installation instructions. The aerator must be in operation while the remaining clarification chamber service is performed.
11. Check the surface of the clarification chamber for grease or biologically untreatable material. A significant accumulation of these materials indicates

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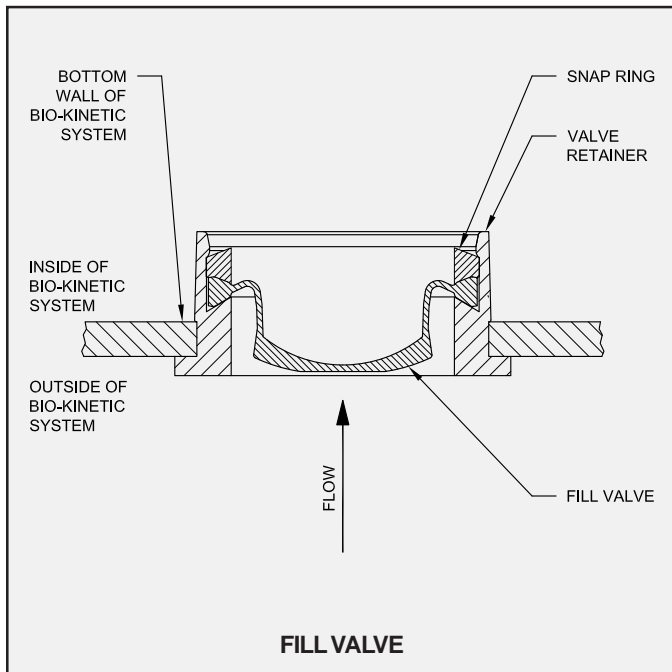
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WASTEWATER TREATMENT SYSTEM

CLARIFICATION AND BIO-KINETIC® SERVICE (Page 3 of 6)

the pretreatment chamber should be evaluated to determine if pumping is required. With the aerator running, use the hopper scraping tool to gently scrape all areas of the clarification chamber hopper side walls. Scrape all the way down to the bottom of the chamber, below the discharge of the Bio-Static sludge return. Then scrape the small flat area at the bottom of the hopper, pushing toward the aeration chamber as far as possible.



12. If the Singulair tank is pumped during system service the pressure sensitive fill valve will fill the Bio-Kinetic system automatically as the tank refills.

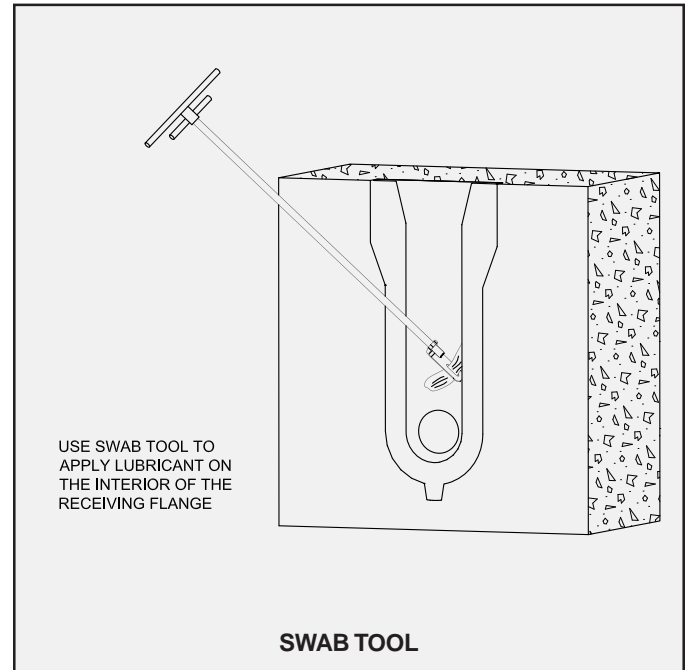
NOTE: It is important that the clarification chamber side walls be cleaned only after the aerator has been serviced and reinstalled. The aerator must be operating so that settled sludge will be fully returned to the aeration chamber by the hydraulic currents flowing through the Bio-Static sludge return.

13. Visually check each Bio-Static sludge return to insure that it is securely engaged in the aeration/clarification chamber wall.

14. If necessary, use water to wash away any sludge from the inside of the system mounting casting, grade riser, cover and surrounding grass or landscaping.

15. Note the liquid level in the clarification chamber. If the liquid level is above the flow line of the outlet coupling, consult the troubleshooting guide to determine if there

is a problem with drainage. Improper drainage will lead to flooding of the Singulair Bio-Kinetic wastewater treatment system and must be reported to the owner. Examine the inside of the access riser for evidence of surface water entry.

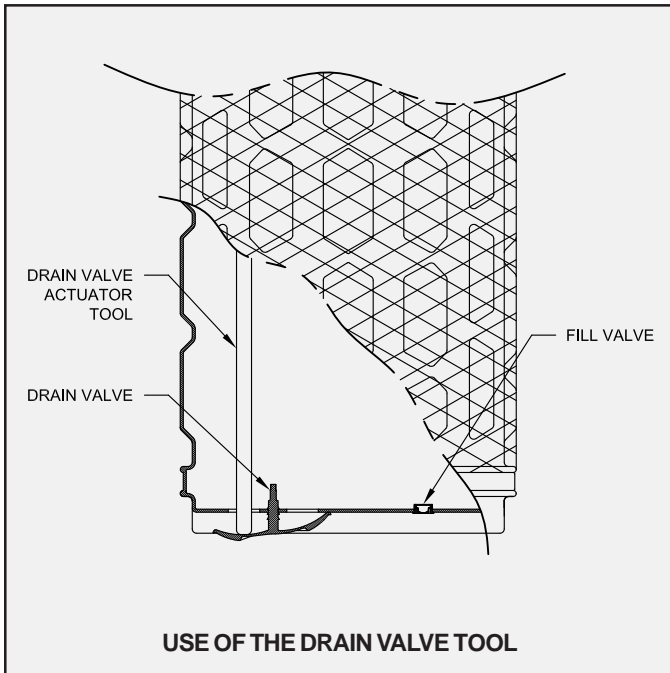


16. Examine the condition of the Singulair tank outlet coupling and cast-in receiving flange. Any debris that has accumulated in the grooves of the receiving flange or the inside of the tank outlet coupling must be removed. Wipe the face of the receiving flange and the internal surface of the grooves clean. Using the swab tool, apply a liberal amount of Bio-Kinetic lubricant to the entire face of the receiving flange and the inside of the grooves. Apply the lubricant evenly until all interior surfaces of the receiving flange and grooves are thoroughly coated.

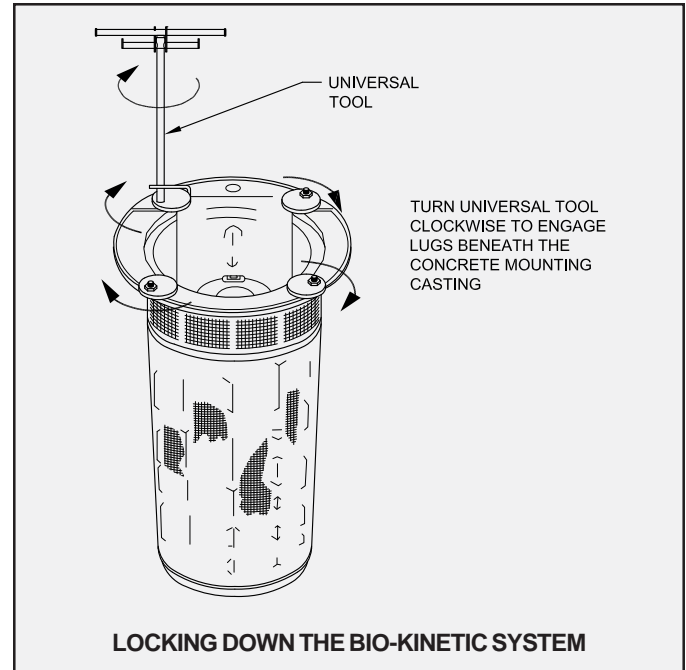
CAUTION: Bio-Kinetic lubricant has been specially formulated. Use of other lubricants, especially petroleum based lubricants, can cause degradation of the rubber components and will void the warranty.

17. Remove the discharge flange assembly and internal components from the exchange Bio-Kinetic system. Lubricate the grommet in the outlet opening. From the inside of the contact chamber, insert the male threaded flange through the grommet. Reinstall the gasketed discharge flange on the Bio-Kinetic system by turning it clockwise until tight. Reinstall the flow deck and internal components. Apply lubricant to the exterior surfaces of the gasketed discharge flange.

CLARIFICATION AND BIO-KINETIC® SERVICE (Page 4 of 6)



NOTE: Leveling of the flow distribution deck is essential for proper operation of the flow equalization ports, chemical feed tubes and effluent weir within the Bio-Kinetic system.



18. Remove the internal components from the replacement Bio-Kinetic system and set aside. Use the universal tool to lower the exchange Bio-Kinetic system outer chamber into the mounting casting. Carefully insert the tip of the drain valve actuating tool through the drain valve located in the bottom of the outer chamber of the Bio-Kinetic system. This will allow the Bio-Kinetic system to fill with water as it is lowered into position. If allowed to tilt, the Bio-Kinetic system could rub the edge of the access opening and damage the filter media. Align the discharge flange with the cast-in-place receiving flange. As the chamber is set into position on the concrete ledge of the access opening, the Bio-Kinetic system discharge flange must engage the top of the cast-in-place receiving flange before proceeding.
19. Once in the proper position, carefully remove both the drain valve actuating tool and the universal tool. This will allow the drain valve to seal against the exterior bottom of the Bio-Kinetic system. Use the locking lug tool to twist each of the round, black locking lugs clockwise so that each of the lugs is rotated to the furthest extension point possible.
20. Reinsert the internal components from the replacement Bio-Kinetic system. Locate the level indicator mounted above the outlet of the Bio-Kinetic system flow distribution deck. The bubble should be resting squarely between the two lines in the clear plastic case. If the location of the bubble indicates the system is not installed in a level position, the flow deck should be leveled using the four adjustment lugs provided for this purpose. With the ratchet drive, extension and $\frac{7}{16}$ " socket from the Tool Kaddy, turn each of the adjustment lugs until the bubble comes to rest squarely between the two lines in the clear plastic case.

21. Remove the Bio-Kinetic system outlet sealing tool from in between the system outlet flange and the cast-in-place receiving flange of the Singulair tank.
22. The system service cover with information tag from the originally installed Bio-Kinetic system must be reinstalled in the tank. Install the cover, handle side up, by aligning the four holes in the cover with the four locking lug bolts. Be sure the optional chlorination and dechlorination feed tube access openings are in the proper position. The cover will come to rest on the collar of the Bio-Kinetic system. There is no need to add fasteners to the locking lug bolts.
23. If the installation requires effluent disinfection, the chlorine feed tube opening in the service cover must be positioned on the inlet side of the system nearest the aerator mounting casting. The Bio-Kinetic system chlorine feed tube should be filled with Norweco Blue Crystal disinfecting tablets. Blue Crystal tablets have been specially formulated for use in the Bio-Kinetic system, other disinfecting chemicals will not provide the same results. Before handling Blue Crystal disinfecting tablets, carefully read the container

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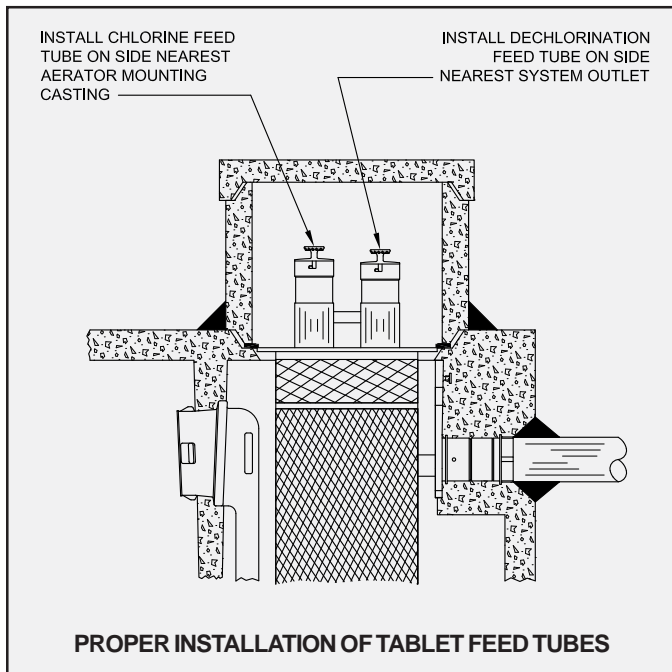
WASTEWATER TREATMENT SYSTEM

CLARIFICATION AND BIO-KINETIC® SERVICE (Page 5 of 6)

label and the "Warning" section of these instructions. To fill the chlorine feed tube, remove the cap, hold the tube open end down with one hand and insert Blue Crystal disinfecting tablets, one tablet at a time, until the tube is filled. The tube holds approximately a six-month supply and each tablet must lie flat in the stack. When the tube has been completely filled, replace the cap. Install the feed tube, slotted end down, through the plastic collar molded into the top of the Bio-Kinetic system service cover. The feed tube will begin to engage the round recess in the flow distribution deck. Rotate the tube clockwise until it locks into position.

either safety goggles or a face shield when handling Blue Crystal disinfecting tablets or working with the chlorine feed tube. Keep tablets out of the reach of children, as they can cause skin and eye damage, be irritating to the nose and throat, and may be fatal if swallowed. Avoid breathing dust and do not allow contact with eyes, skin or clothing. Contaminated clothing should be removed and washed before reuse. If tablets or residue contact skin, wash with plenty of soap and water for fifteen minutes. If irritation continues, call a physician. If swallowed, immediately drink large quantities of water, do not induce vomiting, avoid alcohol and get medical attention immediately. If inhaled, immediately remove victim to fresh air. In case of fire, apply liberal quantities of water. It is a violation of Federal Law to use Blue Crystal disinfecting tablets in a manner inconsistent with the instructions printed on the storage container label.

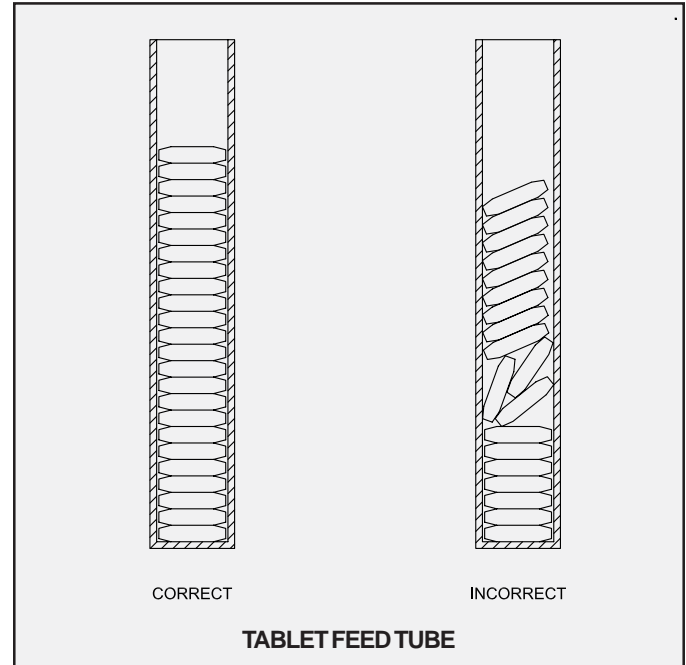
24. If the installation requires effluent dechlorination, the Bio-Kinetic system will be supplied with a dechlorination feed tube. To fill the dechlorination feed tube, remove the cap, hold the tube open end down with



NOTE: The chlorine feed tube must always be installed through the mounting collar nearest the aerator mounting casting. If the installation requires disinfection and dechlorination, there will be two feed tube mounting collars molded into the protective cover. The dechlorination feed tube must be installed nearest the system outlet.

WARNING

Blue Crystal disinfecting tablets are a strong oxidizing agent and highly corrosive. Tablets should be stored in a cool, dry, well-ventilated area away from combustible materials such as paper, petroleum products, chemicals, rags or cardboard. Tablets should be mixed only with water. Contact with other liquids or chemicals may cause fire. Wear rubber gloves and



one hand and insert the Bio-Neutralizer dechlorination tablets, one tablet at a time, until the tube is filled. The tube holds approximately a six-month supply of tablets and each tablet must lie flat in the stack. Replace the cap and insert the dechlorination feed tube, slotted end down, into the mounting collar closest to the system outlet. The bottom of the tube must come to rest evenly on the floor of the flow distribution deck.

CLARIFICATION AND BIO-KINETIC® SERVICE (Page 6 of 6)

WARNING

Bio-Neutralizer dechlorination tablets must be stored in a cool, dry place away from acids and oxidizers. Do not allow Bio-Neutralizer tablets to come into contact with chlorine tablets. Although not rated a hazardous material by the USEPA, exercise caution when handling and wash skin thoroughly with soap and water if contact occurs.

25. Reinstall the clarification chamber access cover. If the installation requires effluent disinfection and/or dechlorination, note the quantity of tablets installed on the Service Inspection Card in order to properly invoice the customer for the appropriate chemical tablets. Clean and store all tools and supplies.
26. When the service is complete, return the selector switch in the control center to the proper time cycle position. Close the cover of the control center enclosure and secure it with a new tamper evident seal.

EFFLUENT DISPOSAL SYSTEM CHECK

1. Determine if the effluent from the Singulair system is being carried to an outlet for surface and/or subsurface discharge, or if it is being disposed of onlot. Inspect the condition of the effluent disposal system and make appropriate notations on the Service Inspection Card.
2. Although the Singulair system effluent may be discharged and/or disposed of in several acceptable fashions, there should always be a ground water relief point installed in the effluent line. It should be located at a point no higher than the outlet invert of the Singulair tank. It will prevent flooding in cases where the disposal line is submerged or saturated with ground water. Locate the ground water relief point and be sure that it is free of obstructions.
3. Locate the point of discharge closest to the Singulair system outlet. A free-falling "grab" sample of effluent can be collected after the point of discharge has been thoroughly cleaned. Take note of effluent color, odor and the presence or absence of suspended particles. Accumulation of mud in the effluent disposal line or at its outlet can be a sign of a crushed or broken effluent line and should be reported to the owner. Foaming, odor or particulate sediment indicates that the Singulair system has not been providing adequate treatment. Recheck the entire system by using the Singulair Troubleshooting guide.

NOTE: An effluent "grab" sample allows a visual assessment and should only be used in conjunction with routine service and/or troubleshooting procedures to accurately evaluate system operation. A "composite"

sample, collected over 24 hours of system operation, preserved and transported using USEPA established procedures, is necessary if laboratory analysis of the effluent is to be performed. Laboratory analysis of an effluent "grab" sample can lead to misleading conclusions about system operation and should not be conducted. For further information regarding proper evaluation techniques for sampling onsite systems, refer to the Norweco Technical Bulletin EFFLUENT SAMPLING TECHNIQUES FOR RESIDENTIAL TREATMENT SYSTEMS.

4. Make appropriate notations on the condition of the plant effluent and disposal system on the Service Inspection Card.

BEFORE YOU LEAVE THE FACILITY...

1. Make sure that both sides of all three Service Inspection Cards are properly and completely filled out, including any specific notes or special services that your inspection indicates are needed.
2. Leave the top section of the Service Inspection Card with the owner and provide a brief verbal explanation of the condition of the system. Advise when to expect your next routine visit and provide your business card with office phone number, should the owner have any questions.
3. Point out the advantages of a continued service policy with your company if the warranty or current service policy is nearing expiration.
4. Explain that the Singulair aerator is set to operate on a time cycle and should not be turned off even during extended periods of non-use. Explain also that the Singulair control center contains no user-serviceable parts and that the cover is secured with a tamper evident seal both for owner protection and protection of component parts.
5. Review the operation of the red warning light and audible alarm on the Service Pro control center with the owner. Inform the owner that the control center should be checked daily to insure proper system operation. Explain that if the light glows and the alarm sounds, it could be due to temporary high water or electrical power fluctuation and that the reset button should be pushed to see if normal operation is resumed before requesting special service.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

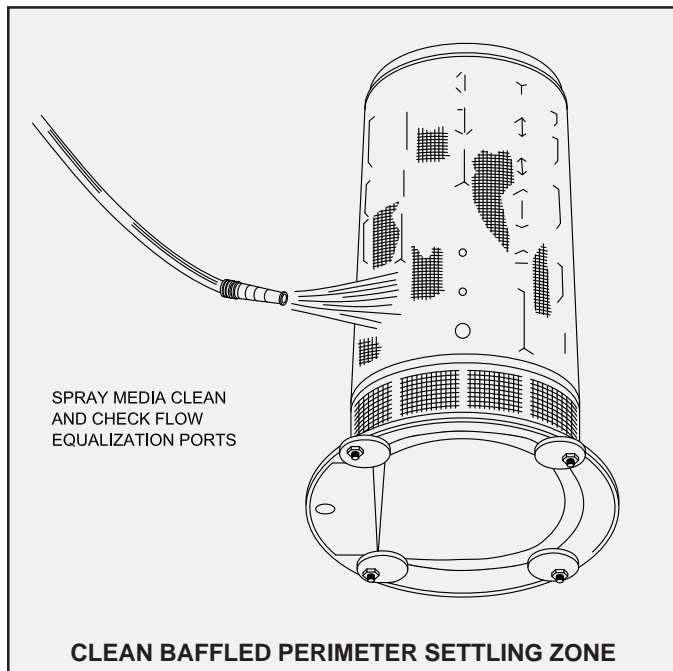
CLEANING AND DISASSEMBLY INSTRUCTIONS FOR THE BIO-KINETIC® SYSTEM

EQUIPMENT REQUIRED FROM THE BIO-KINETIC SYSTEM TOOL KADDY

- ☐ water hose and spray nozzle
- ☐ Bio-Kinetic system universal tool
- ☐ rubber gloves
- ☐ safety face shield or goggles
- ☐ ratchet drive and $\frac{7}{16}$ " socket

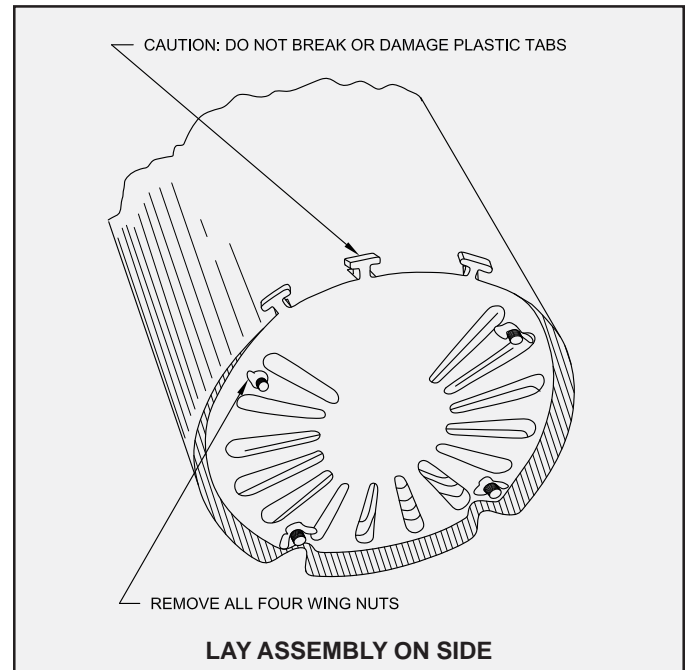
A fresh water supply and sewer drain are required for cleaning the Bio-Kinetic system.

1. Remove the Bio-Kinetic system from the service container. Rinse the container and lid. Rotate the four locking lugs to the outboard position on the Bio-Kinetic system. Remove the gasketed discharge flange assembly from the flow deck and rinse it with water.
2. Grasp the top flange of the system with one hand and insert the disassembly tool beneath each of the strap handles on the flow deck. Pull up on the disassembly tool to remove the flow deck and internal system components from the contact chamber and set aside. Use the water hose and spray nozzle to wash the inside of the contact chamber.
3. Use the water hose and spray nozzle to wash off the



filter media. Continue spraying until all sludge and wastewater have been flushed from the media. Invert the filter assembly and flush accumulated material from the baffled perimeter settling zone. Inspect the perimeter settling zone to be certain that it is totally clean. Check the flow equalization ports to be sure they are clean and unobstructed.

4. Wash off any debris that has accumulated on the surface of the flow distribution deck and baffle wall shroud. Lay the assembly down on its side and



remove the four wing nuts on the bottom. Remove and wash the bottom deck plate.

CAUTION: Do not break or damage the molded plastic tabs on the edge of the bottom deck plate.

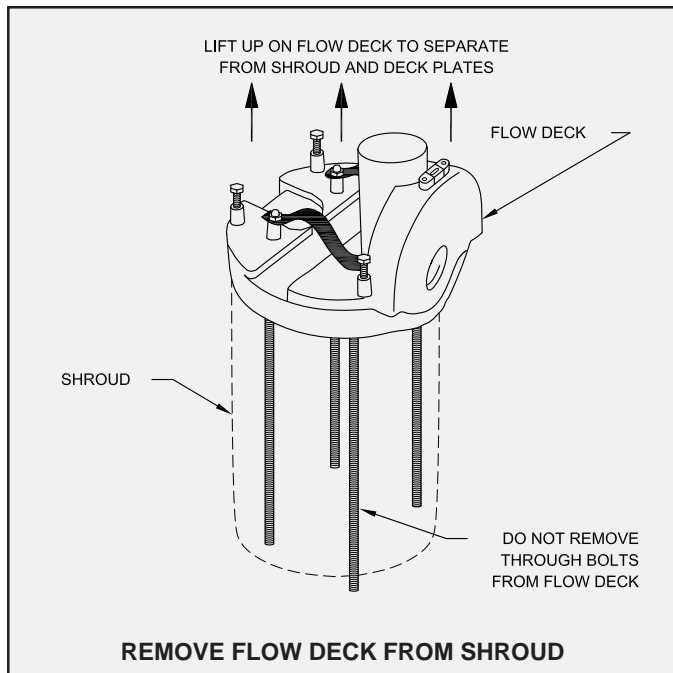
Do not remove the remaining deck plates at this time. Stand the assembly upright and lift up on the flow distribution deck to separate it from the baffle wall shroud and deck plates. You may find it helpful to hold the baffle shroud between your feet when lifting up on the flow deck.

NOTE: The through bolts will be removed from the shroud and deck plates when the flow deck is lifted off the baffle

BIO-KINETIC® SYSTEM CLEANING AND DISASSEMBLY INSTRUCTIONS (Cont.)

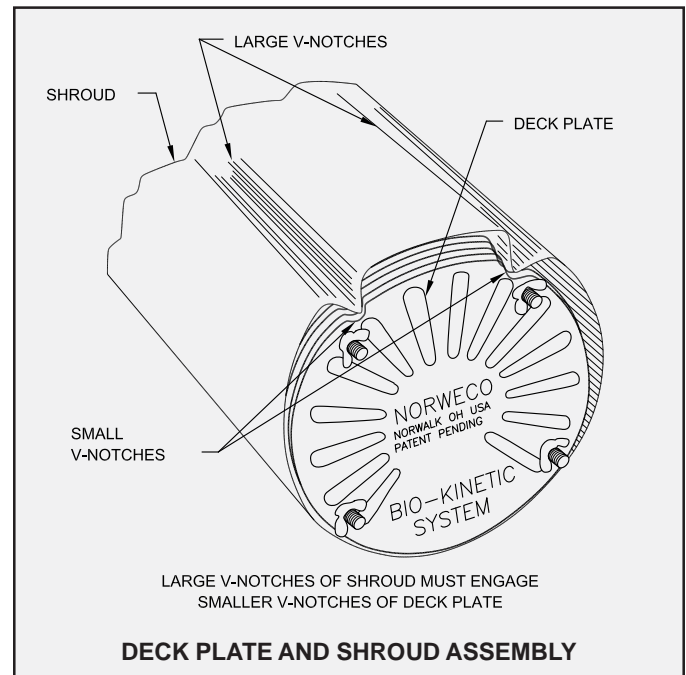
wall shroud. Do not remove the through bolts from the flow distribution deck. Rinse the flow distribution deck thoroughly inside and out. Inspect the weir and final discharge zone to be sure they are completely clean.

5. Lift up the baffle wall shroud to remove it from the deck plates. Rinse the inside and outside of the shroud and set it aside. Take the cleaned, round bottom deck plate and set it on the floor with the engraved name facing down.
6. Remove the top deck plate from the remaining stack and wash off both sides. When cleaned, set it on top of the cleaned, round bottom deck plate. Repeat this procedure with each deck plate until all plates are cleaned and reassembled into a single stack. Each deck plate is molded with four circular depressions in the bottom side of the plate and four round stand-off posts in the top side of the plate. When restacking the clean deck plates, make sure the four depressions on the bottom engage the top of the four posts below. All



deck plates must be placed onto the stack baffle side up (engraving down). When properly assembled, all edges of each plate should be vertically aligned.

7. Lower the baffle wall shroud over the assembled stack of deck plates. The two large V-notches in the shroud should engage the smaller notches on the edge of the deck plates. Check the four leveling lugs on the flow deck. They must be unscrewed until they are flush with the bottom of the flow deck. Now position the flow distribution deck above the baffle wall shroud so that the outlet of the flow distribution deck is directly opposite the two large V-notches in the shroud. Insert each of the four through bolts through the holes in the top of the baffle shroud and into the stack of deck plates. Lower the flow distribution deck until it fully engages



the top of the baffle shroud. Push each through bolt down into the assembly as far as it will go.

8. Lay the assembly on its side and push the through bolts through the bottom deck plate. Fasten a wing nut to each of the four through bolts where they project through the bottom deck plate. While tightening each wing nut, make sure the molded plastic tabs on the bottom deck plate engage the slots on the edge of the shroud. Tighten enough to insure all three tabs are fully engaged into the three slots in the shroud.
9. Lubricate the grommet in the outlet opening of the contact chamber. Grasp the strap handles and lower the flow deck and internal components into the cleaned contact chamber making sure to align the flow deck outlet with the outlet of the contact chamber. Apply a moderate amount of downward force until the outlet of the flow distribution deck aligns with the outlet of the contact chamber.
10. Place the assembled Bio-Kinetic system back into the cleaned service container. Place the discharge flange assembly onto the flow distribution deck. Now place the service container cover into position by aligning the four holes in the cover with the locking lug bolts. Add a wing nut to each of the lug bolts to hold the cover in place. Return the container to your service stock.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

FILTER MEDIA REPLACEMENT KIT INSTRUCTIONS

The filter media replacement kit is provided so that repair of a Bio-Kinetic system with worn or damaged media may be easily accomplished, if required, during the routine service cycle. Media replacement should be done only when necessary and only by a factory-trained technician as part of maintaining a stock of exchange Bio-Kinetic systems. Media replacement should be performed at your place of business rather than at the installation site. Replacement of properly functioning media will not improve operational performance and is not recommended.

The filter media replacement kit contains the following items to be used during replacement:

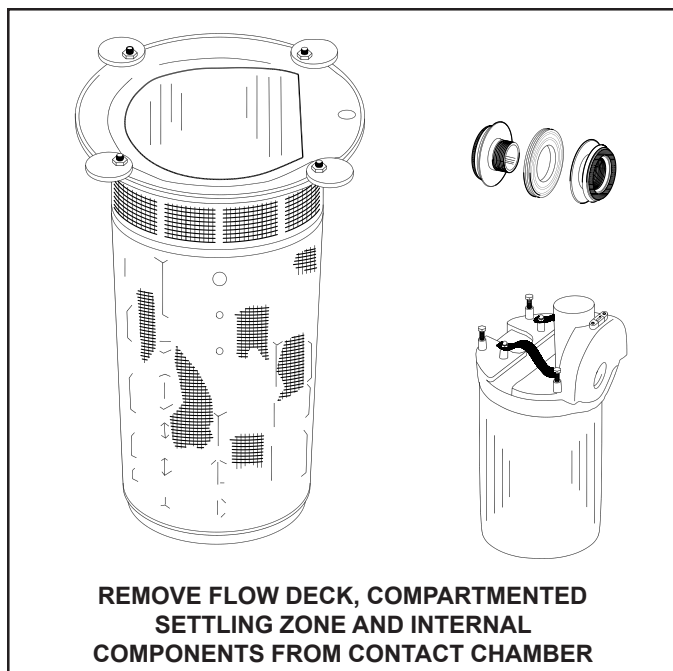
- ☐ One cylindrical filter media section, made up of design and peak flow media, lock-stitched together with bonded nylon thread for maximum strength and durability.
- ☐ Two retainer straps, one inserted into each stitched hem located at both ends of the filter media cylinder.
- ☐ One separate retainer strap to place around the outside of the center stitched seam connecting the peak flow and design flow media.

The following equipment is required from the Bio-Kinetic system Tool Kaddy:

- ☐ rubber gloves
- ☐ safety face shield or goggles
- ☐ retainer strap tool

No adhesive is necessary to attach the media to the Bio-Kinetic system when utilizing the replacement kit. Media replacement, when performed as outlined in these instructions, will bring the unit up to new system standards. For instructions regarding removal and reinstallation of the Bio-Kinetic system from the Singulair tank, refer to the instructions contained in the Clarification Chamber and Bio-Kinetic Service section of the Singulair Service Manual.

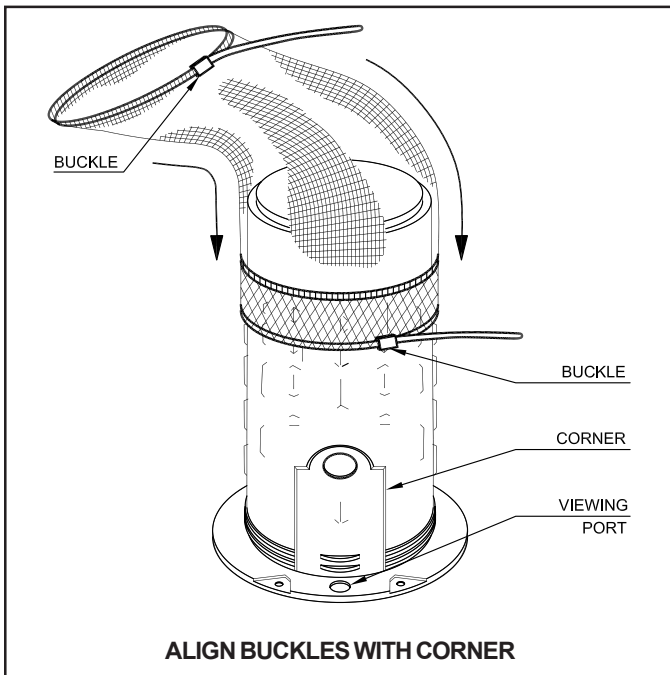
1. Remove the Bio-Kinetic system from the service container. Rinse the container and lid. Rotate the four locking lugs to the outboard position on the Bio-Kinetic system. Remove the gasketed discharge flange assembly from the flow deck and rinse it with water.



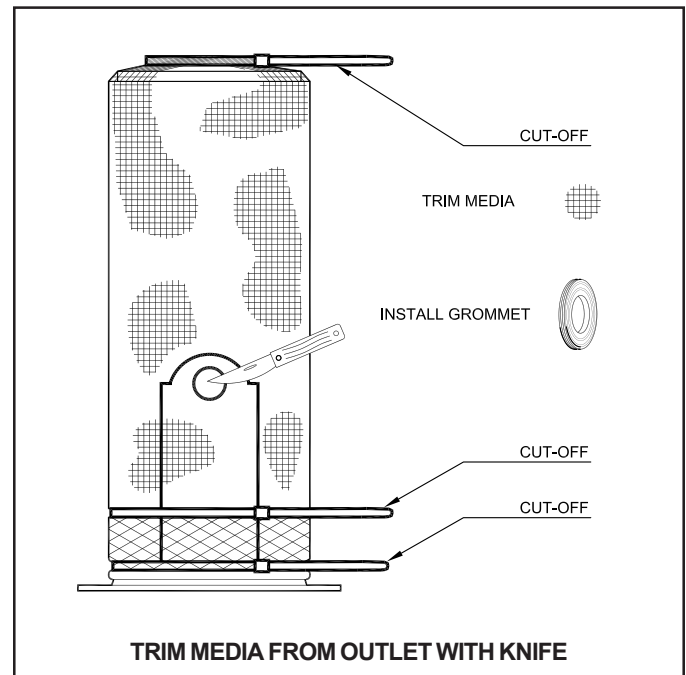
2. Insert the disassembly tool beneath each of the strap handles on the flow deck. Pull up on the disassembly tool to remove the flow deck and internal system components from the contact chamber and set the internal components aside. Use the water hose and spray nozzle to wash the inside of the contact chamber.
3. Use the water hose to wash off the filter media. Spray until all sludge and dirt have been flushed from the media. Now invert the filter assembly and flush accumulated material from the baffled perimeter settling zone. Inspect the perimeter settling zone to be certain that it is totally clean. Check the flow equalization ports to be sure they are clean and unobstructed.
4. Remove the black rubber outlet grommet from the outlet opening. With a knife, cut and remove the three retainer straps and the old filter media from the Bio-Kinetic system. Take care not to damage the contact chamber or baffled perimeter settling zone. Clean any accumulation of adhesive from the horizontal grooves at the top, middle and bottom of the contact chamber. With a wet rag, clean the outside of the contact chamber to insure ease of installation of the new filter media and straps. Inspect the design flow, sustained flow and peak flow ports again to be sure they are clean and unobstructed. Be sure there are no burrs on the inside, as well as, the outside surface of each port.

FILTER MEDIA REPLACEMENT KIT INSTRUCTIONS (Cont.)

5. Remove the locking lugs, bolts, nuts and washers from the top flange of the Bio-Kinetic system. Turn the contact chamber over with the top flange resting on a clean even surface.
6. Starting with the peak flow filter end, slide the replacement filter media cylinder onto the contact chamber. The filter media cylinder will fit tightly against the baffles of the perimeter settling zone. Some effort will be required to slide the media over the contact chamber. Rubber gloves will provide the friction necessary for proper media installation. Be careful not to damage the filter media or retainer straps.
7. The stitched hem at each end of the filter media cylinder has a retainer strap with plastic buckle. Install the filter media so that the retainer strap buckle is seated on the corner of the outlet boss of the contact chamber. This position is on the corner closest to one of the locking lugs on either side of the viewing port.



8. Engage the peak flow retainer strap into the horizontal groove closest to the top flange of the contact chamber. Once in position, tighten the strap with the retainer strap tool. The strap should be tightened enough to permanently locate the filter media in position. Make sure the buckle remains on the corner of the outlet boss. Do not over-tighten the strap. Over-tightening could warp the contact chamber. Once the strap is secured, cut off the excess strapping material with the retainer strap tool.
9. Attach the retainer strap tool to the strap at the bottom of the design flow media. Tighten the strap until all wrinkles have been removed from the filter and the media cylinder is taut and firmly drawn against the baffles of the contact chamber. Do not over-tighten the media. Cut off the excess strapping material with the strap tool.



10. Place the third, separate retainer strap over the seam that joins the design flow and peak flow media. Make sure this strap is properly engaged in the locating grooves molded into the baffles of the contact chamber. Place the buckle on the edge of the outlet boss in alignment with the other two. Using the retainer strap tool, tighten the strap over the seam and secure the buckle on the outlet boss corner. Once the strap has been firmly tightened, cut off the excess strapping material with the strap tool.
11. With a knife, trim the media from the outlet of the Bio-Kinetic system using the outlet opening as a guide. The hole in the filter media should not be larger than the outlet opening. Remove the trimmed media and reinstall the black rubber grommet. **NOTE:** When reinstalling the grommet, make sure the media surrounding the outlet opening stays between the contact chamber and the outboard flange of the grommet. Correct reinstallation of the grommet is important for proper Bio-Kinetic system operation.
12. Reinstall all four locking lugs with the bolts, nuts and washers originally supplied.

Proceed with the remaining steps outlined in Bio-Kinetic System Cleaning and Disassembly Instructions. If no service is required, reassemble the Bio-Kinetic system according to Bio-Kinetic Cleaning and Disassembly Instructions and return the system to your service stock.

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CONVERSION KIT AND ADAPTER PLATE INSTRUCTIONS

The discharge flange conversion kit and adapter plate are used to upgrade the outlet connection of the Bio-Kinetic system. When properly installed, the conversion kit replaces the flexible discharge flange with a precision-molded set of rigid discharge flanges manufactured with closed cell foam gaskets. The flanges thread together to form an assembly that eliminates the flexible discharge flange and stainless steel locking clip. A Bio-Kinetic system with a rigid discharge flange assembly can be used in a tank having either a rigid receiving flange or a flexible receiving flange with adapter plate. The adapter plate must be installed to use a rigid discharge flange with a flexible receiving flange.

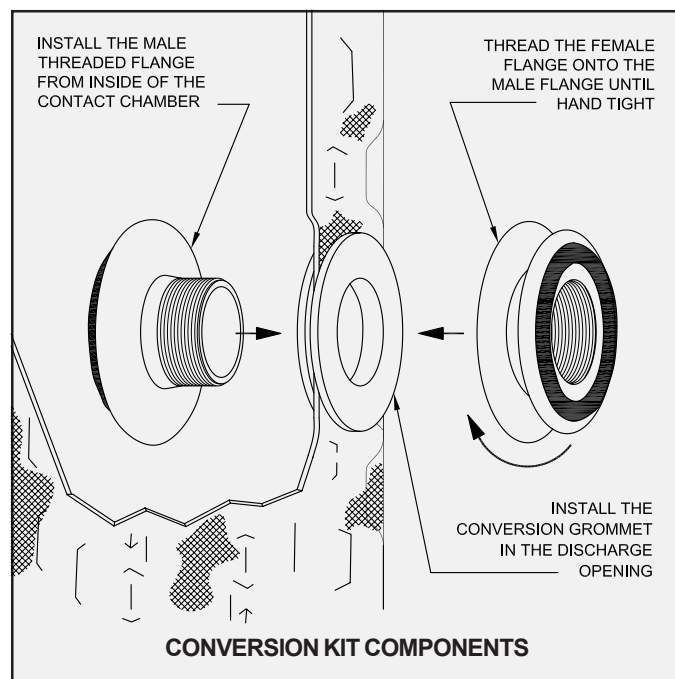
PREPARING FOR CONVERSION

Prior to the conversion of the flexible discharge flange, the Bio-Kinetic system should be cleaned following the steps outlined in Cleaning and Disassembly Instructions for the Bio-Kinetic system. Do not place the assembled Bio-Kinetic system into the service container after it has been cleaned.

Installation of the discharge flange conversion kit can be accomplished in a few minutes and requires only a flat blade screwdriver. To begin the conversion, the flexible discharge flange components must be removed from the Bio-Kinetic system. Using the flat blade screwdriver, remove the stainless steel locking clip from the discharge flange. Remove the flexible discharge flange from the Bio-Kinetic system. The flow deck and internal components should now be removed from the contact chamber and set aside. Remove the rubber grommets from the opening in the flow deck and the opening in the contact chamber. The stainless steel locking clip, flexible discharge flange and both rubber grommets are no longer required and may be returned to service stock for future use.

INSTALLING THE RIGID DISCHARGE FLANGE

The rigid discharge flange may now be installed on the Bio-Kinetic system. Install the conversion grommet into the discharge opening in the contact chamber. The design flow filter media around the discharge opening must be behind the flange of the grommet. Apply a light coating of Bio-Kinetic lubricant to the threads of the male discharge flange and the flat surface that contacts the conversion grommet. From the inside of the contact chamber, insert the flange with the male threads through the conversion grommet. The male threads should extend through the discharge opening in the contact chamber. Apply a light coating of Bio-Kinetic lubricant to the flat surface of the female discharge flange that contacts the conversion grommet. Align the female flange with the threads on the male flange. Turn the female flange clockwise to begin threading the components together. Continue turning the female flange onto the male flange until it is hand tight. Do not overtighten the flanges.



LUBRICATING THE GASKETS

The rigid discharge flanges are equipped with foam gaskets that must be lubricated before installing the internal components and prior to installing the Bio-Kinetic system into the Singulair tank. Thoroughly coat the surfaces of both gaskets with Bio-Kinetic lubricant.

CAUTION: Bio-Kinetic lubricant has been specially formulated. Use of other lubricants, especially petroleum based lubricants, can cause degradation of the rubber components and will void the warranty.

REASSEMBLING THE BIO-KINETIC SYSTEM

The internal components may now be reinstalled into the contact chamber. Align the flow deck outlet with the outlet of the contact chamber and lower the internal components into position. Apply a moderate downward force until the internal components are seated in the contact chamber.

CONVERSION KIT AND ADAPTER PLATE INSTRUCTIONS (Cont.)

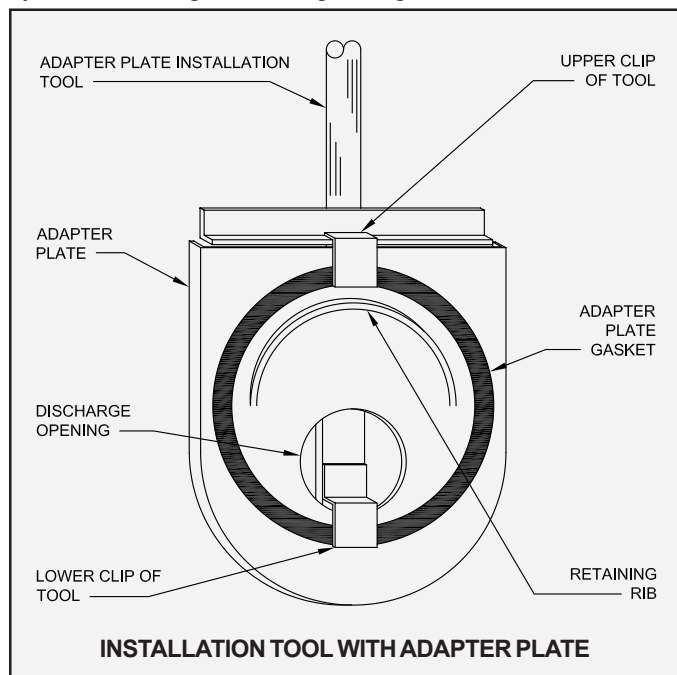
USE OF THE ADAPTER PLATE

While the discharge flange conversion kit allows a Bio-Kinetic system equipped with a flexible discharge flange to be upgraded to a rigid discharge flange, the receiving flange adapter plate allows a flexible receiving flange to be upgraded for use with a rigid discharge flange. In this way, whether your service stock contains Bio-Kinetic systems with flexible or rigid discharge flanges, you can be ready to install them in any tank, regardless of the receiving flange configuration.

An upgrade to a flexible receiving flange by the installation of an adapter plate can readily be accomplished by a technician at the time of Bio-Kinetic service. There is no need to enter the Singular tank or to remove any portion of the cast-in-place flexible receiving flange. The only equipment required is an adapter plate, the adapter plate installation tool, the swab tool, cloth and Bio-Kinetic lubricant from your Service Pro Tool Kaddy.

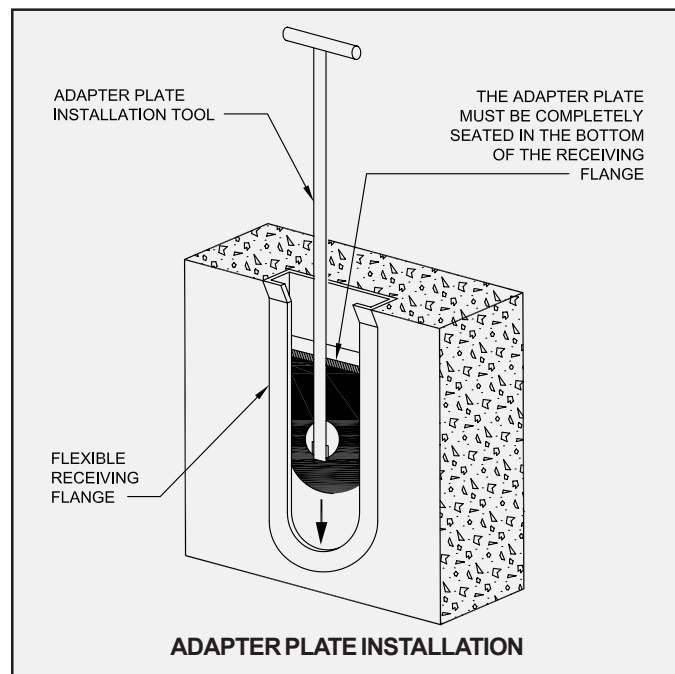
INSTALLING THE ADAPTER PLATE

When required, a flexible receiving flange can be modified in place, with the addition of a permanent adapter plate. This modification will permit the installation of a Bio-Kinetic system with a rigid discharge flange.



Prior to installing the adapter plate, be sure to clean the interior portion of the flexible receiving flange. Any concrete residue or debris that has accumulated in the grooves of the receiving flange must be removed. Using the swab tool and a cloth from the Tool Kaddy, clean the interior face of the receiving flange and the inside of the grooves. Once the receiving flange is clean, remove and discard the swab cloth. Install a new cloth in the swab tool and apply a liberal amount of Bio-Kinetic lubricant to the cloth. Coat the interior face of the flexible receiving flange and the inside of the grooves with lubricant.

Apply Bio-Kinetic lubricant to the adapter plate gasket. Engage the upper clip of the adapter plate installation tool over the top edge of the adapter plate. Insert the lower clip of the installation tool through the discharge opening of the adapter plate. Slide the adapter plate onto the installation tool until both clips compress the gasket.



Use the tool to lower the adapter plate into the top of the flexible receiving flange cast into the Singular tank, with the gasketed side of the plate facing the tank outlet. Be sure that both edges of the adapter plate engage the grooves on each side of the receiving flange. Lower the adapter plate fully into position. The retaining rib molded into the gasketed side of the adapter plate will lock into position when the adapter plate is fully engaged. Lift gently on the installation tool until both the upper and lower clips are clear of the adapter plate and remove the tool from the tank. Once the adapter plate is installed in the receiving flange of the Singular tank, there is no need to remove it. The adapter plate will remain permanently in place for the life of the system.

No other modifications to the Singular tank or Bio-Kinetic system are necessary to install a rigid discharge flange into the flexible receiving flange. The Bio-Kinetic system can now be installed following the procedure outlined in steps 17-24 of Singular Clarification Chamber and Bio-Kinetic Service. Make a note on the Service and Warranty Record Card indicating that the installation has been upgraded with the discharge flange conversion kit and adapter plate.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

TROUBLESHOOTING

During service inspections you may periodically encounter a situation which, if not identified and corrected, will result in interruption of service for the Singulair system. This troubleshooting guide is designed to enable you to isolate the cause of system problems that may be encountered from time to time. Whenever a potential problem is encountered, you should take immediate steps to eliminate the cause. Please note that all areas of installation, including those normally the responsibility of the contractor, excavator, electrician and owner, are covered. You will find that many problems can be traced to causes other than the system or its components. Your help and suggestions in solving these for the owner will save unnecessary expense and will insure maximum system performance.

PLEASE NOTE:

This troubleshooting guide provides efficient and correct solutions to most wastewater treatment problems when used in conjunction with established inspection procedures performed by a factory-trained service technician.

Before responding to a customer service call, check to see that:

- ✓ A member of your service staff, factory-trained and certified by Norweco, is dispatched to answer the call.
- ✓ Installation and service records for the particular system are up-to-date and have been reviewed.
- ✓ The service technician has a copy of the Singulair Service Manual.
- ✓ The service vehicle has loaner aerators, exchange aerators, Bio-Kinetic Service Cart, exchange Bio-Kinetic systems and a fully stocked Tool Kaddy with replacement parts.
- ✓ Clear and concise directions to the installation, including tank and control center location, are given to the service technician.

OPERATIONAL TROUBLESHOOTING

MUD OR SILT IN SINGULAIR SYSTEM OR BIO-KINETIC SYSTEM*

Influent sewer line separated at a joint or fitting	Have contractor excavate and repair
Sewer line crushed	Have contractor excavate and replace
Defective seal around tank inlet or outlet	Excavate and reseal
Singulair tank structurally damaged	Excavate and patch or replace tank
Singulair casting joint improperly sealed	Excavate and seal with non-shrink grout

*Have Singulair system pumped to remove mud after repairs have been completed. Multiple pumping may be required to remove all mud from the Singulair system. See: Singulair Tank Pumping instructions.

TROUBLESHOOTING (Cont.)

SEPTIC ODOR IN SINGULAIR SYSTEM

Aerator turned off	Place control center selector switch in "automatic" position
Insufficient air delivery by aerator	Service aerator
Aspirator shaft plugged with deposits	Remove from aerator and flush with shaft cleaning hose
Aspirator orifices plugged with deposits	Remove deposits
Water softener backwash discharging into system	Have owner remove backwash line from system
Circuit breaker tripped	See "Control Center Warning Light Glows/Audible Alarm Sounding"
Improperly sealed pretreatment chamber access cover	Seal pretreatment access cover
Vent cap openings restrict fresh air entry	Clean vent cap openings
Incomplete treatment due to hydraulic overloading	See "Hydraulic Overloading"
Periodic septic odor for no reason	Have sanitary sewer vent checked

HYDRAULIC OVERLOADING OF SINGULAIR SYSTEM

Ground water entering system through tank joint	Excavate and seal with non-shrink grout
Ground water entering system through crack in side wall	Excavate and patch with non-shrink grout
Ground water entering system through defective seal at inlet or outlet line	Excavate and reseal piping as needed
Roofing down spouts, footer drains, sump pump piping or garage and basement floor drains tied into Singulair system influent line	Have contractor relocate improper connection downstream of Singulair system

ORGANIC OVERLOADING OF SINGULAIR SYSTEM

Aeration chamber settled solids test reads in excess of 75%	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions
Aeration chamber solids appear black	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions

FLOATING SOLIDS IN CLARIFICATION CHAMBER OR PLANT EFFLUENT

Excessive sludge on clarifier sidewalls	Scrape hopper side walls
Restriction of Bio-Static or sludge return port	Remove obstruction
Pretreatment chamber discharging excessive solids	Evaluate pretreatment chamber - See Singulair Tank Pumping instructions
Hydraulic overloading of system	See "Hydraulic Overloading"

CONTROL CENTER WARNING LIGHT GLOWS/AUDIBLE ALARM SOUNDING

Liquid in tank at level of foam restrictor	See "Singulair System Flooded"
Aerator drawing excessive current	See "Aerator Drawing Excessive Current"
Dead short in power line to aerator	Have owner call his electrician

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM AERATOR TROUBLESHOOTING

AERATOR WILL NOT OPERATE

Electrical service to aerator interrupted	See "No Electrical Power from Control Center to Aerator"
Voltage supplied is insufficient to start aerator*	Report condition to power company
Defective bearing, windings or insulation in motor	Return entire aerator to factory
Debris wound on aspirator shaft	Remove debris with knife
Aspirator shaft bent	Return entire aerator to factory
Foam restrictor or entire aerator under water	See "Singulair System Flooded"

*If you suspect low voltage, check the voltage at the watertight electrical connector, not at the Service Pro control center. If voltage above 103 or more is measured, check the other possibilities listed in this section.

AERATOR DRAWING EXCESSIVE CURRENT

Foam restrictor partially under water	See "Singulair System Flooded"
Debris on aspirator shaft	Remove debris with knife
Motor failure	Return aerator to factory
Insufficient voltage (less than 103 volts)	Report condition to power company
Excessive voltage (greater than 126 volts)	Report condition to power company

AERATOR MAKING EXCESSIVE NOISE

Rubber shock absorbers on brackets worn	Replace shock absorbers
Bearing failure in aerator motor	Return aerator to factory
Noise is generated by excessive vibration	See "Aerator Operates With Excessive Vibration"

AERATOR OPERATES WITH EXCESSIVE VIBRATION

Debris on aspirator shaft	Remove debris with knife
Aspirator shaft bent	Return entire aerator to factory
Aerator mounting brackets bent	Straighten brackets
Top aerator brackets not seated evenly	Adjust mounting brackets
Aspirator shaft installed too tightly on intermediate shaft	Reinstall aspirator shaft with set screws finger tight only. If condition persists return entire aerator to factory.
Aspirator shaft installed with improper alignment to intermediate shaft	Reinstall aspirator shaft to factory alignment marks

AERATOR OPERATES BRIEFLY BEFORE CIRCUIT BREAKER TRIPS

Aerator is drawing excessive current	See "Aerator Drawing Excessive Current"
Aerator is partially under water	See "Singulair System Flooded"
Aspirator shaft bent	Return entire aerator to factory
Moisture has entered aerator motor	Return entire aerator to factory

AERATOR TROUBLESHOOTING (Cont.)

ELECTRICAL TROUBLESHOOTING

CAUTION: Before initiating any electrical component inspection or repair, turn off all power to the Singlair system by switching off the dedicated circuit breaker in the main electrical service panel and then testing with the electrical multi-meter. Repairs should always be made by a qualified electrician using proper procedures and safe tools. Make sure all circuits are properly grounded. Do not stand in damp locations when making electrical system tests. Always use tools with insulated handles for electrical repairs.

NO ELECTRICAL POWER FROM ELECTRICAL SERVICE PANEL TO CONTROL CENTER

Circuit breaker in electrical service panel has tripped	Turn breaker to "off" position, then turn "on"
Fuse in electrical service panel has blown	Have owner replace fuse
Circuit breaker in electrical service panel turned "off"	Turn breaker "on"
Loose connection in electrical service panel	Tighten all connections: First, shut off breaker in main electrical service panel
Defective circuit breaker in electrical service panel	Have owner replace circuit breaker
Corrosion on contacts prevents flow of current	Clean or replace contacts
Incomplete circuit - neutral not properly wired	Have owner wire directly to neutral bar
Power cable from service panel to Service Pro control center severed	Have owner locate break and repair

NO ELECTRICAL POWER FROM CONTROL CENTER TO AERATOR

Service Pro control center terminal A1 and neutral read zero voltage	Place selector switch in "on" position. If voltage is read, place selector switch in "automatic" position and rotate time clock knob until voltage is read. If no voltage can be read, replace control center insert.
Singlair circuit breaker has tripped	Push reset breaker
Singlair circuit breaker is defective	Replace breaker
Singlair selector switch turned "off"	Turn switch to "automatic" operation
Singlair selector switch defective	Replace control center insert
Corrosion on terminals prevents flow of current	Clean or replace contacts
Power cable from Service Pro control center to aerator damaged	Locate damage and repair
Loose wiring connection	Check all connections

AERATOR WILL NOT START

Reset breaker in Service Pro control center tripped	Push reset breaker
Loss of power to Service Pro control center	See both "No Electrical Power" sections
Insufficient voltage present at aerator	Report condition to power company
Watertight electrical connector not properly engaged	Remove watertight electrical connector and plug in tightly
Watertight electrical connector not properly wired	Rewire watertight electrical connector
Defective motor	Return entire aerator to factory

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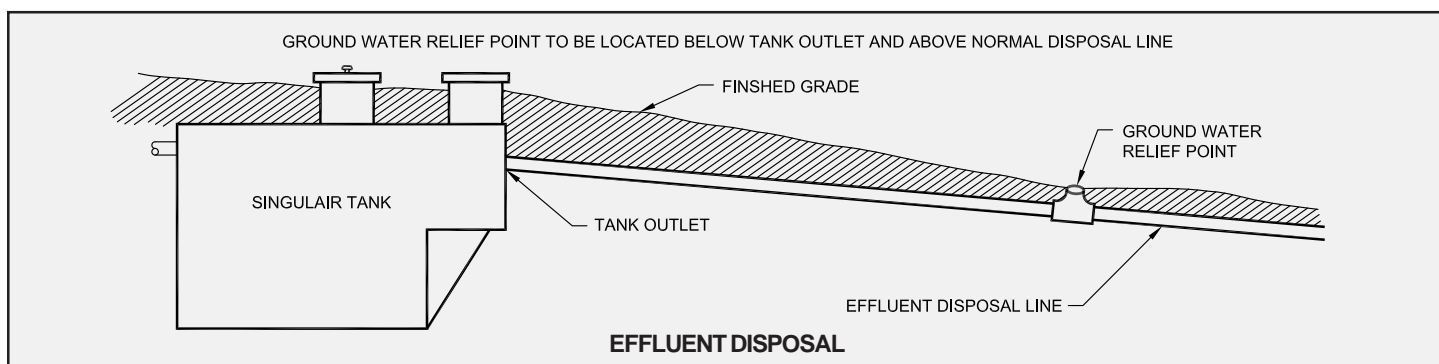
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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

BIO-KINETIC® SYSTEM TROUBLESHOOTING

Although the system effluent may be discharged and/or disposed of in several acceptable fashions, there should be a ground water relief point installed in the effluent line. It should be at a point no higher than the outlet invert of the Singulair tank. It will prevent flooding in cases where the disposal line is submerged or saturated with ground water. Locate the ground water relief point and be sure that it is free from obstructions.



SINGULAIR SYSTEM FLOODED

Bio-Kinetic system plugged

Tank outlet plugged

Groundwater relief point restricted

Disposal field plugged

Effluent pump failure

Surface water drains toward Singulair tank

Outlet line installed with insufficient fall

Outlet line crushed or filled with debris

Effluent disposal lines installed with insufficient fall
or have settled

See "Bio-Kinetic System Plugged"

Clean debris from tank outlet

Remove obstruction

Notify owner immediately

Repair or replace effluent pump

Have contractor regrade and/or install risers

Have contractor correct

Have contractor clean or replace

Have contractor correct or replace

BIO-KINETIC SYSTEM PLUGGED

Mud has fouled filter media

Organic overloading

Hydraulic overloading

Water softener backwash discharging into system

Solids flowing in from pretreatment chamber

Incomplete treatment due to aerator shut-off

Internal components flooded

Grease or inorganic matter on filter media or in
clarification chamber

See "Mud or Silt in Singulair System"

See "Organic Overloading"

See "Hydraulic Overloading"

Have owner remove backwash line from system

Evaluate pretreatment chamber - See Singulair
Tank Pumping instructions

Place control center selector switch in "automatic" position

Remove and service Bio-Kinetic system

Evaluate pretreatment chamber - See Singulair
Tank Pumping instructions

BIO-KINETIC® SYSTEM TROUBLESHOOTING (Cont.)

BIO-KINETIC SYSTEM PLUGGED (Cont.)

Compartmented contact chamber plates plugged

Clean chamber plates

Outlet weir obstructed

Inspect and clean outlet weir

CAUTION: Never allow chemical wastes, grease or mud to enter the Singulair system. These materials alter the desirable characteristics of activated sludge and will cause severe problems in the performance of the system.

NO RESIDUAL CHLORINE IN FINAL EFFLUENT

Chlorine feed tube not dispensing chlorine - empty

Refill feed tube with Blue Crystal disinfecting tablets

Chlorine feed tube not dispensing chlorine - tablets jammed

Gently tap tablets down in feed tube to be sure they make contact with the inside bottom of tube

Chlorine feed tube not dispensing chlorine - not fully engaged

Check feed tube to be sure bottom of tube is flush in flow deck

Chlorine feed tube not dispensing chlorine - feed tube plugged

Remove obstruction and reinstall feed tube

CAUTION: Extreme care must be used when handling chemicals. Refer to the Blue Crystal handling instructions before attempting any service. Proper procedures and personal protective equipment must be utilized to avoid serious injury.

FINAL EFFLUENT APPEARS CLOUDY OR TURBID

Aerator not operating

See Aerator Trouble-Shooting

Hydraulic overloading

See "Hydraulic Overloading"

Organic overloading

See "Organic Overloading"

Chlorinator not working

See "No Residual Chlorine in Final Effluent"

Bio-Kinetic system is damaged

Replace system. See Clarification Chamber and Bio-Kinetic Service instructions

Bio-Kinetic system is plugged

See Routine Clarification Chamber and Bio-Kinetic Service Instructions

Saturated disposal field

Report to owner immediately

DECHLORINATION INSTALLED WITH RESIDUAL CHLORINE STILL PRESENT IN FINAL EFFLUENT

Dechlorination feed tube not dispensing chemical-empty

Refill feed tube with Bio-Neutralizer dechlorination tablets

Dechlorination feed tube not dispensing chemical-tablets jammed

Gently tap tablets down in feed tube to be sure they make contact with the inside bottom of tube

Dechlorination feed tube not dispensing chemical-not fully engaged

Check feed tube to be sure bottom of tube is flush in flow deck

Dechlorination feed tube not dispensing chemical-feed tube plugged

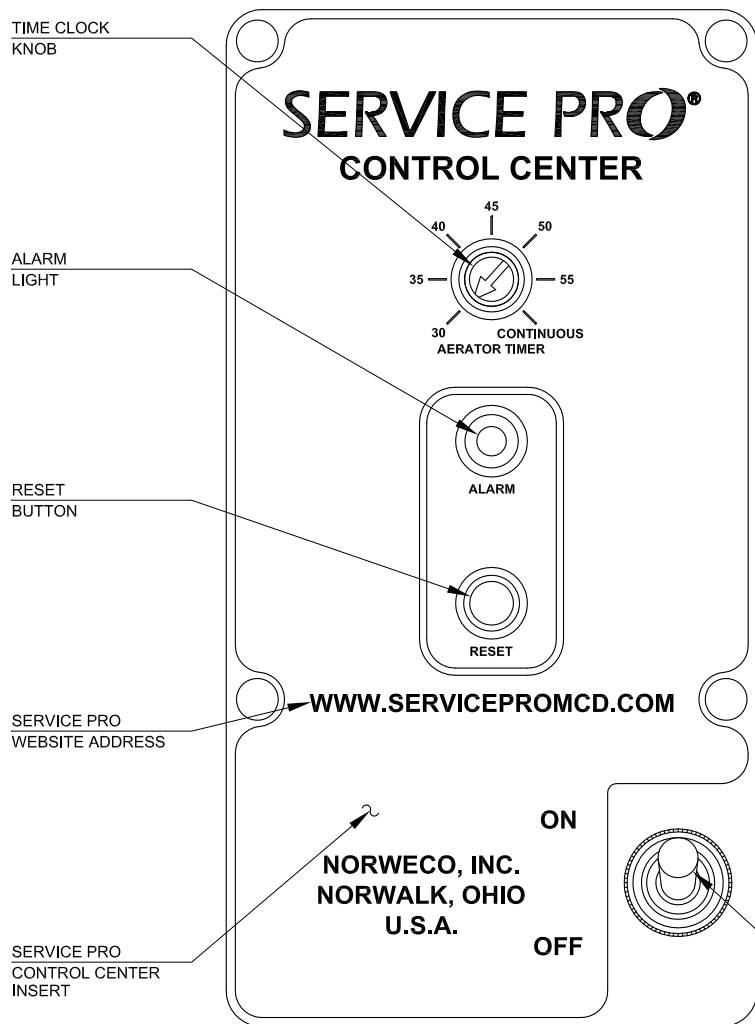
Remove obstruction and reinstall feed tube

CAUTION: Extreme care must be used when handling any chemicals. Refer to the Bio-Neutralizer handling instructions before attempting any service. Proper procedures and personal protective equipment must be utilized to avoid serious injury.

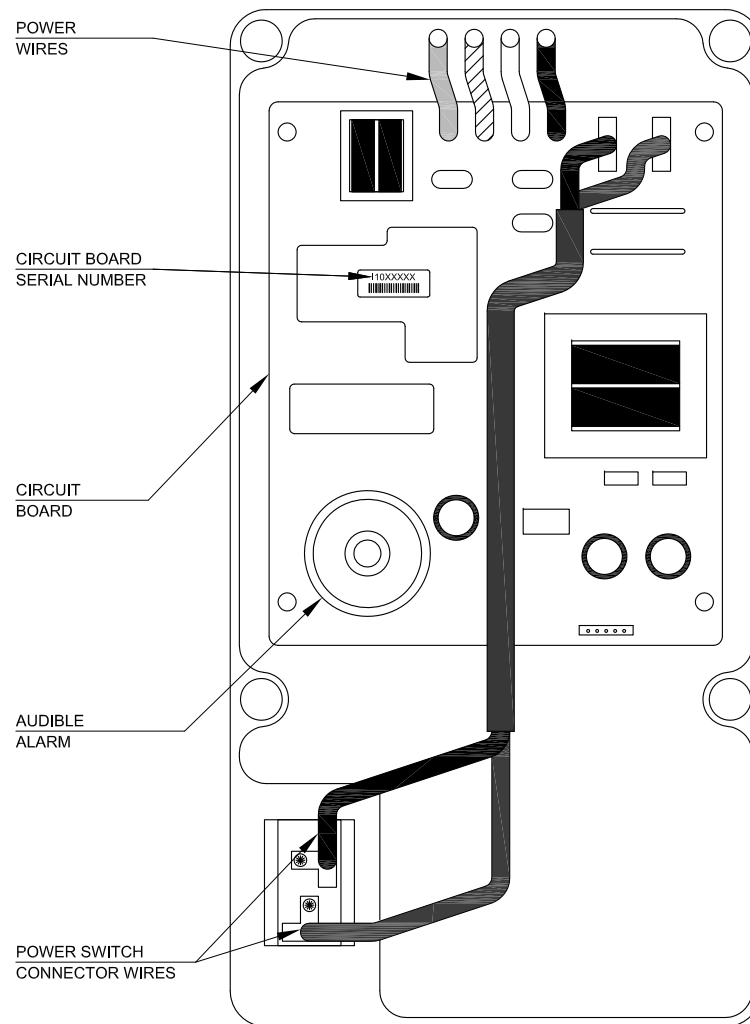
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FRONT VIEW

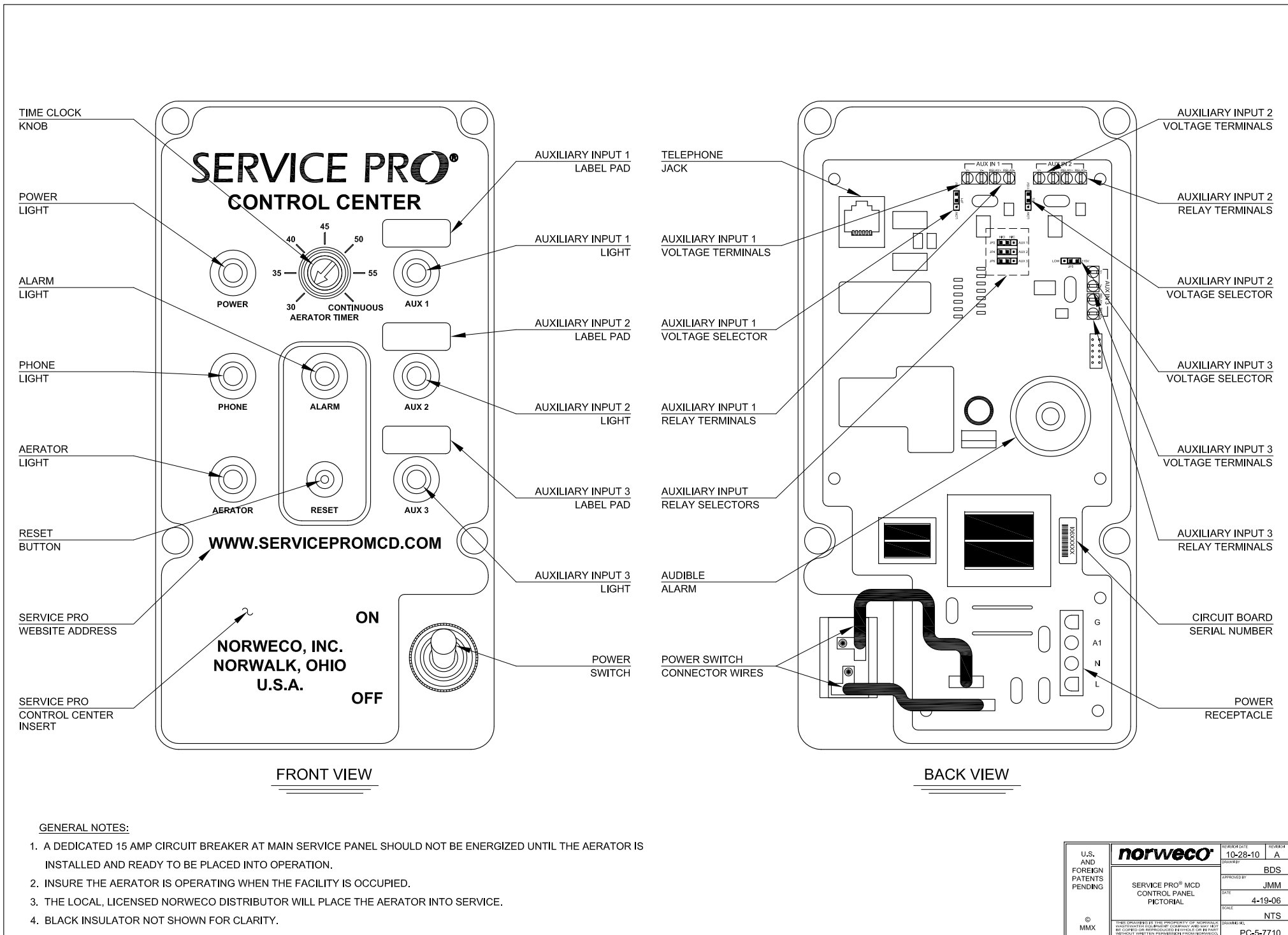


BACK VIEW

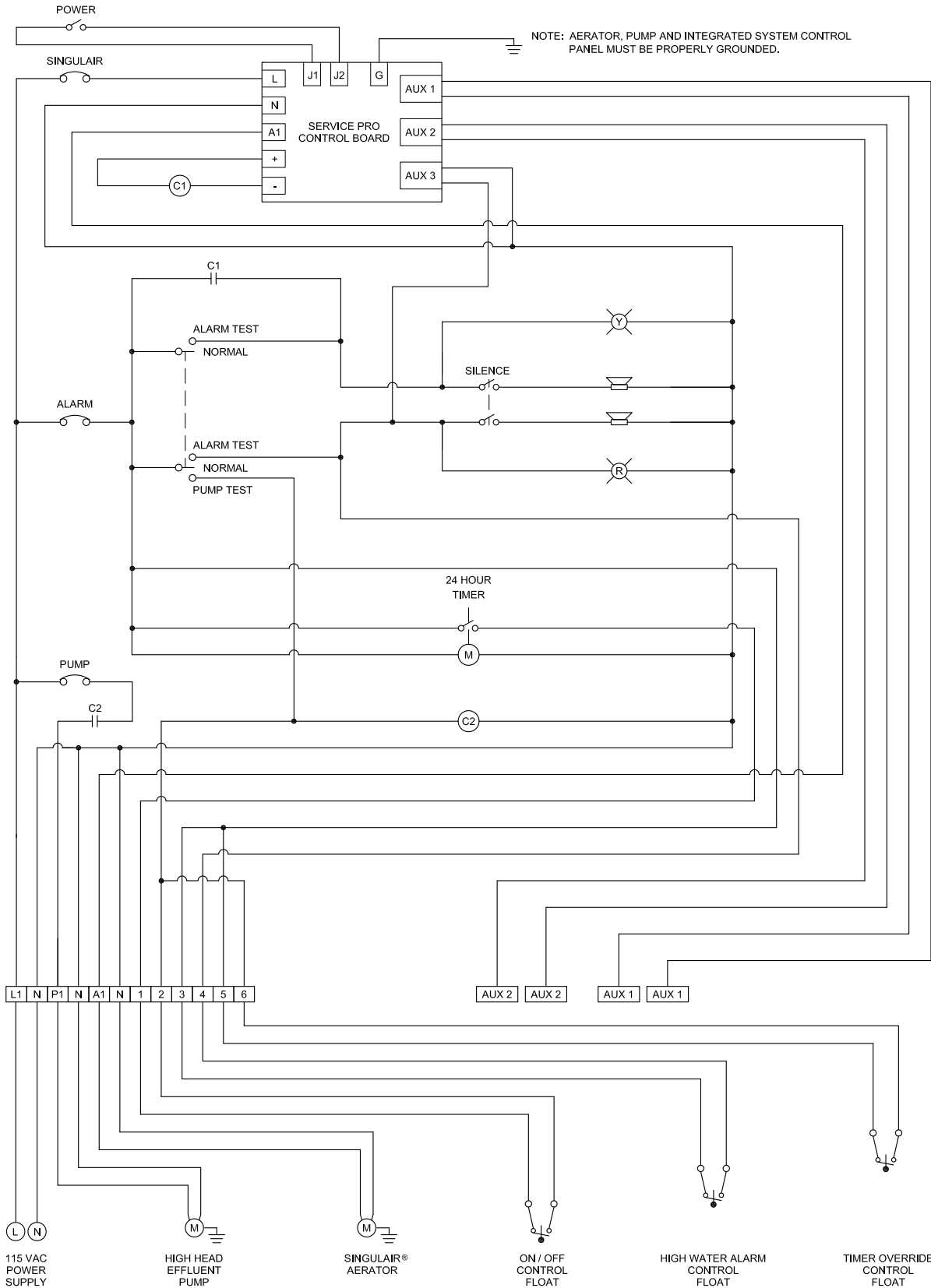
GENERAL NOTES:

1. A DEDICATED 15 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATOR IS INSTALLED AND READY TO BE PLACED INTO OPERATION.
2. INSURE THE AERATOR IS OPERATING WHEN THE FACILITY IS OCCUPIED.
3. THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE.
4. BLACK INSULATOR NOT SHOWN FOR CLARITY.

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			APPROVED BY	JMM
			DATE	11-9-10
			SCALE	NTS
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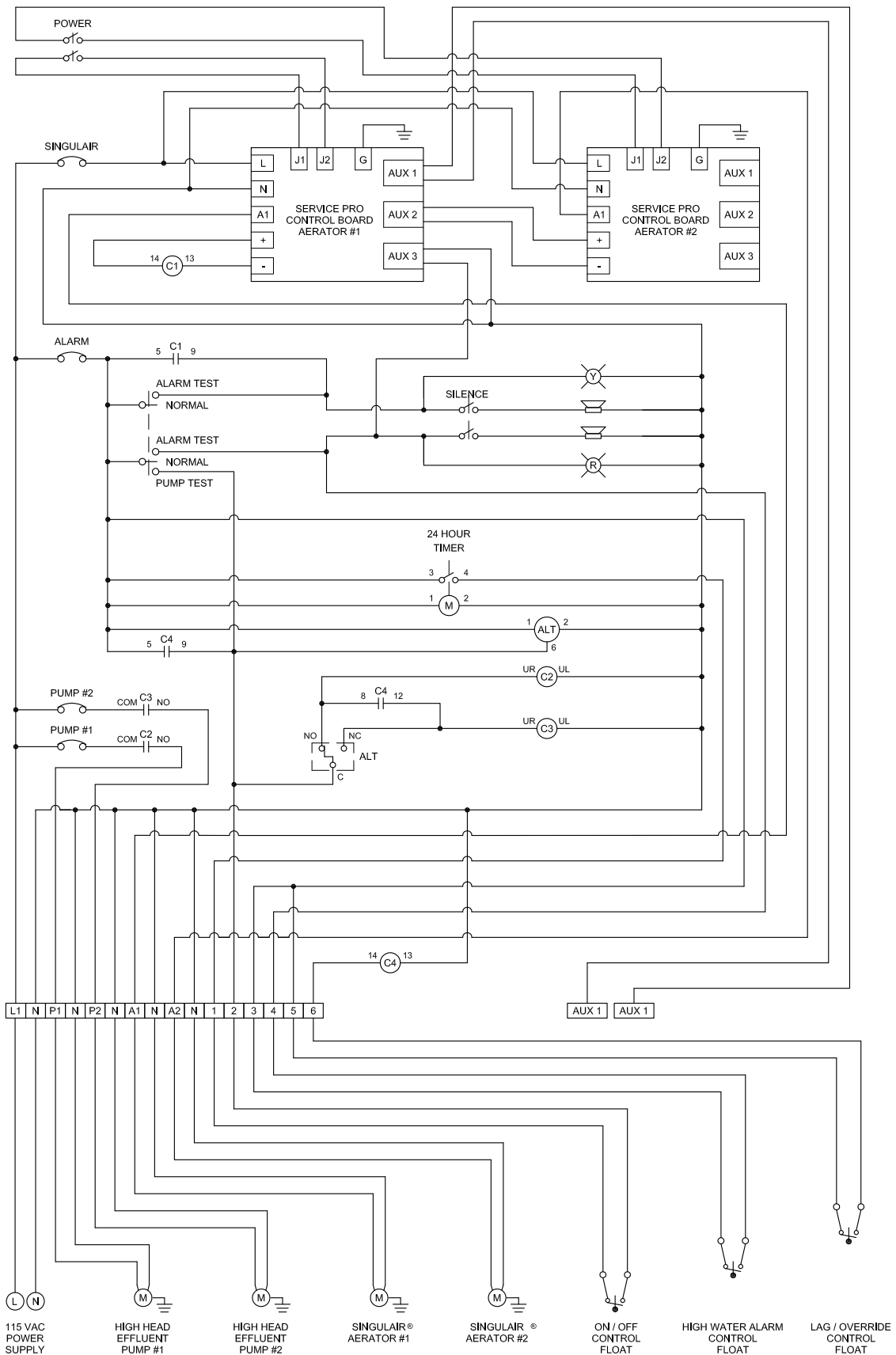
120 VOLT - 1Ø - 60 Hz - 20 AMP SERVICE



PART NUMBER: LTS00270			
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	DATE	6-26-06	
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	PC-2-0526		

120 VOLT - 1Ø - 60 Hz - 30 AMP SERVICE

NOTE: AERATOR, PUMP AND INTEGRATED SYSTEM CONTROL PANEL MUST BE PROPERLY GROUNDING.



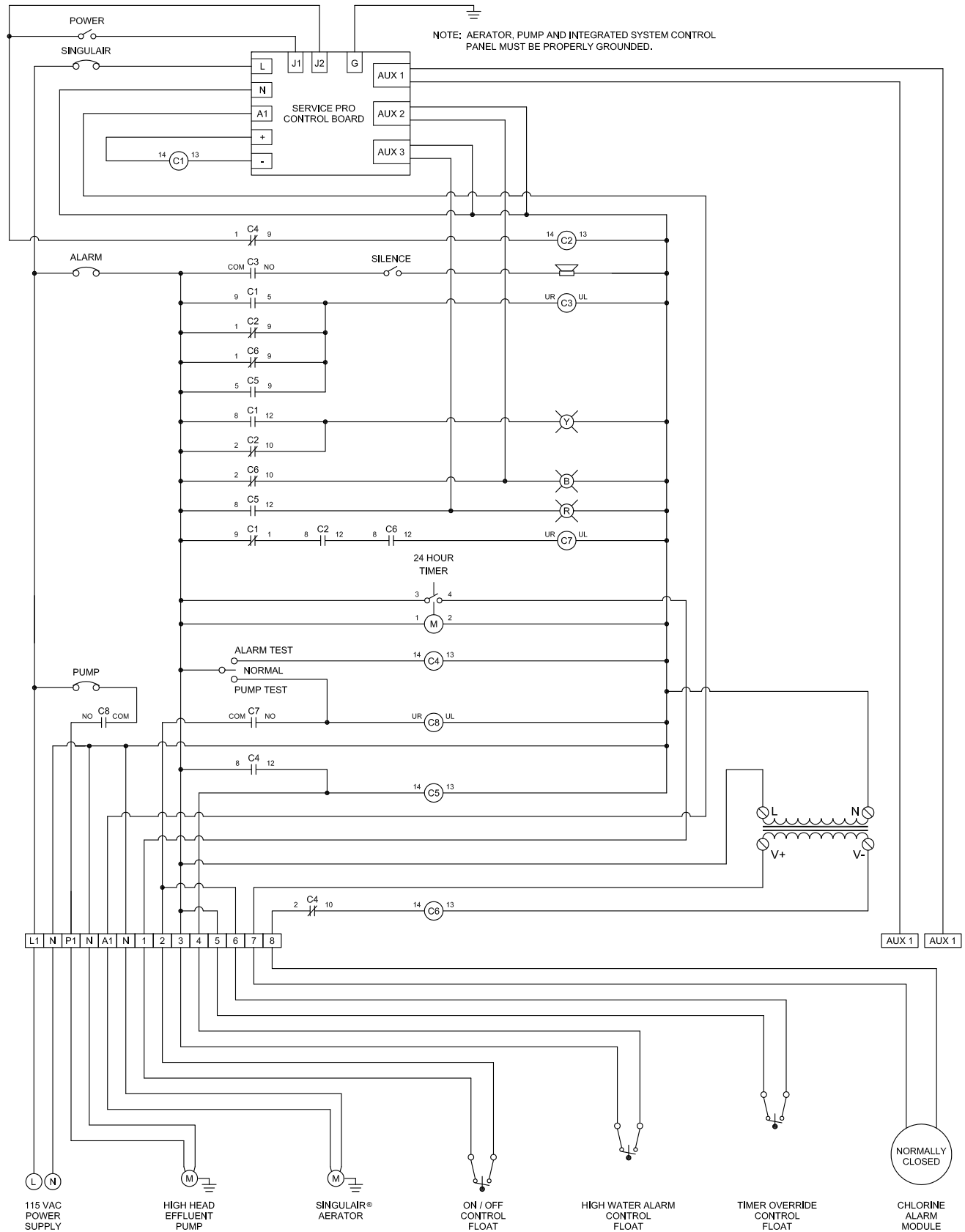
GENERAL NOTES:

- ① A DEDICATED 30 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATORS ARE INSTALLED AND READY TO BE PLACED INTO OPERATION.
- ② INSURE THE AERATORS ARE OPERATING WHEN THE FACILITY IS OCCUPIED.
- ③ THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATORS INTO SERVICE.

PART NUMBER: LTS00271

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120 VOLT - 1Ø - 60 Hz - 20 AMP SERVICE



GENERAL NOTES:

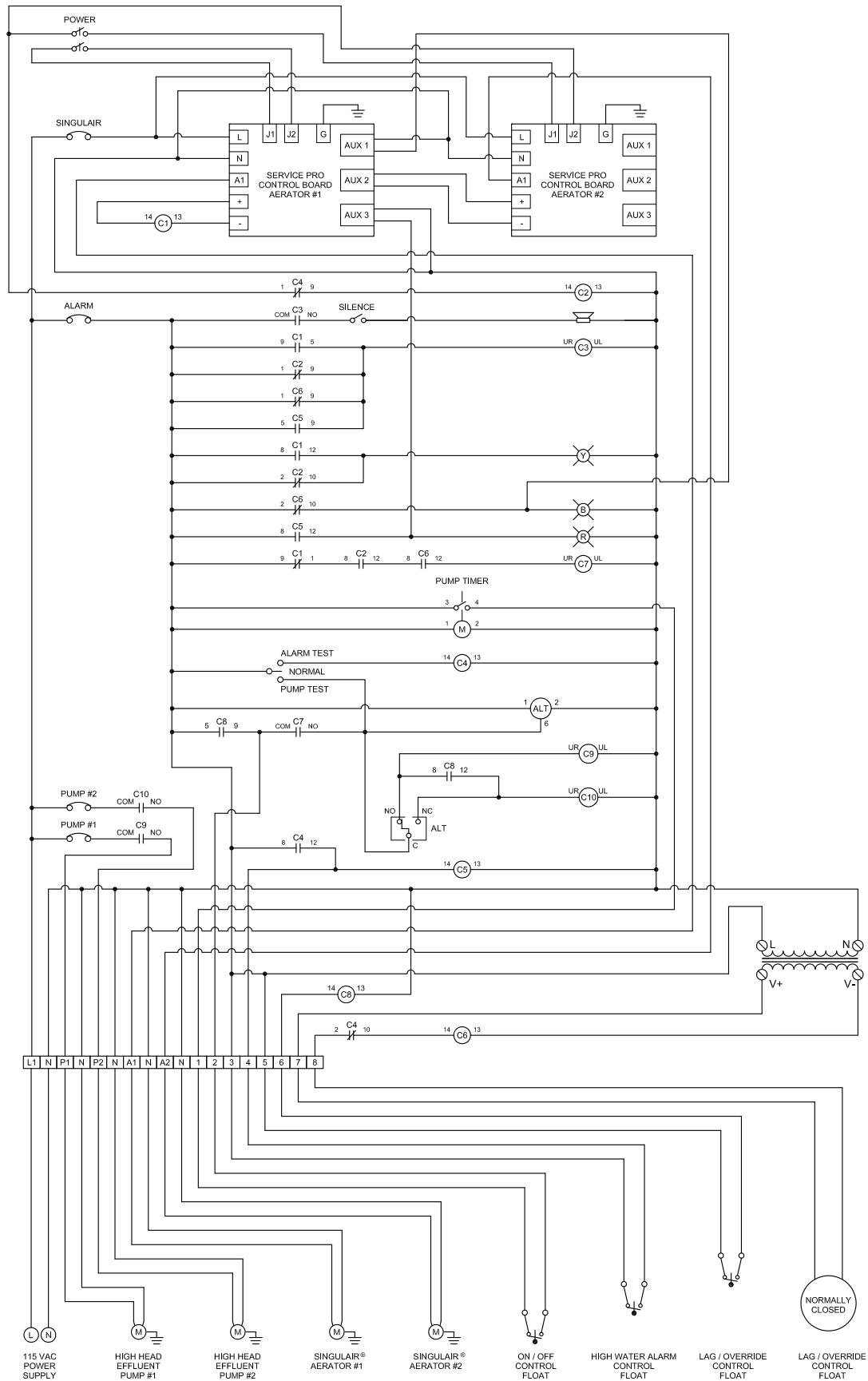
- ① A DEDICATED 20 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATOR IS INSTALLED AND READY TO BE PLACED INTO OPERATION.
- ② INSURE THE AERATOR IS OPERATING WHEN THE FACILITY IS OCCUPIED.
- ③ THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE.

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	DESIGNED BY	1-30-07
	APPROVED BY	BDS
	DATE	JMM
© MMVII	SCALE	6-26-06
	DATE	NTS
THESE DOCUMENTS ARE THE PROPERTY OF NORWECO. NO REPRODUCTION OR TRANSMISSION OF ANY PART OF THESE DOCUMENTS IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF NORWECO.		PC-2-0529

120 VOLT - 1Ø - 60 Hz - 30 AMP SERVICE

NOTE: AERATOR, PUMP AND INTEGRATED SYSTEM CONTROL PANEL MUST BE PROPERLY GROUNDING.



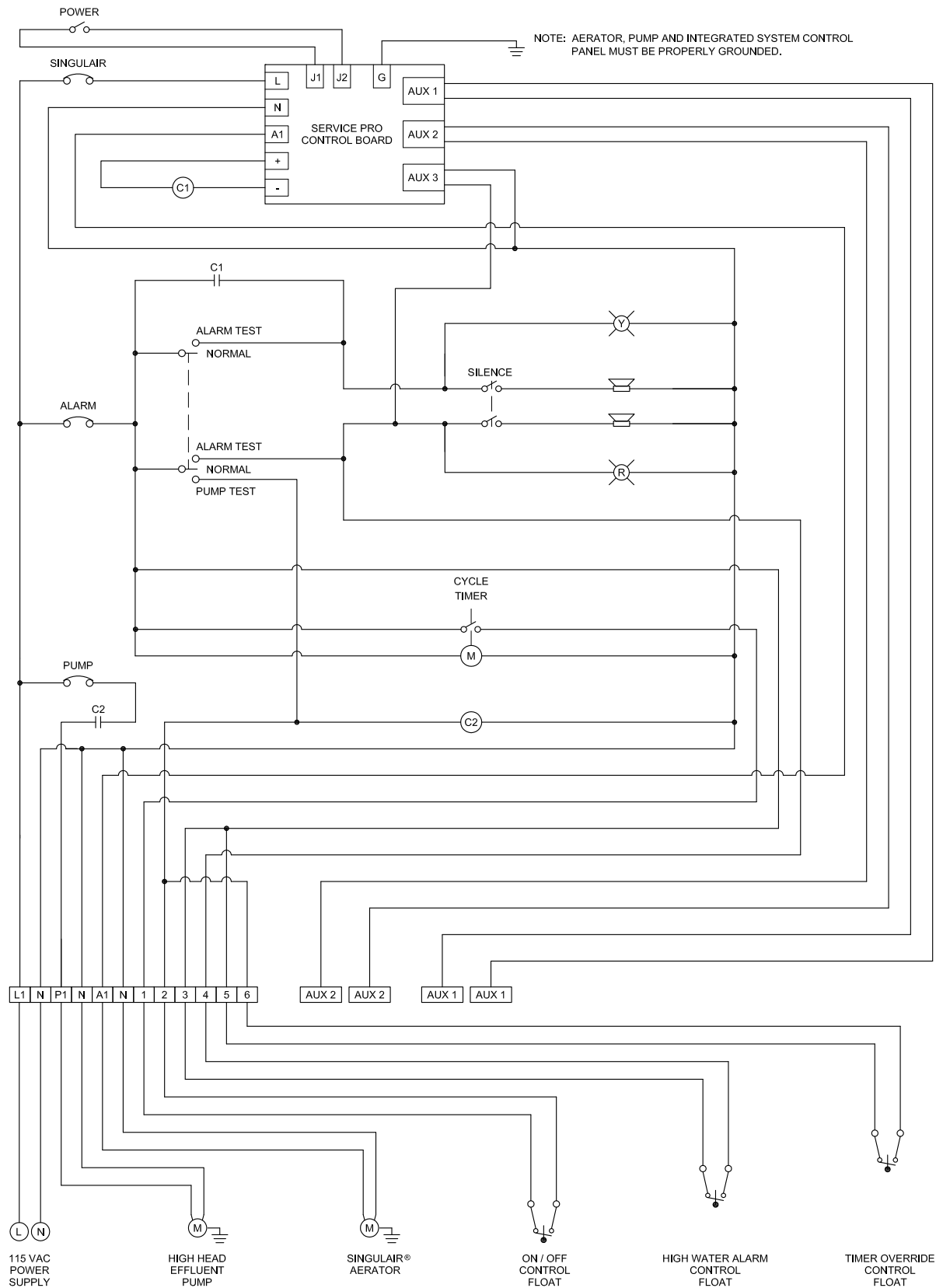
GENERAL NOTES:

- 1 A DEDICATED 30 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATORS ARE INSTALLED AND READY TO BE PLACED INTO OPERATION.
- 2 INSURE THE AERATORS ARE OPERATING WHEN THE FACILITY IS OCCUPIED.
- 3 THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATORS INTO SERVICE.

PART NUMBER: LTS00273

U.S. AND FOREIGN PATENTS PENDING	norweco	
	DESIGNED BY	1-30-07
	APPROVED BY	BDS
	DATE	8-17-06
© MMVII	SERVICE PRO ISC HYBRID DUPLEX / DUPLEX SPRAY FAILSAFE WIRING DIAGRAM	
	SCALE	NTS
THESE DOCUMENTS ARE THE PROPERTY OF NORWECO. NO REPRODUCTION OR TRANSMISSION OF ANY PART OF THESE DOCUMENTS IS ALLOWED WITHOUT WRITTEN PERMISSION FROM NORWECO.		PC-2-0533

120 VOLT - 1Ø - 60 Hz - 20 AMP SERVICE

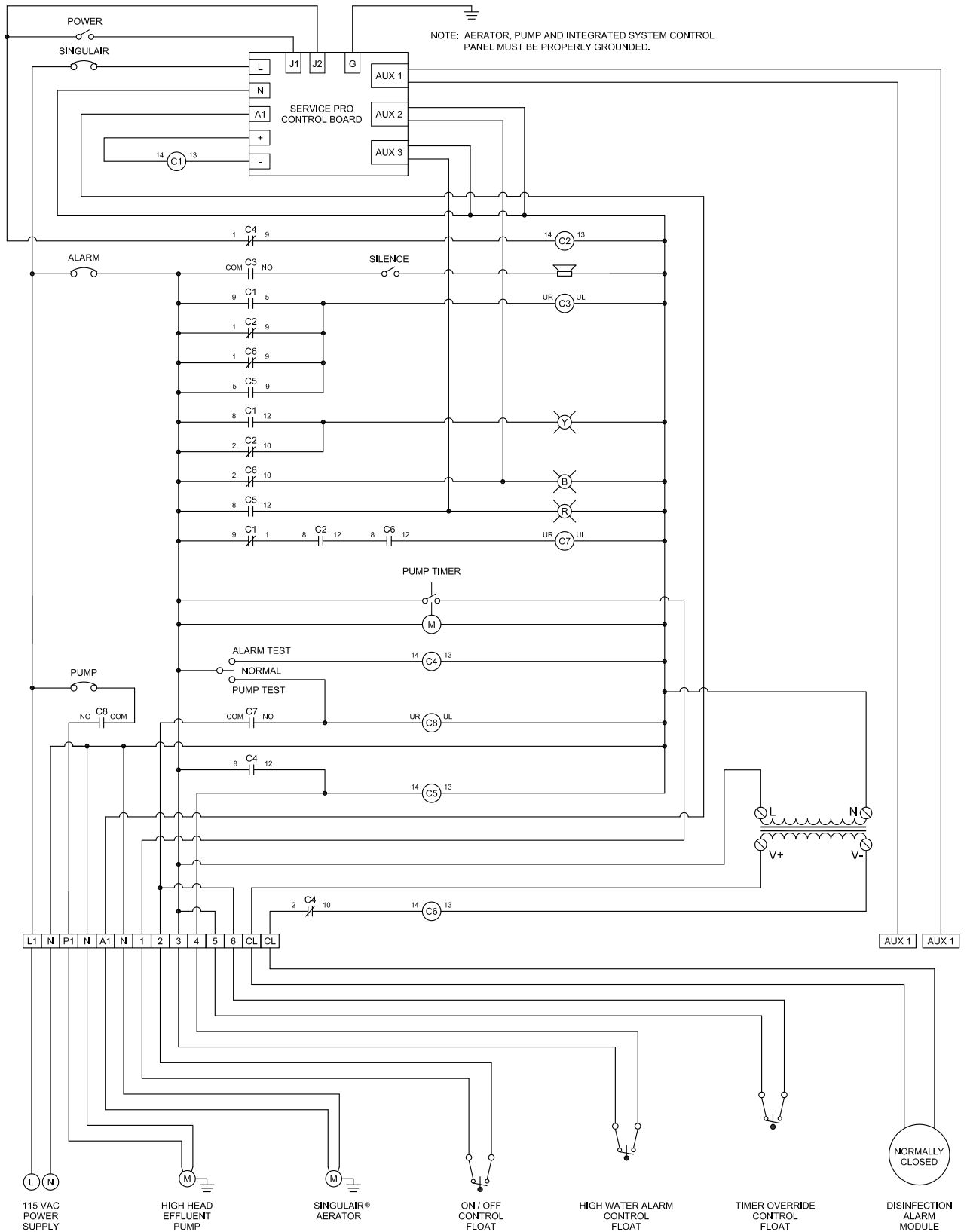


GENERAL NOTES:

- ① A DEDICATED 20 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATOR IS INSTALLED AND READY TO BE PLACED INTO OPERATION.
- ② INSURE THE AERATOR IS OPERATING WHEN THE FACILITY IS OCCUPIED.
- ③ THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE.

PART NUMBER: LTS00272			
U.S. AND FOREIGN PATENTS PENDING	<i>norweco</i> SERVICE PRO ISO HYBRID SIMPLEX / SIMPLEX DRIP WIRING DIAGRAM	REVISION DATE	REVISION
		1-30-07	B
		DESIGNED BY	BDS
		APPROVED BY	JMM
		DATE	6-26-06
© MMVII		SCALE	NTS
		DATE/REVISED	PC-2-0530

120 VOLT - 1Ø - 60 Hz - 20 AMP SERVICE

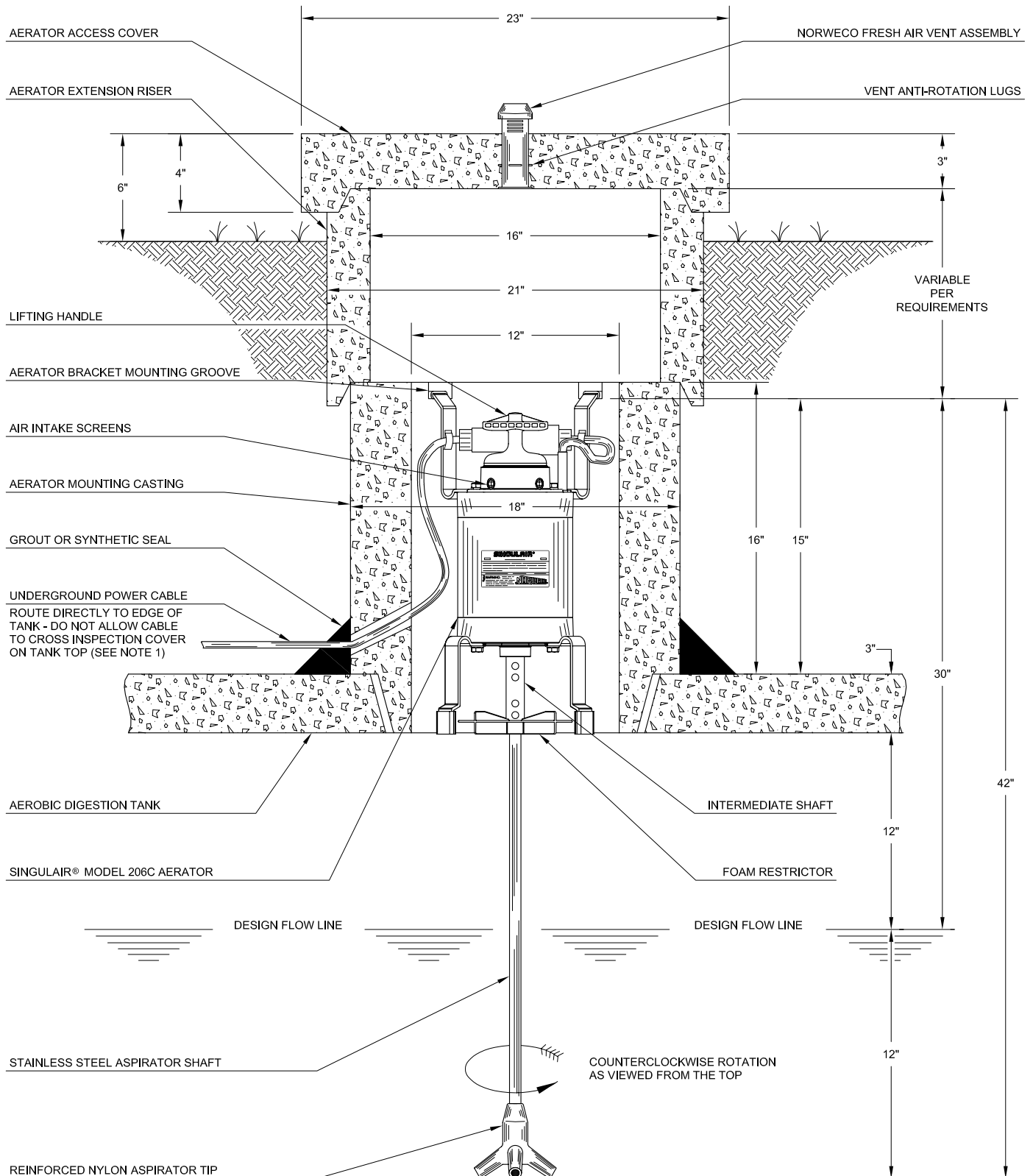


GENERAL NOTES:

- ① A DEDICATED 20 AMP CIRCUIT BREAKER AT MAIN SERVICE PANEL SHOULD NOT BE ENERGIZED UNTIL THE AERATOR IS INSTALLED AND READY TO BE PLACED INTO OPERATION.
- ② INSURE THE AERATOR IS OPERATING WHEN THE FACILITY IS OCCUPIED.
- ③ THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE.

PART NUMBER: LTS00275

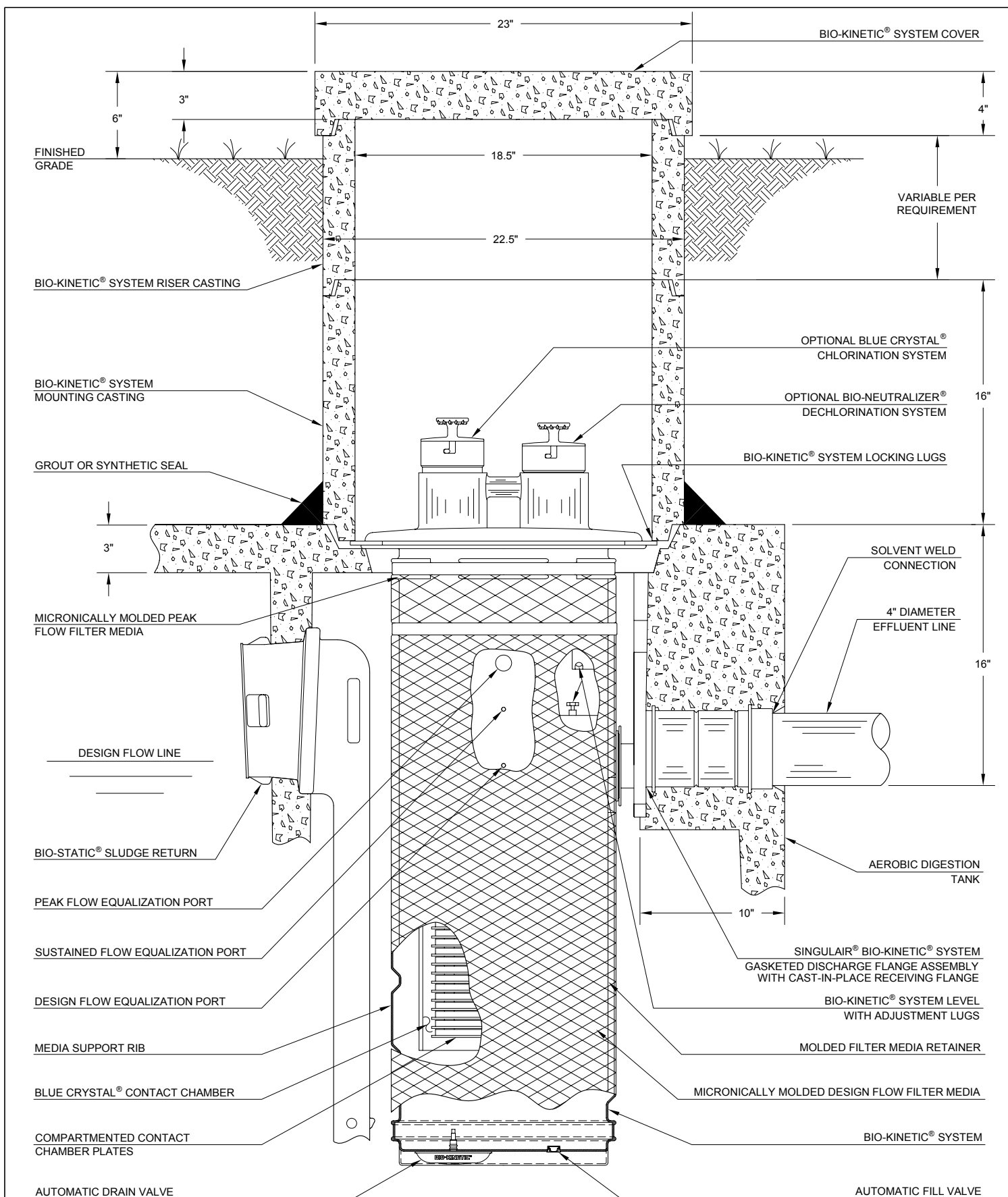
U.S. AND FOREIGN PATENTS PENDING	norweco	
	DESIGNED BY	2-25-08
	APPROVED BY	BDS
	DATE	8-16-06
© MMVII	SCALE	NTS
	DESIGNED BY	PC-2-0534



GENERAL NOTES:

1. UNDERGROUND POWER SUPPLY MUST BE WIRED INTO AN APPROVED SINGLAIR® CONTROL CENTER.
2. SINGLAIR® CONTROL CENTER MUST BE WIRED INTO A SEPARATE 10 AMP CIRCUIT BREAKER AT MAIN ELECTRICAL SERVICE PANEL IN THE FACILITY.
3. AERATOR AND AERATOR CONTROL CENTER MUST BE PROPERLY GROUNDED.
4. THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE.

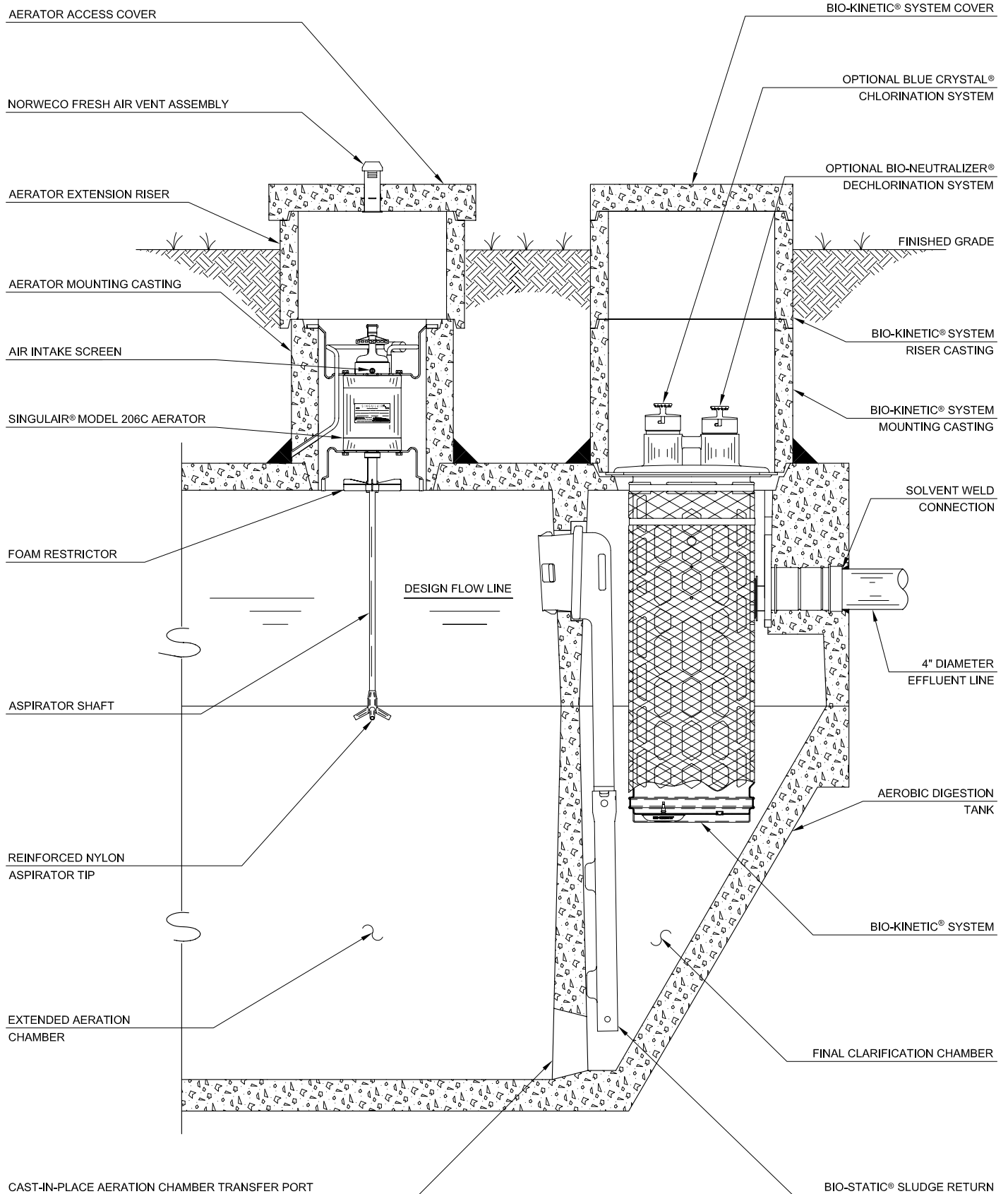
U.S. AND FOREIGN PATENTS PENDING © MMVI	norweco		APPROVED BY: 7-6-06 DRAWN BY: G
	MODEL 206C SINGLAIR® AERATOR MOUNTING AND INSTALLATION DETAIL		APPROVED BY: JMM DATE: 1-8-95
	<small>THIS DOCUMENT IS THE PROPERTY OF NORWECO ENVIRONMENTAL EQUIPMENT COMPANY AND MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM NORWECO ENVIRONMENTAL EQUIPMENT COMPANY.</small>		SCALE: NTS CONTROL NO.: PC-5-7600



GENERAL NOTES:

- ① AFTER INSTALLATION, ALL CHAMBERS OF THE SINGLAIR TANK SHOULD BE FULL TO THE FLOW LINE WITH CLEAN HOLD DOWN WATER.
- ② INTERNAL AND EXTERNAL PRESSURE EQUALIZATION ON THE BIO-KINETIC SYSTEM IS MANAGED AUTOMATICALLY BY THE DRAIN VALVE AND FILL VALVE.
- ③ WHEN USING OPTIONAL CHEMICAL FEED TUBES, INSURE THE BLUE CRYSTAL® CHLORINATION FEED TUBE IS INSTALLED THROUGH THE MOUNTING COLLAR NEAREST THE AERATOR MOUNTING CASTING, AND THE BIO-NEUTRALIZER® DECHLORINATION FEED TUBE IS INSTALLED THROUGH THE MOUNTING COLLAR NEAREST THE SYSTEM OUTLET.

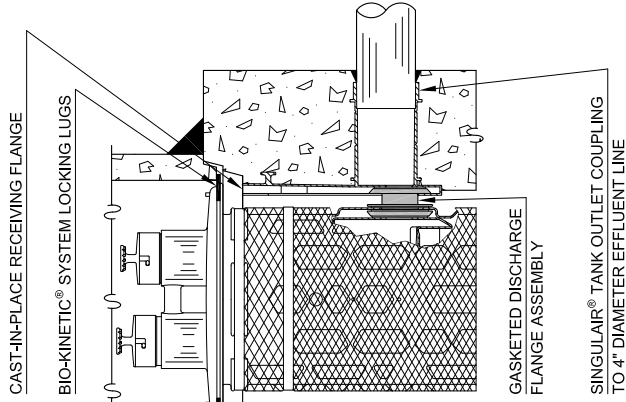
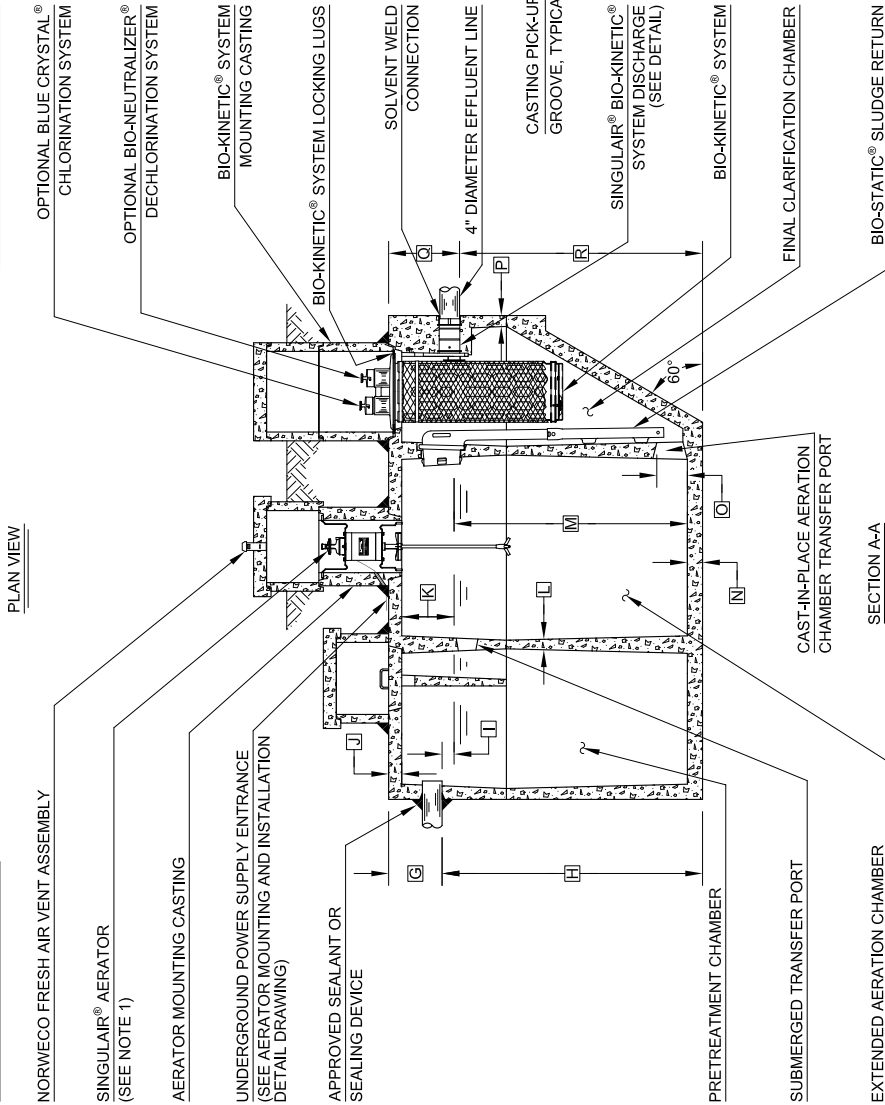
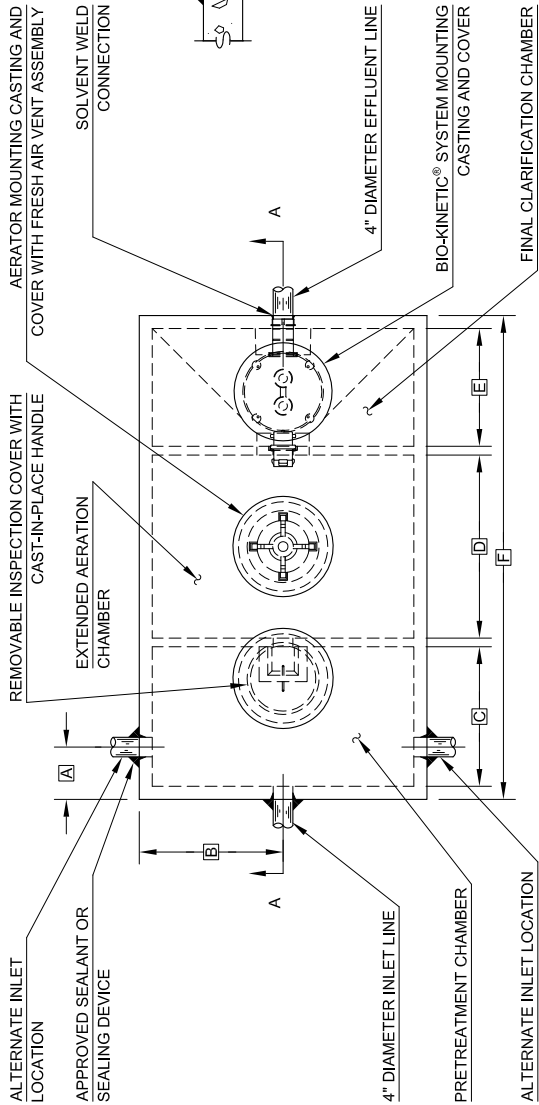
U.S. AND FOREIGN PATENTS PENDING © MMVII	<i>norweco</i>		REVISION DATE	REVISION
	BIO-KINETIC® MOUNTING AND INSTALLATION DETAIL		3-16-07	G
			DRAWN BY	
			BDS	
			APPROVED BY	
			GJS	
		DATE	7-8-96	
		SCALE	NTS	
		DRAWING NO.		
PC-5-8501				



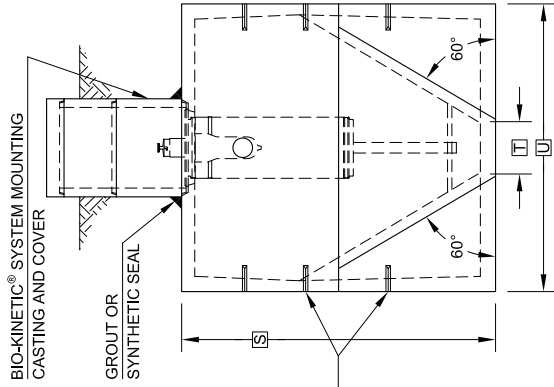
GENERAL NOTES:

- ① BIO-STATIC® SLUDGE RETURNS MUST BE INSTALLED PRIOR TO INSTALLATION OF THE BIO-KINETIC® SYSTEM MOUNTING CASTINGS.
- ② ONE BIO-STATIC® SLUDGE RETURN ASSEMBLY IS REQUIRED FOR 500 GPD, 750 GPD AND 1000 GPD SYSTEMS. TWO BIO-STATIC® SLUDGE RETURN ASSEMBLIES ARE REQUIRED FOR 1250 GPD AND 1500 GPD SYSTEMS.
- ③ THE BIO-STATIC® SLUDGE RETURN IS INSTALLED IN THE FINAL CLARIFICATION CHAMBER DURING TANK SETTING.
- ④ ONCE INSTALLED, THE BIO-STATIC® SLUDGE RETURN REMAINS IN PLACE AND NEEDS NO SERVICE OR MAINTENANCE.

U.S. AND FOREIGN PATENTS PENDING © MMVI	norweco	REVISION DATE 7-6-06	REVISION G
	BIO-STATIC® SLUDGE RETURN MOUNTING AND INSTALLATION DETAIL	DESIGNED BY JMM	
		APPROVED BY GJS	
		DATE 9-9-96	
		SCALE NTS	
		DESIGNED BY PC-5-8502	



BIO-KINETIC® SYSTEM DISCHARGE DETAIL



- GENERAL NOTES:
- SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
 - FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
 - ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
 - TANK REINFORCED PER ACI STD. 318-05.
 - REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
 - CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	5'-0"	U	5'-6"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	4'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM
MODEL 960 - 500/600 GPD

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PROJECT NO. 08-04-11

DATE 08-04-11

DESIGNER BDS

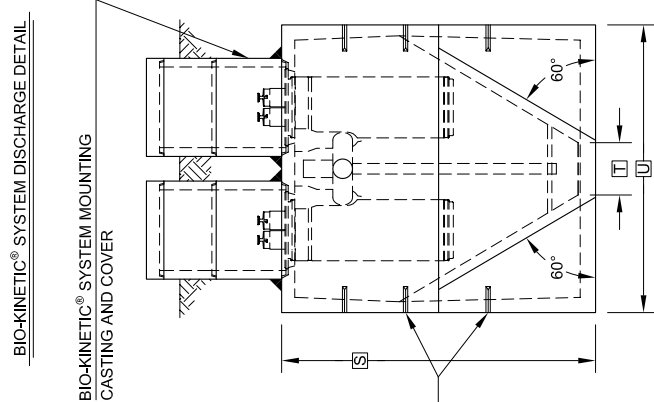
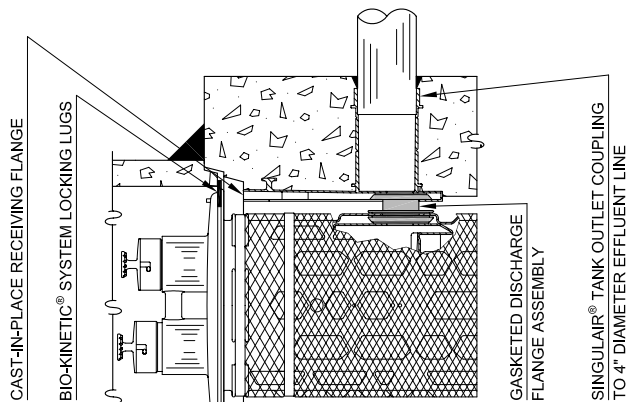
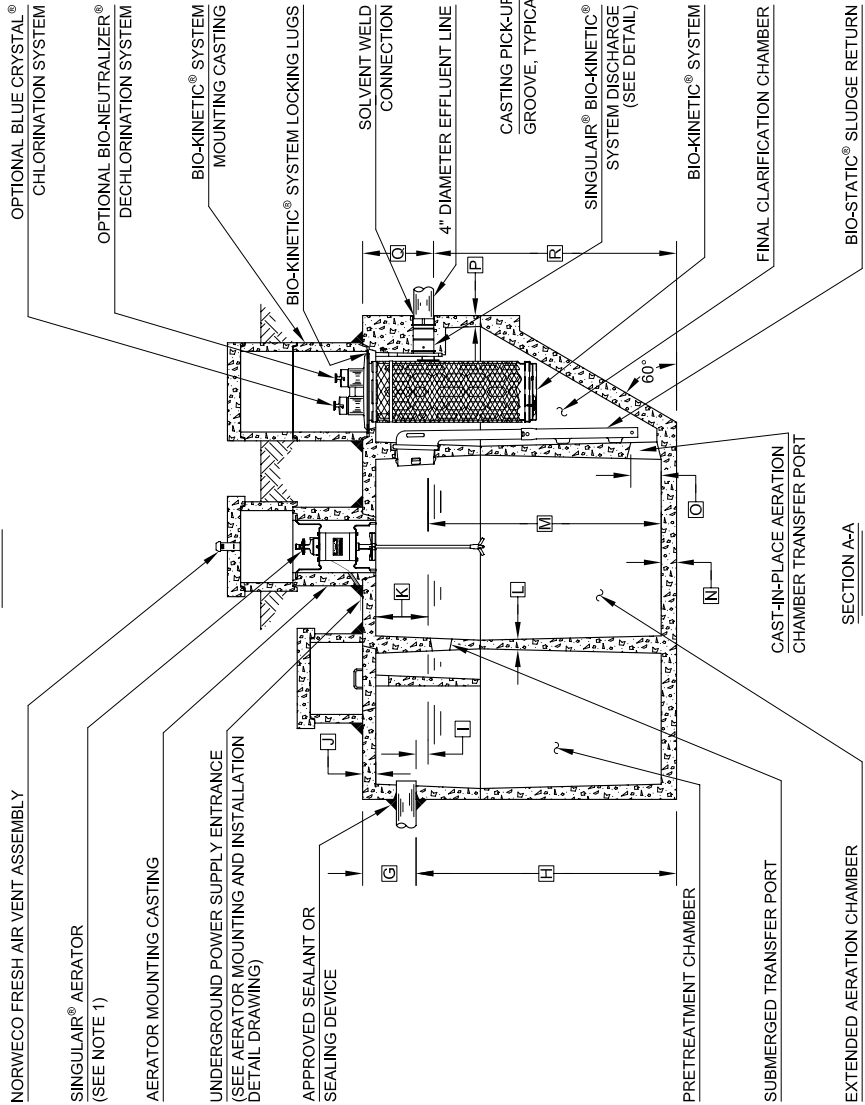
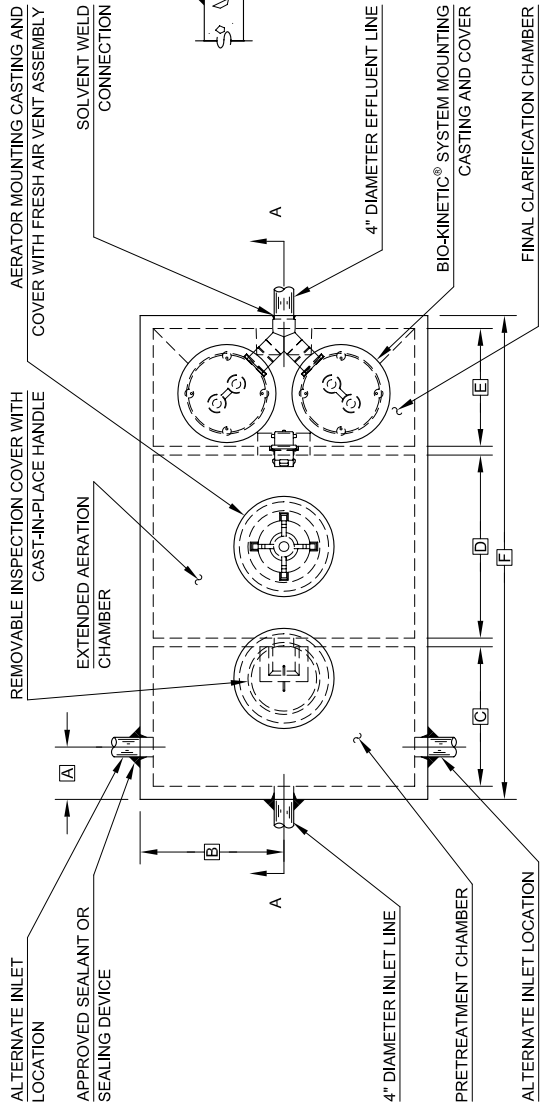
CHECKER JMM

DATE 1-5-96

DRAWN NTS

PROJECT NO. PC-5-7006

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 500/600 GALLONS PER DAY



- GENERAL NOTES:**
- SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
 - FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
 - ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
 - TANK REINFORCED PER ACI STD. 318-05.
 - REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
 - CONTACT THE LOCAL LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	5'-8"
F	9'-3"	S	7'-0"
G	1'-0"	T	1'-0"
H	6'-0"	U	5'-6"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	5'-6"	Z	

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U.S. AND FOREIGN PATENTS PENDING

SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 960 - 750 GPD

1-29-07

BDS

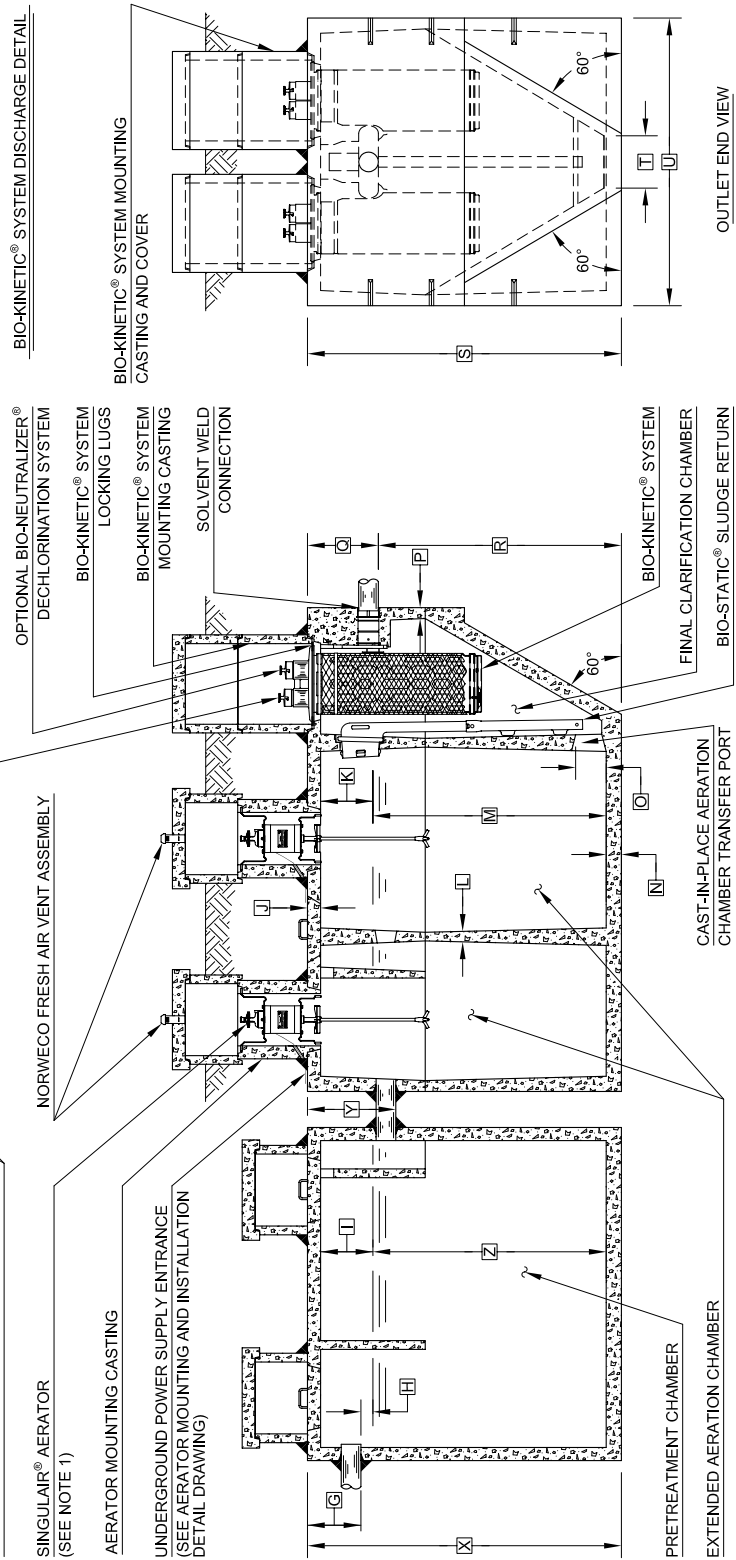
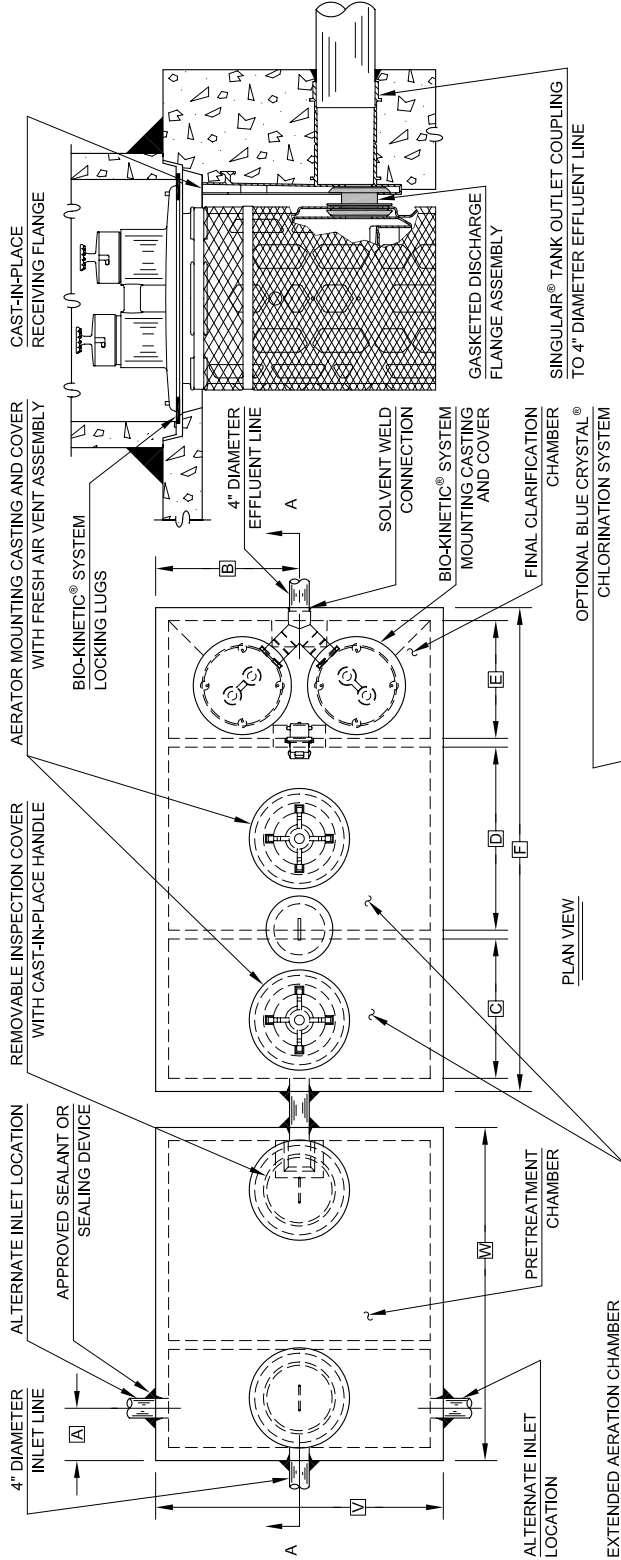
JMM

3-6-96

NTS

PC-5-7007

NOTE: TOTAL SYSTEM CAPACITY: 1,600 GALLONS
RATED CAPACITY: 750 GALLONS PER DAY



GENERAL NOTES:

- 1 SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
- 2 FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- 4 TANK REINFORCED PER ACI STD. 318-05.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
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NAME: _____

CRITICAL DIMENSIONS

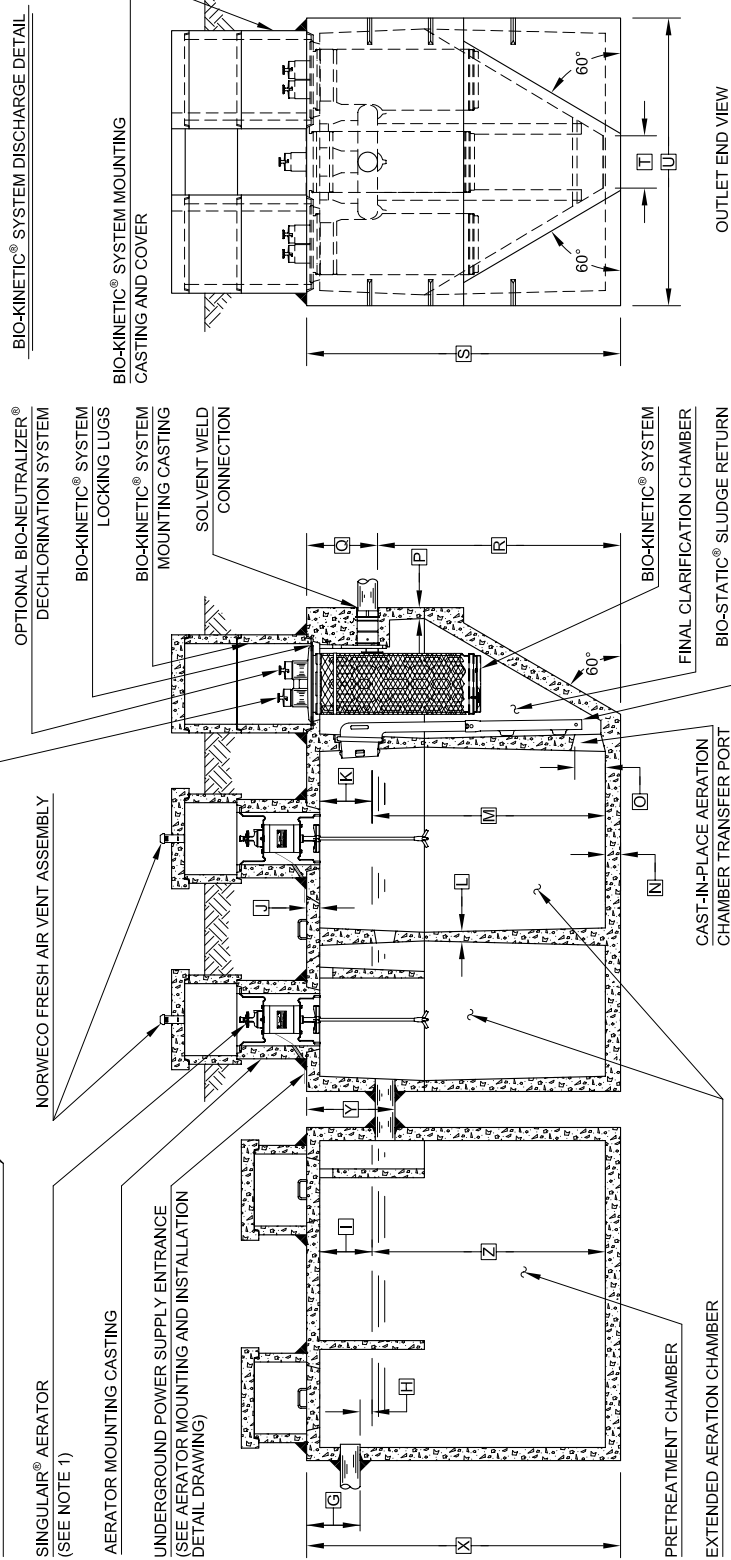
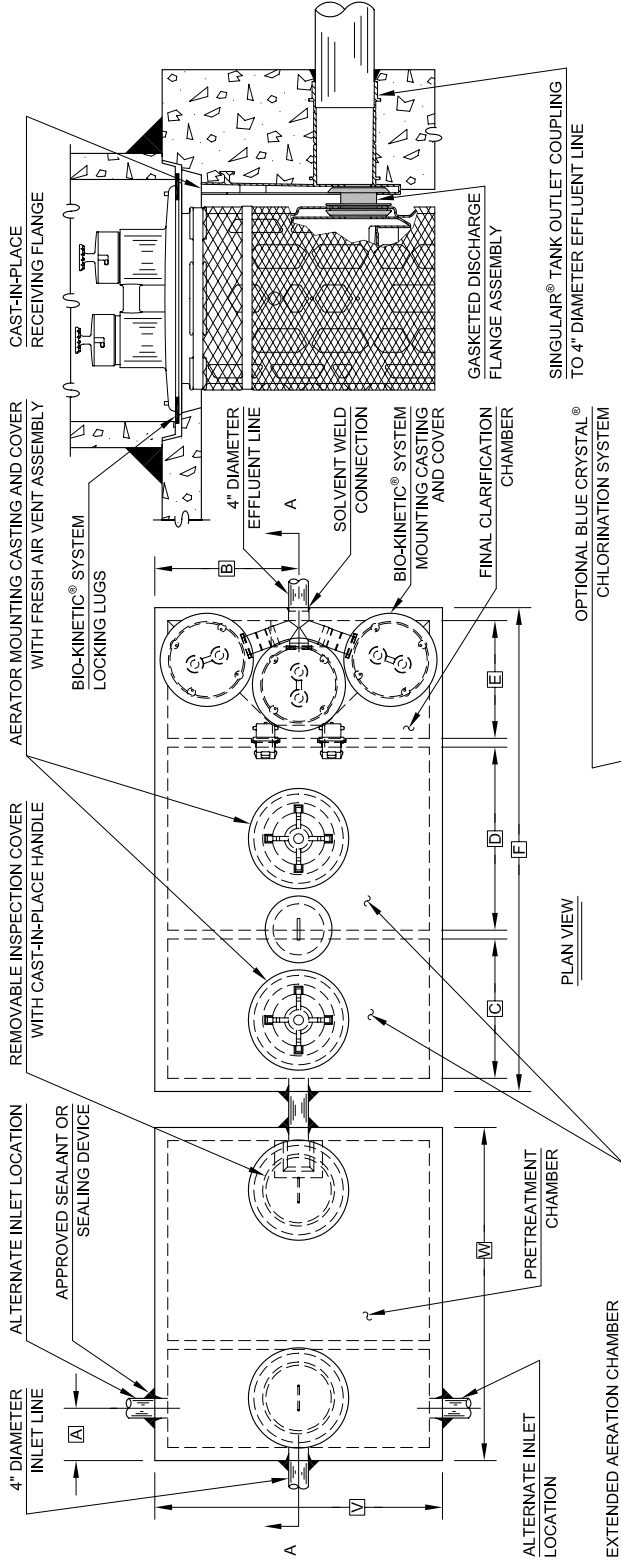
A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	0'-3"	U	5'-6"
I	1'-0"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	1'-8"
M	4'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING		norweco® SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 860 - 1000 GPD	
DATE: 1-29-07	DESIGN: BDS	DATE: 1-2-96	NTS
© MWH		PC-5-7008	

NOTE: TOTAL SYSTEM CAPACITY: 2,300 GALLONS
RATED CAPACITY: 1,000 GALLONS PER DAY

NOTE: SOME CRITICAL DIMENSIONS ARE INTENTIONALLY LEFT BLANK TO BE FILLED IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,000 GALLONS CAPACITY, 15 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.



- GENERAL NOTES:**
- 1 SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
 - 2 FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
 - 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
 - 4 TANK REINFORCED PER ACI STD. 318-05.
 - 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
 - 6 CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
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DATE: _____

NAME: _____

CRITICAL DIMENSIONS	
A	1'-0"
B	2'-9"
C	2'-8"
D	3'-7"
E	2'-3"
F	9'-3"
G	1'-0"
H	0'-3"
I	1'-0"
J	0'-3"
K	1'-0"
L	0'-2"
M	5'-6"
N	0'-3"
O	0'-6"
P	0'-2 1/2"
Q	1'-4"
R	5'-8"
S	7'-0"
T	1'-0"
U	5'-6"
V	
W	
X	
Y	1'-8"
Z	

norweco

U.S. AND FOREIGN PATENTS PENDING

SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 960 - 1250 GPD

1-29-07

BDS

GLS

3-6-96

NTS

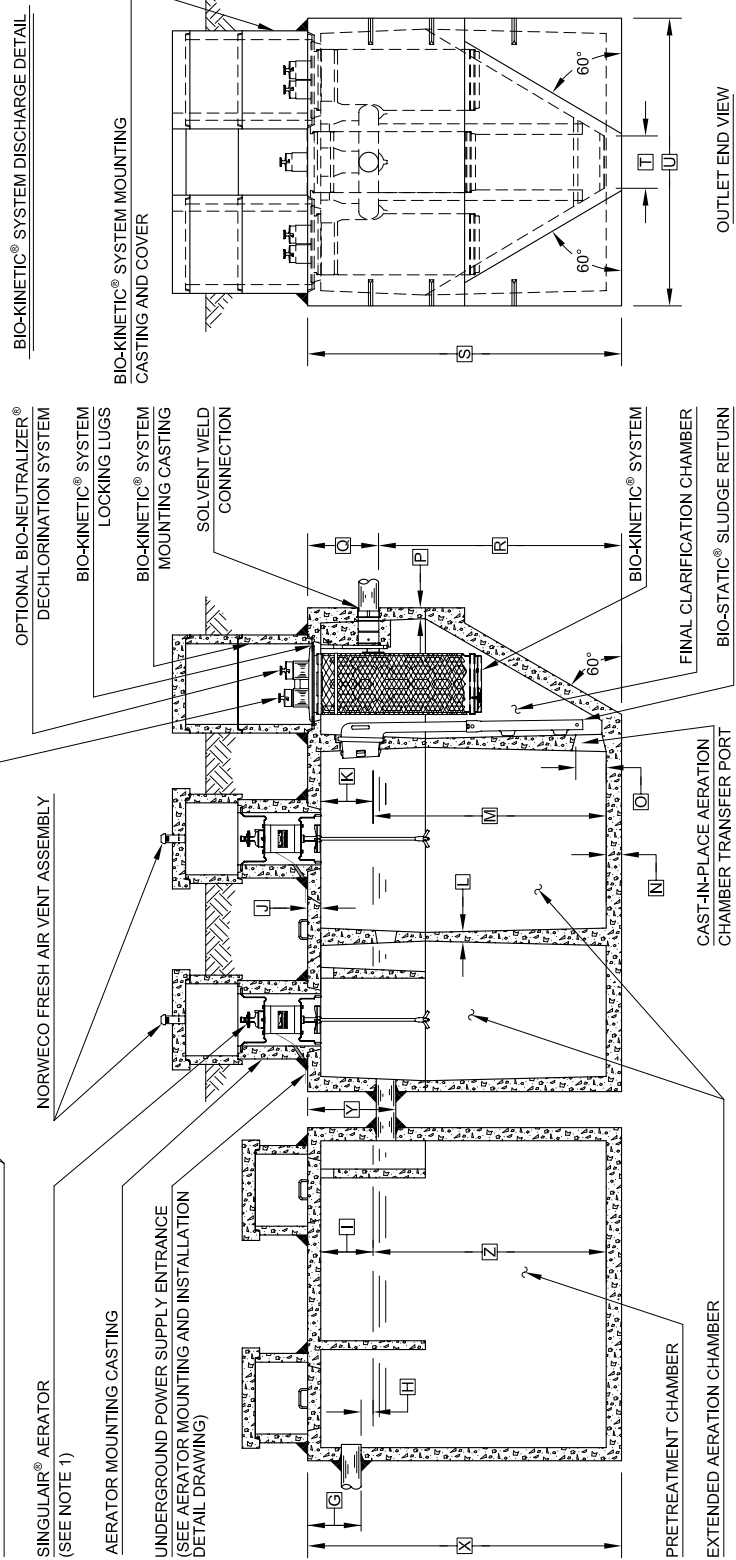
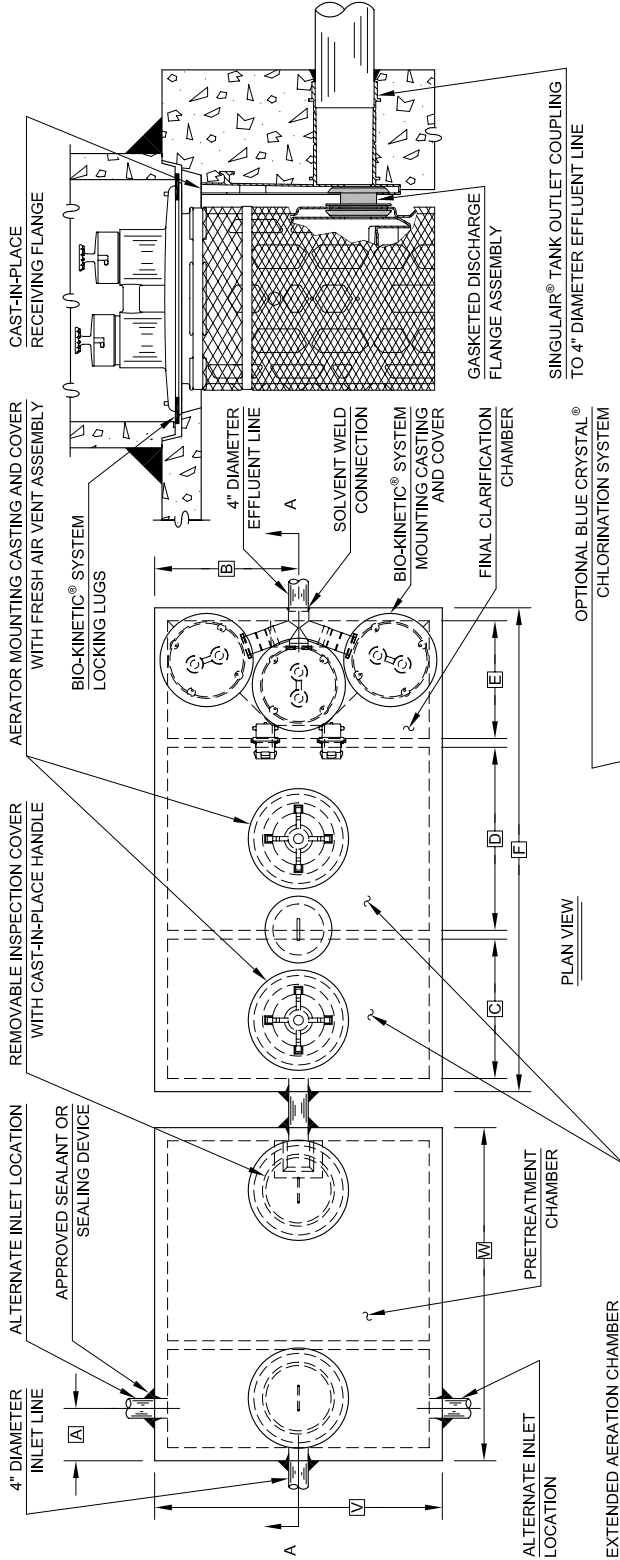
PC-5-7009

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,250 GALLONS CAPACITY, 16 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

NOTE: TOTAL SYSTEM CAPACITY: 2,850 GALLONS
RATED CAPACITY: 1,250 GALLONS PER DAY

NOTE: SOME CRITICAL DIMENSIONS ARE INTENTIONALLY LEFT BLANK TO BE FILLED IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.

SECTION A-A



GENERAL NOTES:

- 1 SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
- 2 FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- 4 TANK REINFORCED PER ACI STD. 318-05.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
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CONTRACTOR'S CERTIFICATION:
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DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
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E	2'-3"	R	6'-8"
F	9'-3"	S	8'-0"
G	1'-0"	T	1'-0"
H	0'-3"	U	5'-6"
I	1'-0"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	1'-8"
M	6'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 960 - 1800 GPD

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REVISIONS

1-29-07

ISSUED BY

BDS

DESIGNED BY

GLS

DRAWN BY

3-6-96

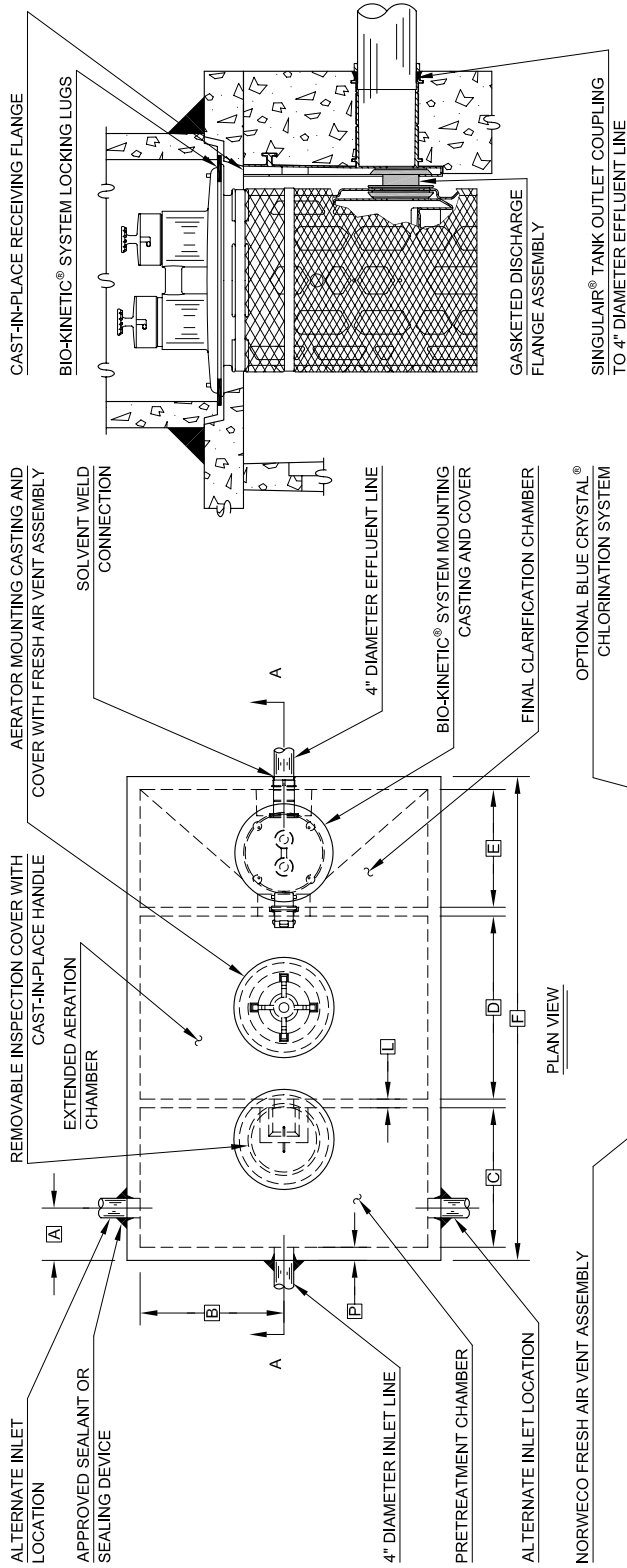
CHECKED BY

NTS

PC-5-7010

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,500 GALLONS CAPACITY, 22 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

NOTE: TOTAL SYSTEM CAPACITY: 3,400 GALLONS. RATED CAPACITY: 1,500 GALLONS PER DAY.



NORWECO FRESH AIR VENT ASSEMBLY

SINGULAIR® AERATOR
(SEE NOTE 1)

AERATOR MOUNTING CASTING

UNDERGROUND POWER SUPPLY ENTRANCE
(SEE AERATOR MOUNTING AND INSTALLATION
DETAIL DRAWING)

APPROVED SEALANT OR
SEALING DEVICE

PRETREATMENT CHAMBER

SUBMERGED TRANSFER PORT

EXTENDED AERATION CHAMBER

SECTION A-A

CAST-IN-PLACE AERATION
CHAMBER TRANSFER PORT

BIO-KINETIC® SYSTEM

FINAL CLARIFICATION CHAMBER

BIO-STATIC® SLUDGE RETURN

SINGULAIR® BIO-KINETIC®
SYSTEM DISCHARGE
(SEE DETAIL)

CASTING PICK-UP
GROOVE, TYPICAL

4" DIAMETER EFFLUENT LINE

SOLVENT WELD
CONNECTION

BIO-KINETIC® SYSTEM
MOUNTING CASTING
AND COVER

BIO-KINETIC® SYSTEM
LOCKING LUGS

OPTIONAL BIO-NEUTRALIZER®
DECHLORINATION SYSTEM

OPTIONAL BLUE CRYSTAL®
CHLORINATION SYSTEM

CAST-IN-PLACE RECEIVING FLANGE

BIO-KINETIC® SYSTEM LOCKING LUGS

GASKETED DISCHARGE
FLANGE ASSEMBLY

SINGULAIR® TANK OUTLET COUPLING
TO 4" DIAMETER EFFLUENT LINE

BIO-KINETIC® SYSTEM DISCHARGE DETAIL

BIO-KINETIC® SYSTEM MOUNTING
CASTING AND COVER

GROUT OR
SYNTHETIC SEAL

OUTLET END VIEW

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 600 GALLONS PER DAY

GENERAL NOTES:

- SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- TANK REINFORCED PER ACI STD. 318.
- REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- CONTACT THE LOCAL, LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
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DATE: _____

NAME: _____

CRITICAL DIMENSIONS	
A	1'-0"
B	3'-0"
C	2'-8"
D	3'-7"
E	2'-3"
F	9'-3"
G	1'-0"
H	5'-0"
I	0'-3"
J	0'-3"
K	1'-0"
L	0'-2"
M	4'-6"
N	0'-3"
O	0'-6"
P	0'-3"
Q	1'-4"
R	4'-8"
S	6'-0"
T	1'-0"
U	6'-0"
V	
W	
X	
Y	
Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM
MODEL INTOP - 600 GPD

THIS DOCUMENT IS THE PROPERTY OF NORWECO INC. IT IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED HEREON. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

REVISIONS

DATE: 6-21-07

BY: B

APPROVED BY: BDS

DATE: 2-15-06

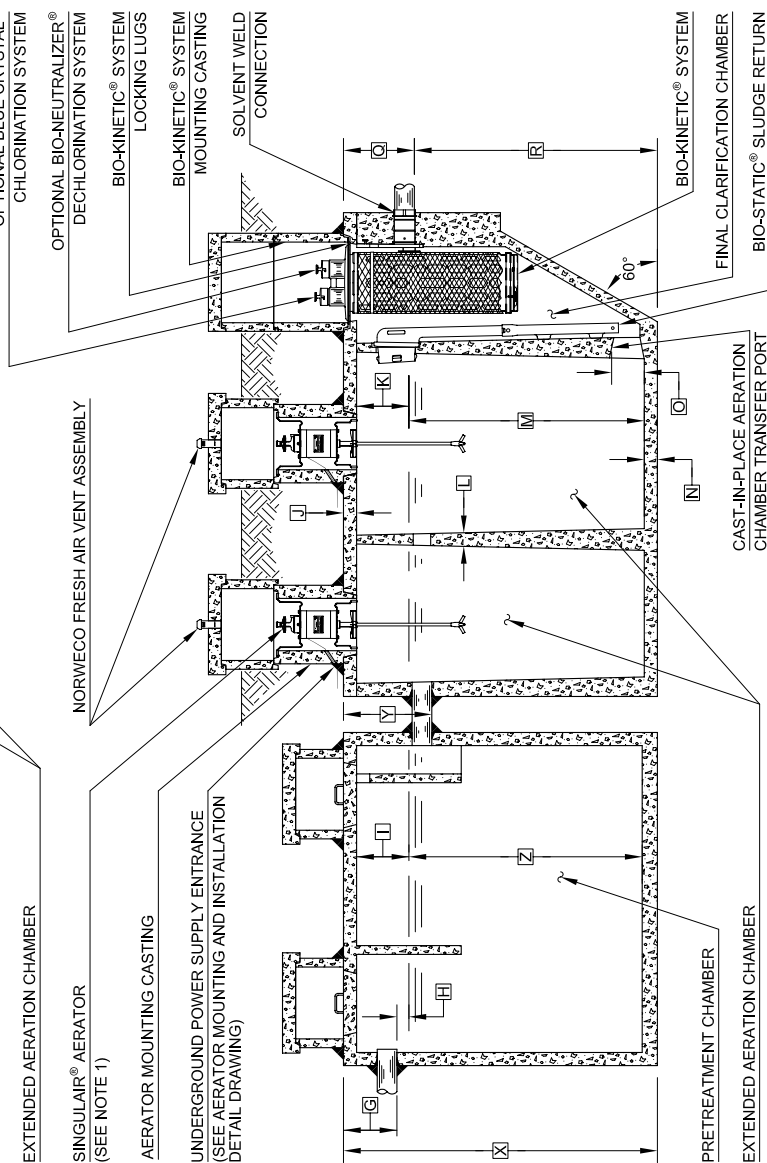
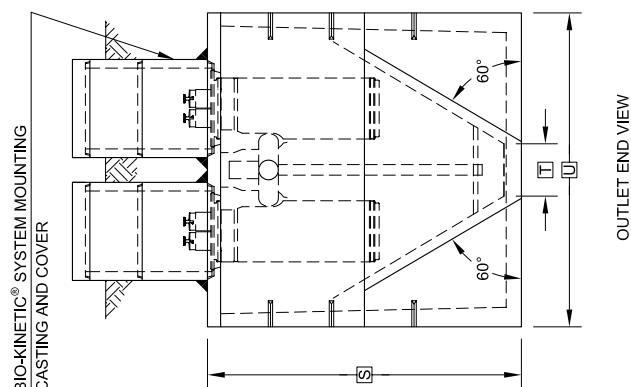
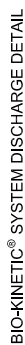
BY: JMM

DATE: _____

BY: NTS

PROJECT: PC-S-7071

- ① SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- ② FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- ③ ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- ④ TANK REINFORCED PER ACI STD. 318.
- ⑤ REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- ⑥ CONTACT THE LOCAL, LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.



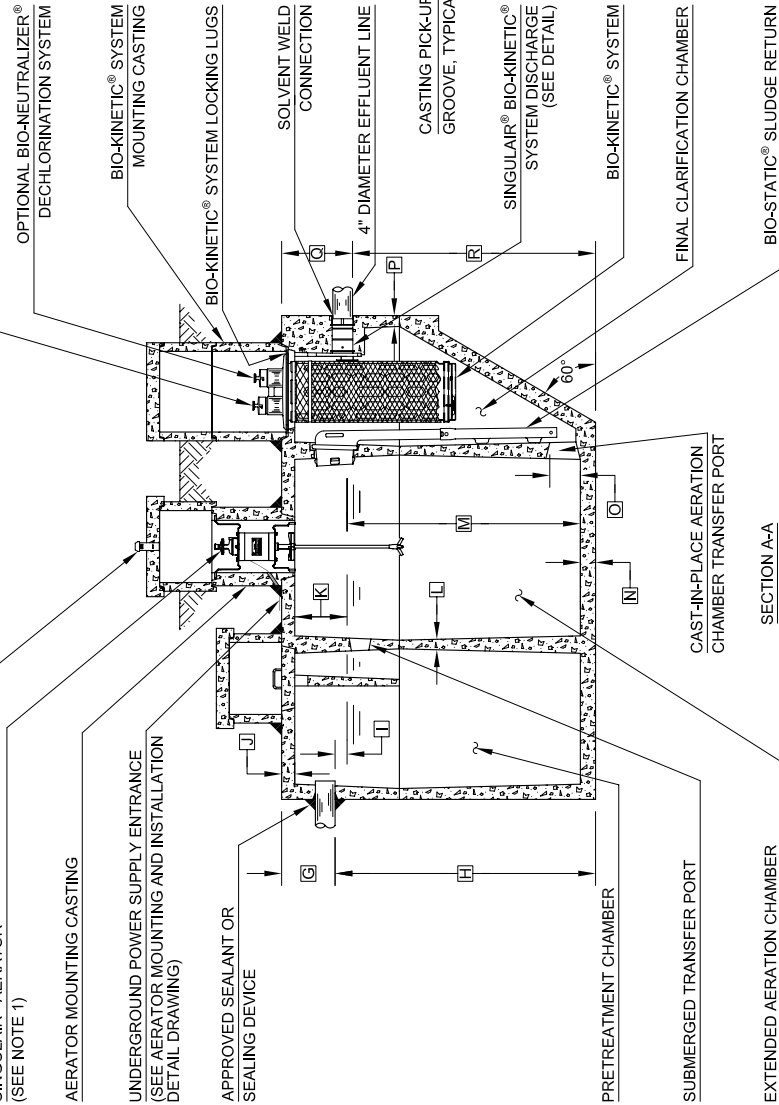
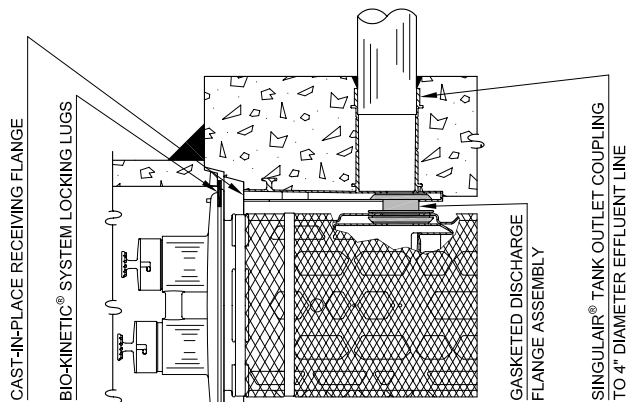
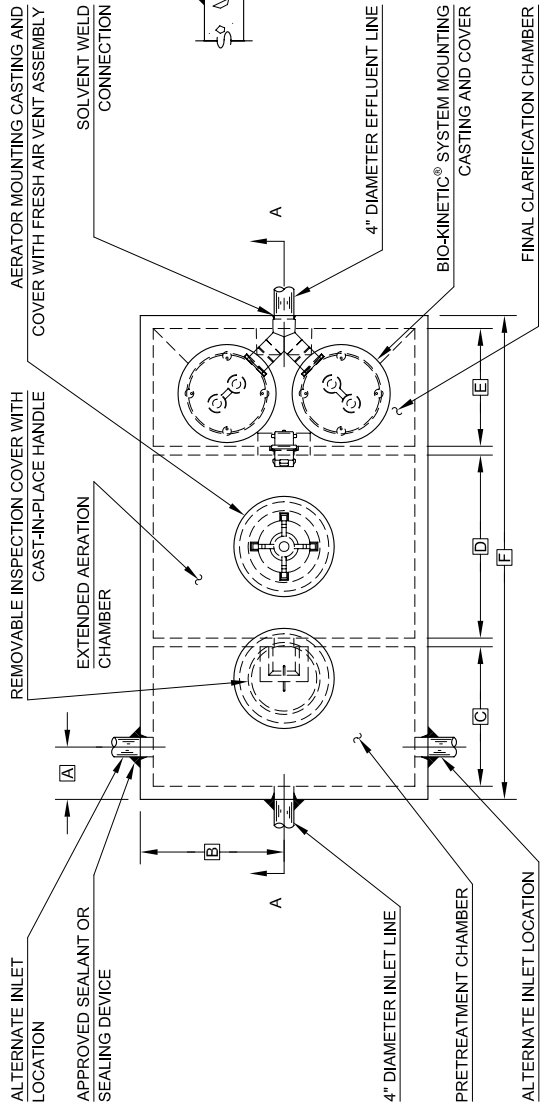
NOTE: TOTAL SYSTEM CAPACITY: 2,300 GALLONS
RATED CAPACITY: 1,000 GALLONS PER DAY

NOTE: SOME CRITICAL DIMENSIONS ARE
INTENTIONALLY LEFT BLANK TO BE FILLED
IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,000 GALLONS CAPACITY, 15 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

SECTION A-A

U.S. PATENT FORUM PATENTS PENDING		SINGULAR: BIO-KINETIC® SYSTEM TREATMENT SYSTEM MODEL TINTOP - 1000 GPD	DESIGN PATENT NO.	7-10-07	C
			APPROVED BY	JMM	BDS
			DATE	2-15-06	
			FOUR		NTS
			DATE	PC-5-7072	



GENERAL NOTES:

- SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
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NAME: _____

CONTRACTOR'S CERTIFICATION:
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DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	5'-8"
F	9'-3"	S	7'-0"
G	1'-0"	T	1'-0"
H	6'-0"	U	5'-6"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	5'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL INT-1-750 GPD

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REVISIONS: 6-25-07 B

DESIGNED BY: BDS

CHECKED BY: JMM

DATE: 2-16-06

DRAWN BY: NTS

PROJECT NO: PC-5-7065

- ① SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- ② FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
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- ⑥ CONTACT THE LOCAL, LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

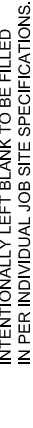


SINGULAIR® AERATOR

AERATOR MOUNTING CASTING

BIO-KINETIC® SYSTEM DISCHARGE DETAIL

NOTE: TOTAL SYSTEM CAPACITY: 2,300 GALLONS
RATED CAPACITY: 1,000 GALLONS PER DAY



SECTION A-A

NOTE: SOME CRITICAL DIMENSIONS ARE

**INTENTIONALLY LEFT BLANK TO BE FILLED
IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.**

CRITICAL DIMENSIONS	
A 1'-0"	N 0'-3"
B 2'-9"	O 0'-6"
C 2'-8"	P 0'-2 1/2"
D 3'-7"	Q 1'-4"
E 2'-3"	R 4'-8"
F 9'-3"	S 6'-0"
G 1'-0"	T 1'-0"
H 0'-3"	U 5'-6"
I 1'-0"	V
J 0'-3"	W
K 1'-0"	X
L 0'-2"	Y 1'-8"
M 4'-6"	Z

U.S. AND FOREIGN PATENTS PENDING	norweco [®]	RECEIVED DATE	B	BDS	
		ORDER NO.	6-25-07	JMM	
		APPROVED BY		JMM	
		DATE	2-16-08		
		SCALE			
		Drawn by	NTS		
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		© MMVI			

- ① SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- ② FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
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BIO-KINETIC® SYSTEM DISCHARGE DETAIL

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS
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NAME: _____

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DATE: _____

NAME: _____

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H	0'-3"
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J	0'-3"
K	1'-0"
L	0'-2"
M	5'-6"
N	0'-3"
O	0'-6"
P	0'-2 1/2"
Q	1'-4"
R	5'-8"
S	7'-0"
T	1'-0"
U	5'-6"
V	
W	
X	
Y	1'-8"
Z	

U.S.
AND
FOREIGN
PATENTS
PENDING

norweco™

norweco®	SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL TNT - 1250 GPD		APPROVED BY	BDS	RESIDUAL DATE	RESIDUAL
			DATE	JMM	6-25-07	B
			SIGNATURE	2-16-06		
				NTS		
<small> THE INFORMATION ON THIS PROPOSAL IS FOR INFORMATIONAL PURPOSES ONLY. IT DOES NOT CONSTITUTE AN OFFER OF ANY FINANCIAL PRODUCT. THE INFORMATION IS NOT A CONTRACT. THE INFORMATION IS NOT A CONTRACT. THE INFORMATION IS NOT A CONTRACT. </small>						



NOTE: TOTAL SYSTEM CAPACITY: 2,850 GALLONS
RATED CAPACITY: 1,250 GALLONS PER DAY

**NOTE: SOME CRITICAL DIMENSIONS ARE
INTENTIONALLY LEFT BLANK TO BE FILLED
IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.**

SECTION A-A

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,250 GALLONS CAPACITY, 16 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.














- ① SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
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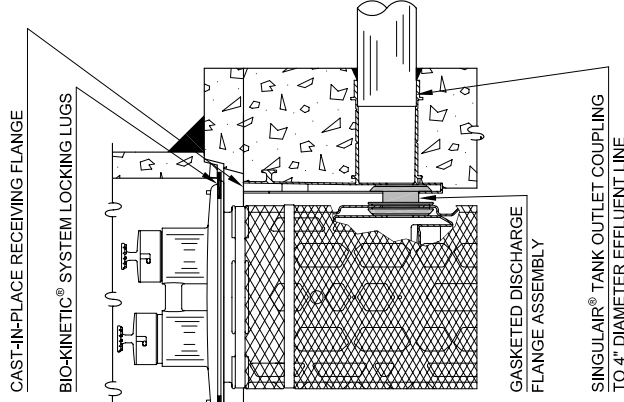
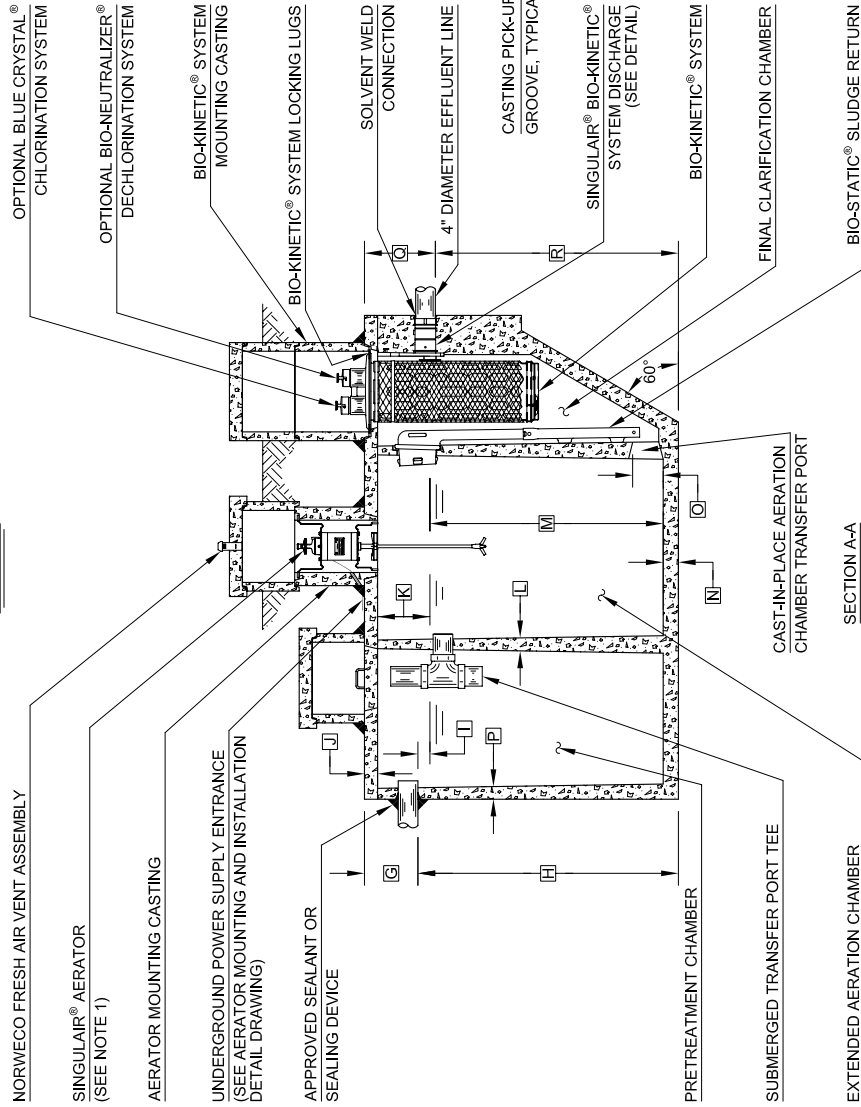
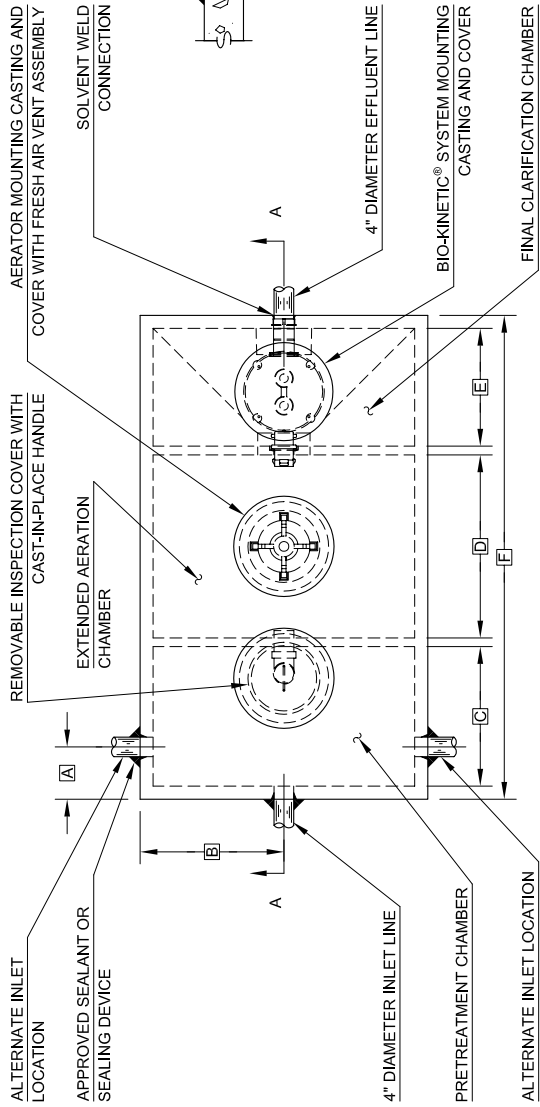


NOTE: TOTAL SYSTEM CAPACITY: 3,400 GALLONS
RATED CAPACITY: 1,500 GALLONS PER DAY

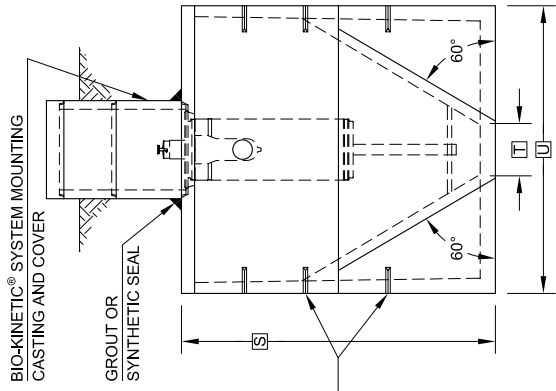
NAME: _____

CRITICAL DIMENSIONS	
	A 1'-0"
	B 2'-9"
	C 2'-8"
	D 3'-7"
	E 2'-3"
	F 9'-3"
	G 1'-0"
	H 0'-3"
	I 1'-0"
	J 0'-3"
	K 1'-0"
	L 0'-2"
	M 6'-6"

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BIO-KINETIC® SYSTEM DISCHARGE DETAIL



- GENERAL NOTES:
- SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
 - FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
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 - TANK REINFORCED PER ACI STD. 318-05.
 - REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
 - CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

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NAME: _____

CONTRACTOR'S CERTIFICATION:
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DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	3'-0"	O	0'-6"
C	2'-8"	P	0'-3"
D	3'-6"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	5'-0"	U	6'-0"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	4'-6"	Z	

norweco

U.S. AND FOREIGN PATENTS PENDING

SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 985 CP-500 GPD

U.S. PATENT NO. 6,123,456

U.S. PATENT NO. 6,123,457

U.S. PATENT NO. 6,123,458

U.S. PATENT NO. 6,123,459

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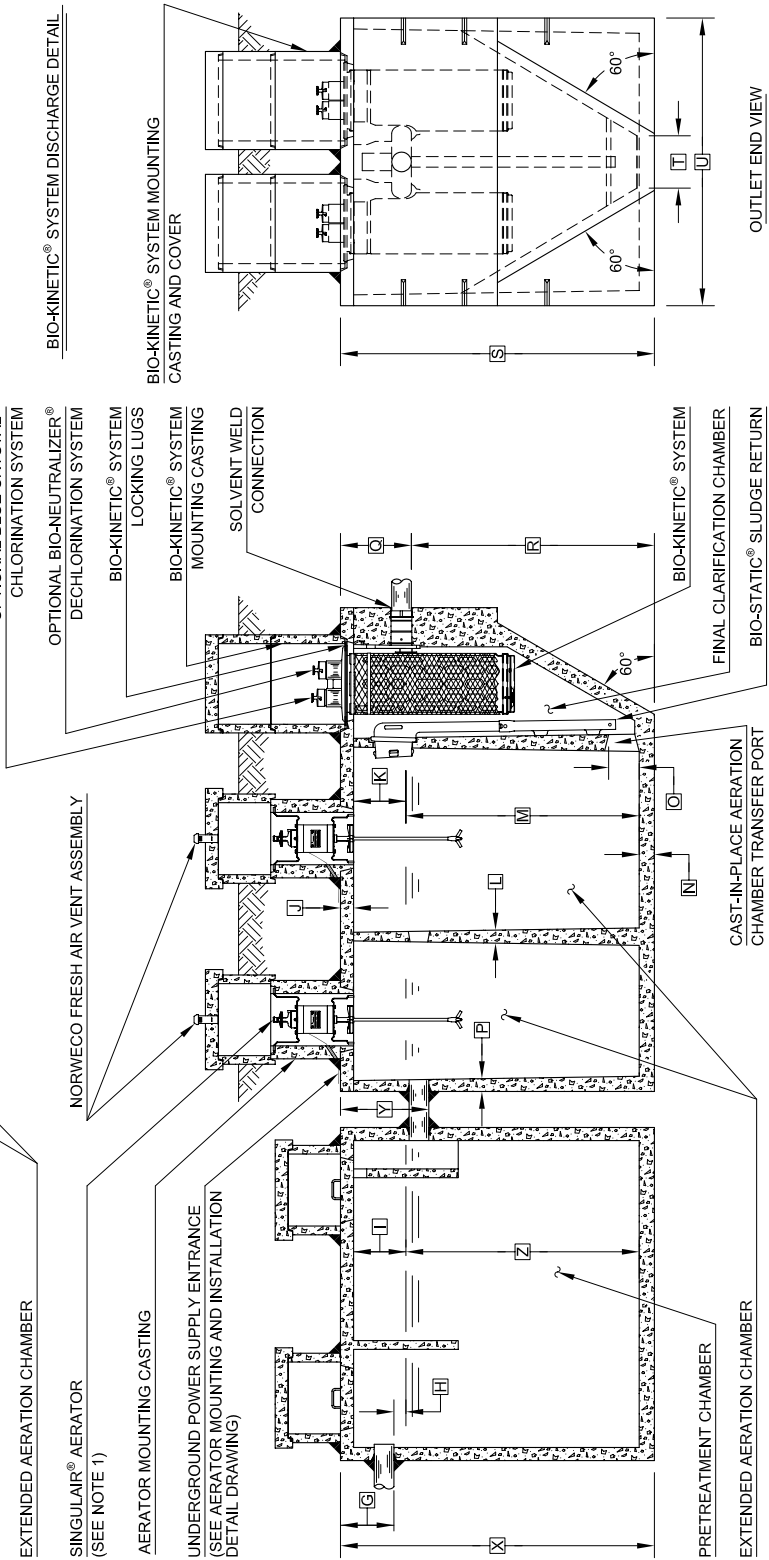
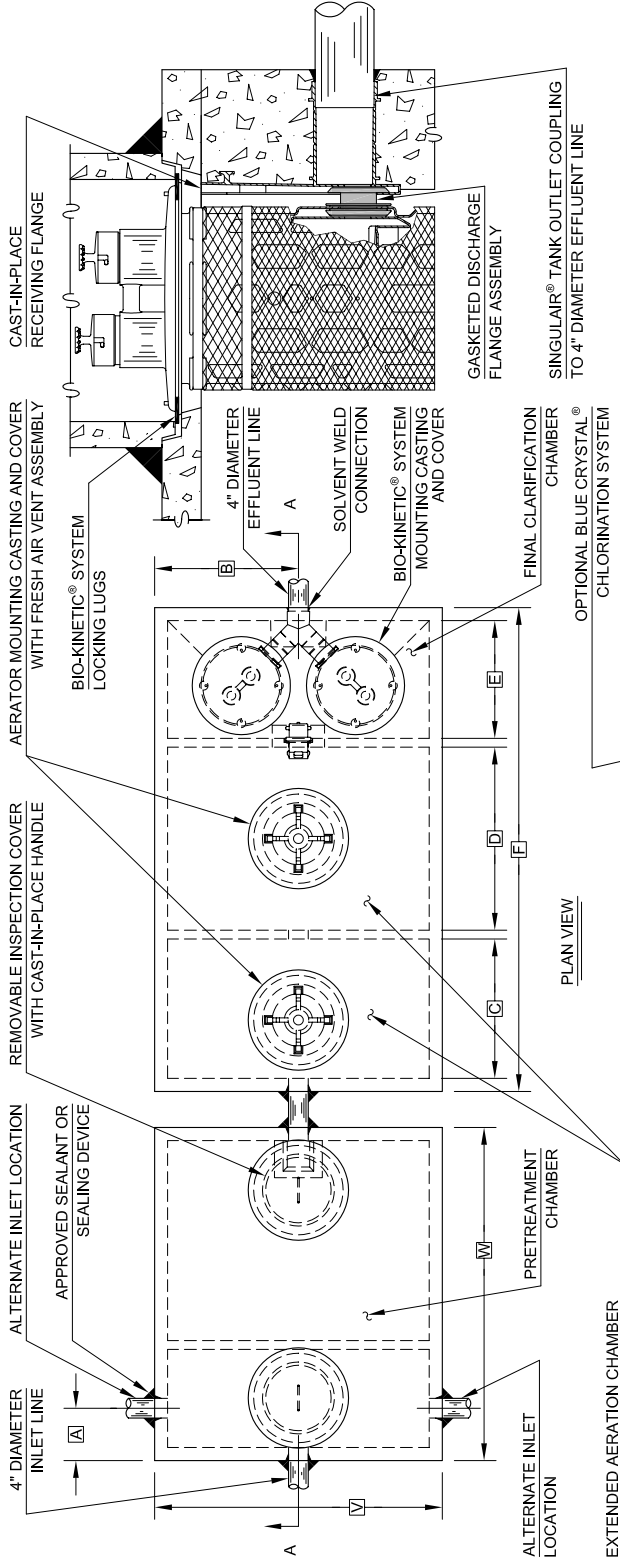
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U.S. PATENT



NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,000 GALLONS CAPACITY, 15 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

NOTE: SOME CRITICAL DIMENSIONS ARE INTENTIONALLY LEFT BLANK TO BE FILLED IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.

NOTE: TOTAL SYSTEM CAPACITY: 2,300 GALLONS
RATED CAPACITY: 1,000 GALLONS PER DAY

GENERAL NOTES:

- 1 SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
- 2 FALL THROUGH SINGULAR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- 4 TANK REINFORCED PER ACI STD. 318.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	3'-0"	O	0'-6"
C	2'-8"	P	0'-3"
D	3'-6"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	0'-3"	U	6'-0"
I	1'-0"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	1'-8"
M	4'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 980 GP-1000 GPD

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REVISIONS

DATE: 7-10-07

BY: J

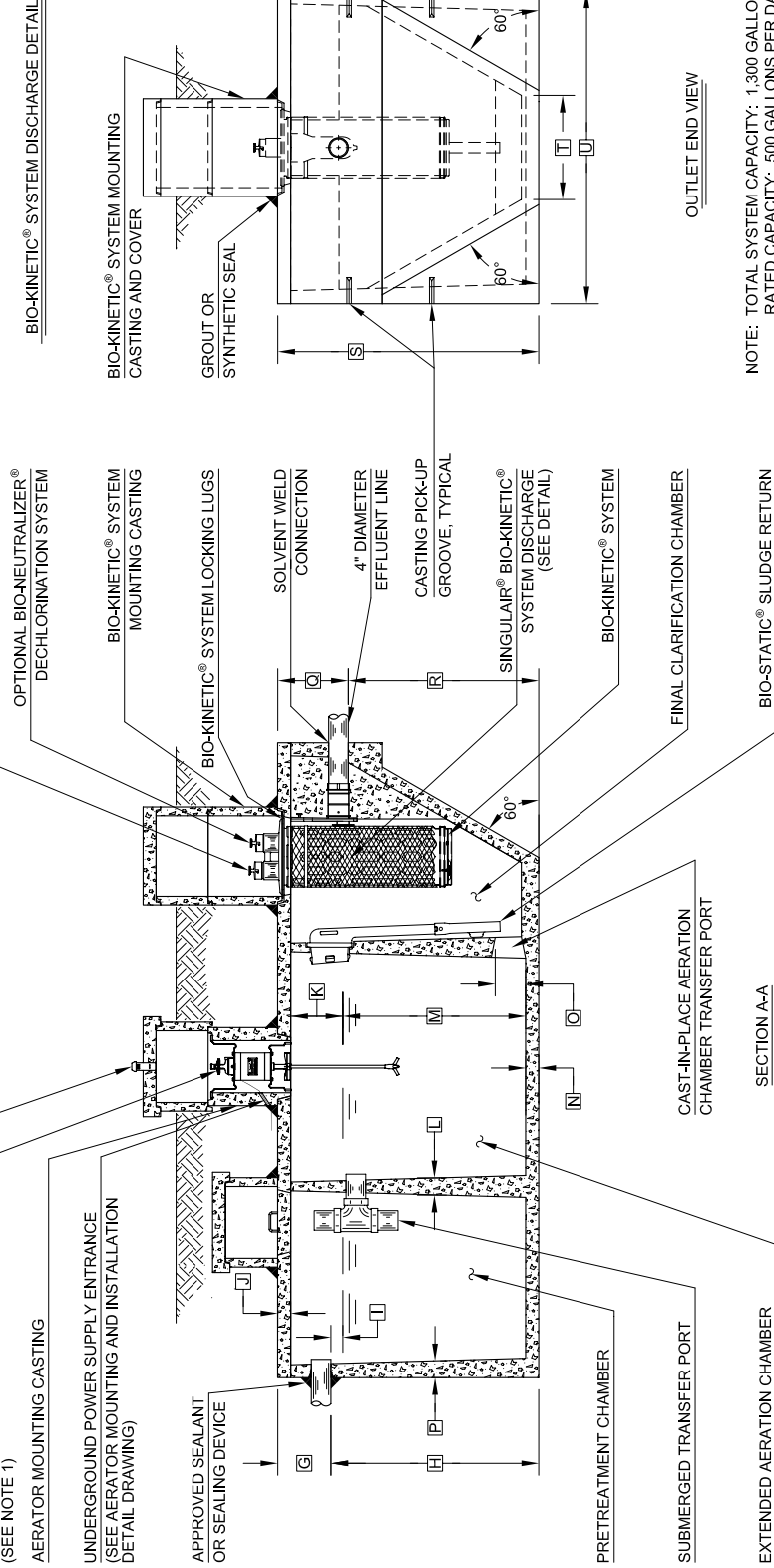
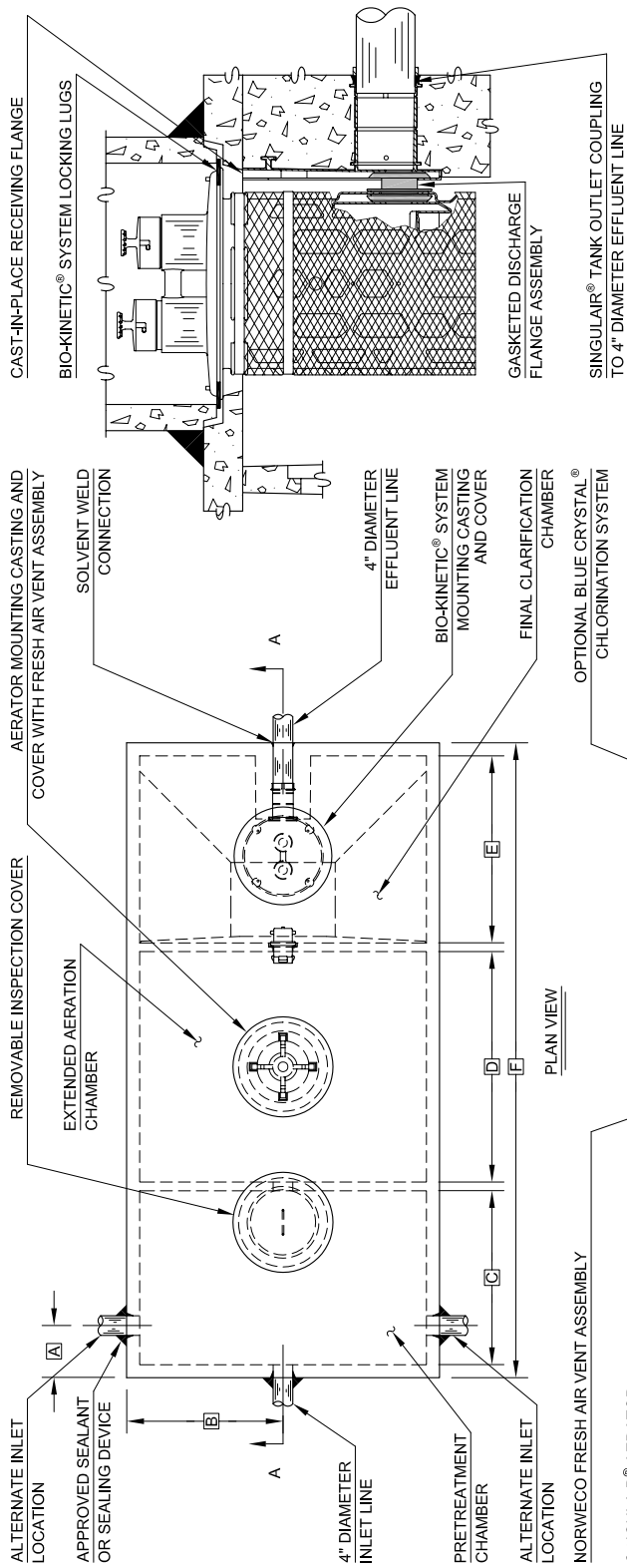
APPROVED BY: BDS

DATE: 8-1-01

BY: JMM

APPROVED BY: NTS

DATE: PC-5-9667



GENERAL NOTES:

- 1 SINGLAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- 2 FALL THROUGH SINGLAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE.
- 4 TANK REINFORCED PER ACI STD. 318-05.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL, LICENSED SINGLAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	3'-0"	O	0'-6"
C	3'-4"	P	0'-3"
D	4'-5"	Q	1'-4"
E	3'-7"	R	3'-8"
F	12'-2"	S	5'-0"
G	1'-0"	T	2'-0"
H	4'-0"	U	6'-0"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	3'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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LOW-PROFILE SINGLAIR® BIO-KINETIC® WASTEWATER AERATOR MOUNTING CASTING MODEL INTLP-500 GPD

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REVISIONS

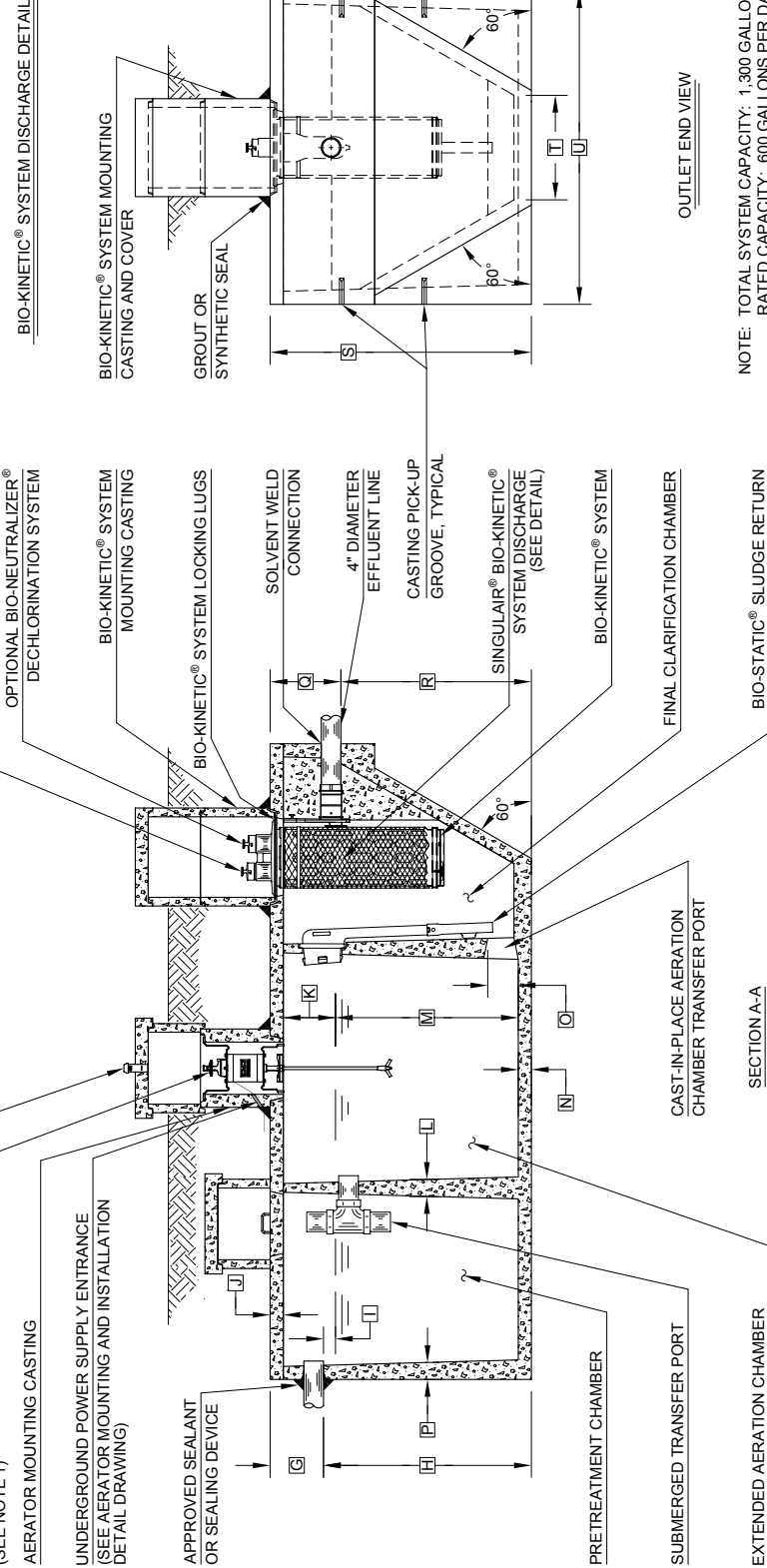
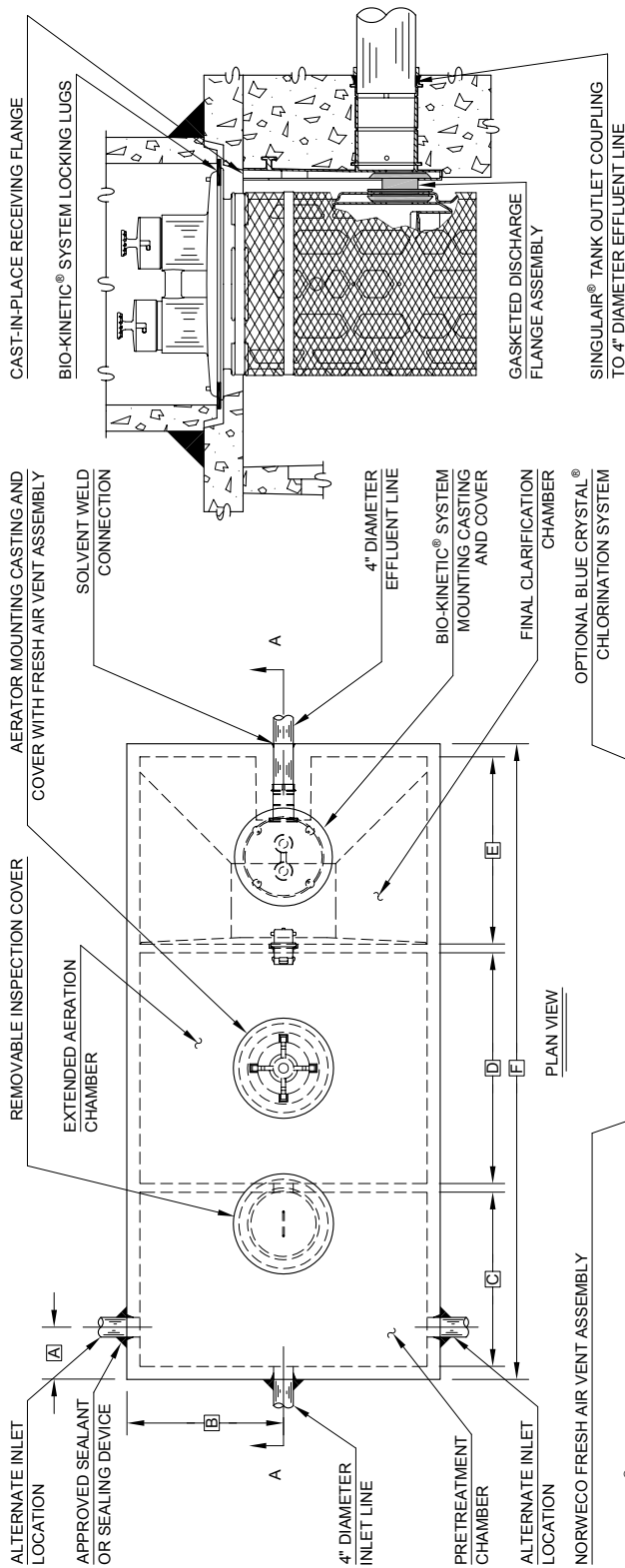
NO.	DATE	DESCRIPTION
1	3-26-07	BDS
2		JMM

DATE: 10-16-06

DRAWN BY: NTS

PROJECT: PC-57091

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 500 GALLONS PER DAY



GENERAL NOTES:

- 1 SINGULAR[®] AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- 2 FALL THROUGH SINGULAR[®] PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC[®] SYSTEM MOUNTING CASTING TO GRADE.
- 4 TANK REINFORCED PER ACI STD. 318-05.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL, LICENSED SINGULAR[®] DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	3'-0"	O	0'-6"
C	3'-4"	P	0'-3"
D	4'-5"	Q	1'-4"
E	3'-7"	R	3'-8"
F	12'-2"	S	5'-0"
G	1'-0"	T	2'-0"
H	4'-0"	U	6'-0"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	3'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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LOW-PROFILE SINGULAR[®] BIO-KINETIC[®] WASTEWATER TREATMENT SYSTEM
MODEL TNLP-600 GPD

THIS DRAWING IS THE PROPERTY OF NORWECO. IT IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED HEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF NORWECO.

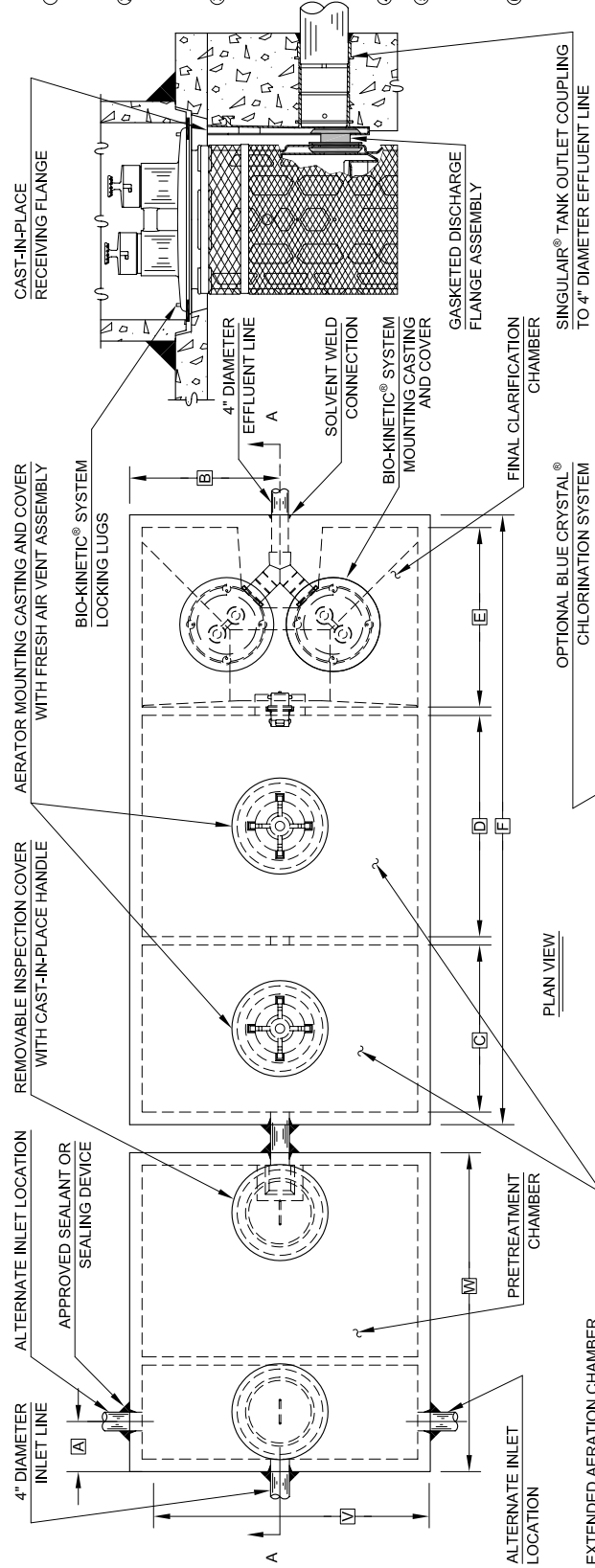
REVISIONS

NO.	DATE	BY	DESCRIPTION
1	3-26-07	B	BDS
2		JMM	JMM
3	10-16-06		NTS

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 600 GALLONS PER DAY

GENERAL NOTES:

- 1 SINGULAR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- 2 FALL THROUGH SINGULAR® PLANT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- 4 TANK REINFORCED PER ACI STD. 318.
- 5 REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- 6 CONTACT THE LOCAL, LICENSED SINGULAR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.



PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.
DATE: _____
NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.
DATE: _____
NAME: _____

CRITICAL DIMENSIONS	
A	1'-0"
B	3'-0"
C	3'-4"
D	4'-5"
E	3'-7"
F	12'-2"
G	1'-0"
H	1'-0"
I	0'-3"
J	0'-3"
K	1'-0"
L	0'-2"
M	3'-6"
N	0'-3"
O	0'-6"
P	0'-3"
Q	1'-4"
R	3'-8"
S	5'-0"
T	2'-0"
U	6'-0"
V	
W	
X	
Y	1'-8"
Z	

OUTLET END VIEW

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1,000 GALLONS CAPACITY, 15 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

NOTE: SOME CRITICAL DIMENSIONS ARE INTENTIONALLY LEFT BLANK TO BE FILLED IN PER INDIVIDUAL JOB SITE SPECIFICATIONS.

NOTE: TOTAL SYSTEM CAPACITY: 2,300 GALLONS. RATED CAPACITY: 1,000 GALLONS PER DAY

U.S. AND FOREIGN PATENTS PENDING

© MAY 11

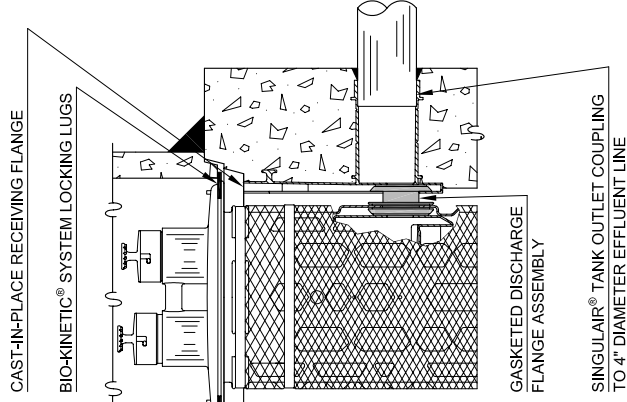
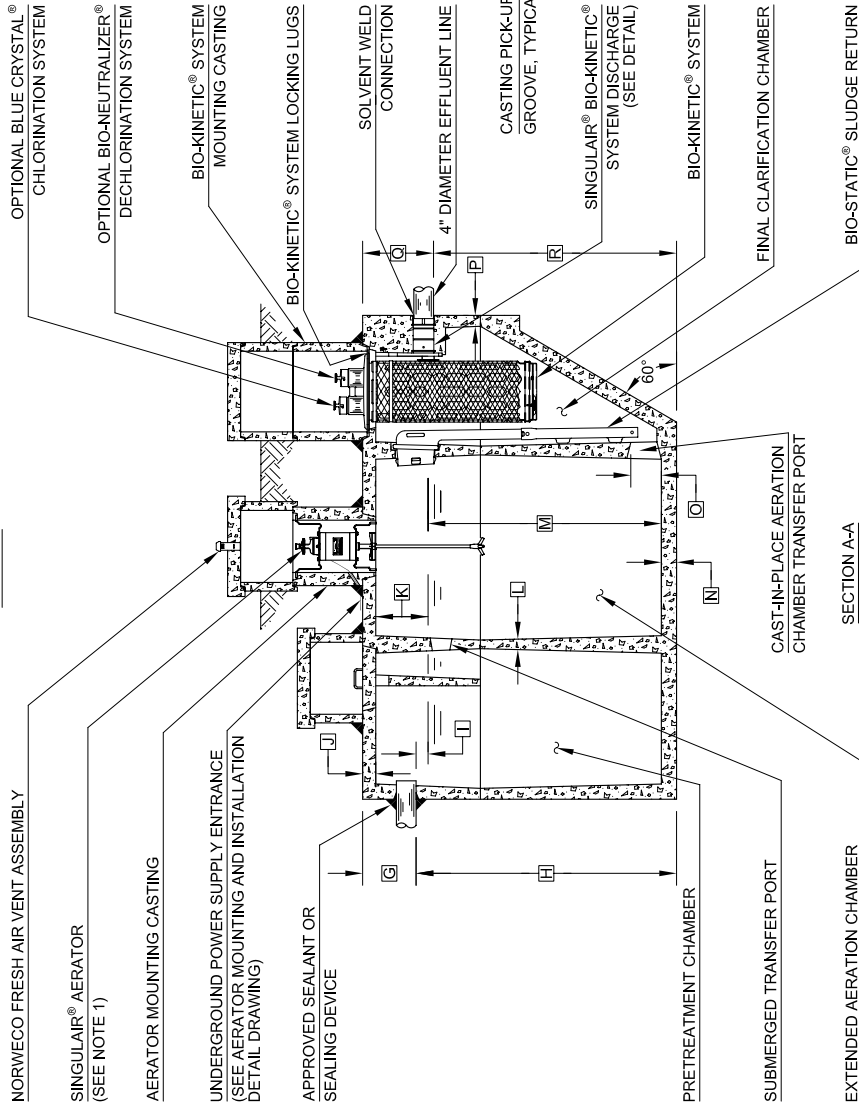
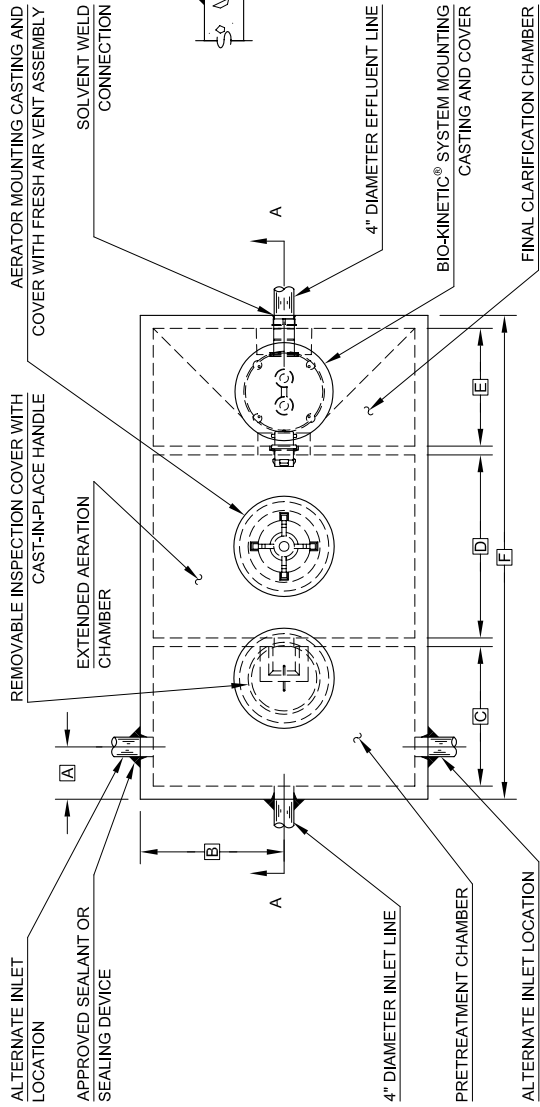
norweco

LOW PROFILE SINGULAR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM
MODEL TMTLP-1000 GPD

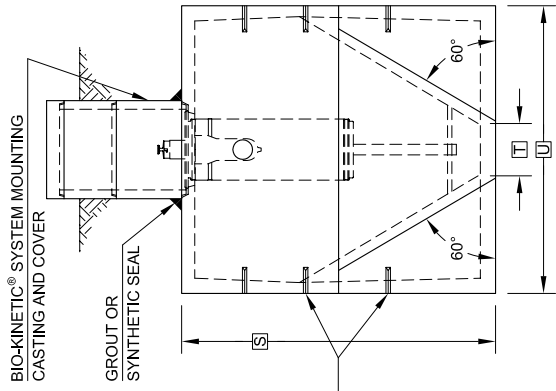
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REVISIONS
REVISION NO. 7-10-07
REVISION BY C

BDS
JMM
11-07-06
NTS
PC-5-7093



BIO-KINETIC® SYSTEM DISCHARGE DETAIL



GENERAL NOTES:

- SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- TANK REINFORCED PER ACI STD. 318.
- REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
- CONTACT THE LOCAL, LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

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DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	5'-0"	U	5'-6"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	4'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL NT-800 GPD

THIS DOCUMENT IS THE PROPERTY OF NORWECO. IT IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED HEREON. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

DATE: 2-17-09

DESIGNER: BDS

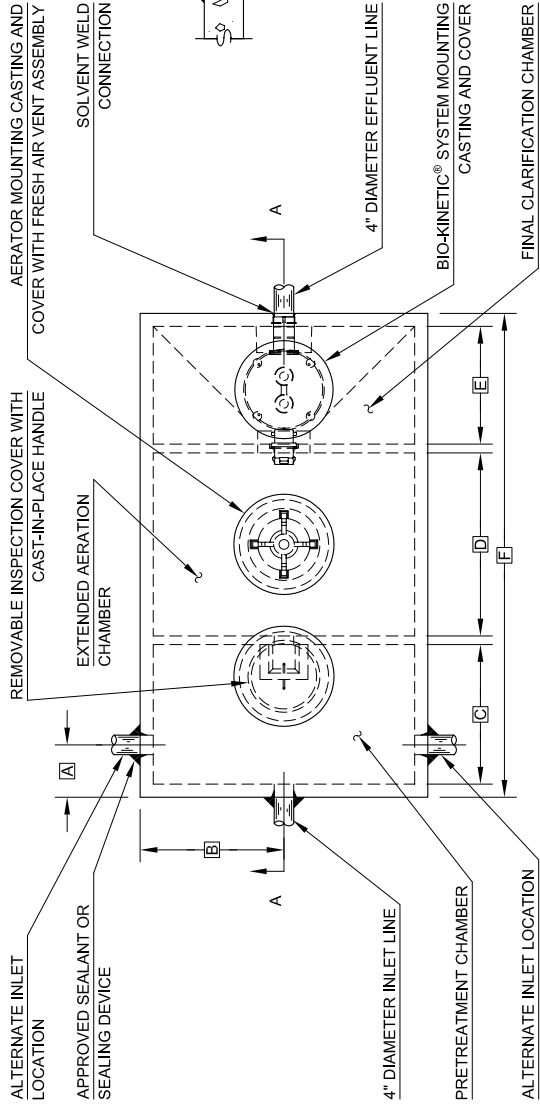
CHECKED: JMM

DATE: 1-25-06

SCALE: NTS

PROJECT: PC-5-7059

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 500 GALLONS PER DAY



NORWECO FRESH AIR VENT ASSEMBLY

SINGULAIR® AERATOR (SEE NOTE 1)

AERATOR MOUNTING CASTING

UNDERGROUND POWER SUPPLY ENTRANCE (SEE AERATOR MOUNTING AND INSTALLATION DETAIL DRAWING)

APPROVED SEALANT OR SEALING DEVICE

PRETREATMENT CHAMBER

SUBMERGED TRANSFER PORT

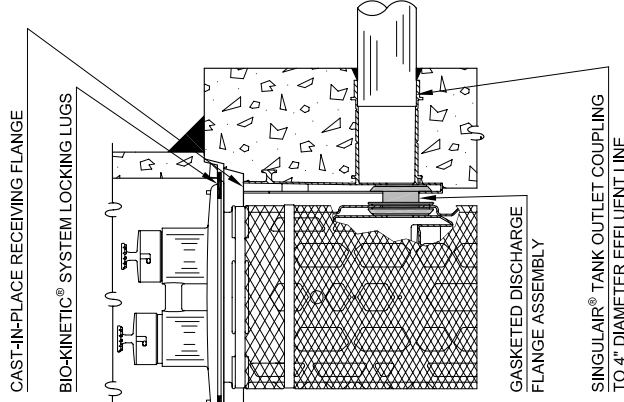
EXTENDED AERATION CHAMBER

CAST-IN-PLACE AERATION CHAMBER TRANSFER PORT

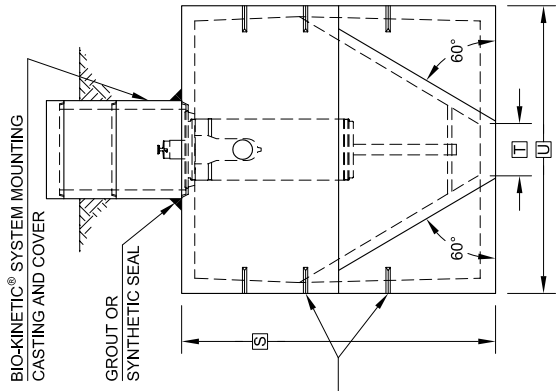
FINAL CLARIFICATION CHAMBER

BIO-STATIC® SLUDGE RETURN

SECTION A-A



BIO-KINETIC® SYSTEM DISCHARGE DETAIL



GENERAL NOTES:

- 1 SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- 2 FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- 3 ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
- 4 TANK REINFORCED PER ACI STD. 318.
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- 6 CONTACT THE LOCAL, LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

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DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'-0"	N	0'-3"
B	2'-9"	O	0'-6"
C	2'-8"	P	0'-2 1/2"
D	3'-7"	Q	1'-4"
E	2'-3"	R	4'-8"
F	9'-3"	S	6'-0"
G	1'-0"	T	1'-0"
H	5'-0"	U	5'-6"
I	0'-3"	V	
J	0'-3"	W	
K	1'-0"	X	
L	0'-2"	Y	
M	4'-6"	Z	

U.S. AND FOREIGN PATENTS PENDING

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SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL NT1 - 600 GPD

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REVISIONS: 6-21-07 B

DESIGNED BY: BDS

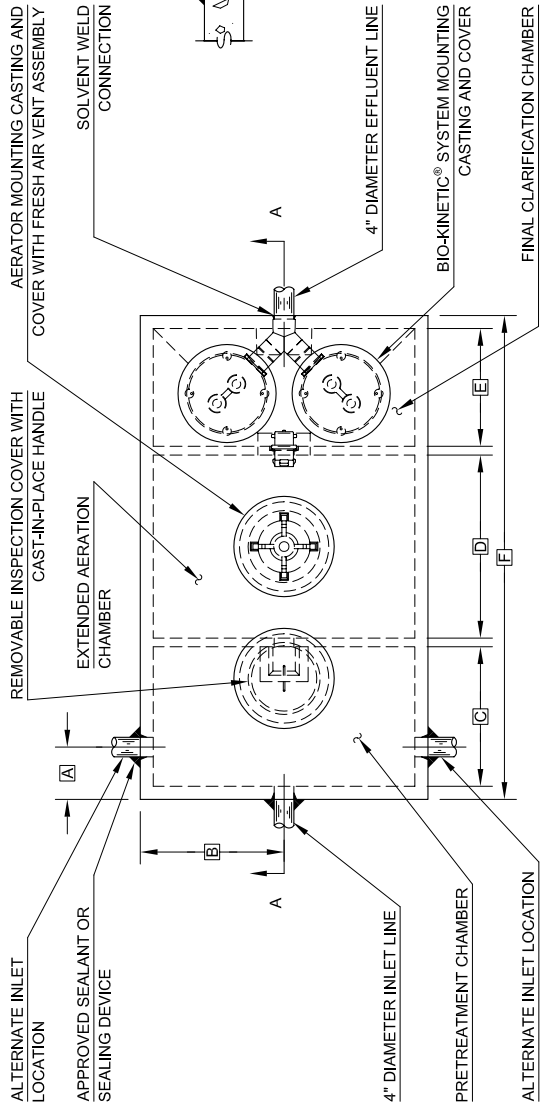
CHECKED BY: JMM

DATE: 2-16-06

DRAWN BY: NTS

PROJECT NO: PC-5-7064

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 600 GALLONS PER DAY



NORWECO FRESH AIR VENT ASSEMBLY

SINGULAIR® AERATOR (SEE NOTE 1)

AERATOR MOUNTING CASTING

UNDERGROUND POWER SUPPLY ENTRANCE (SEE AERATOR MOUNTING AND INSTALLATION DETAIL DRAWING)

APPROVED SEALANT OR SEALING DEVICE

PRETREATMENT CHAMBER

SUBMERGED TRANSFER PORT

EXTENDED AERATION CHAMBER

SECTION A-A

CAST-IN-PLACE AERATION CHAMBER TRANSFER PORT

BIO-KINETIC® SYSTEM

FINAL CLARIFICATION CHAMBER

BIO-STATIC® SLUDGE RETURN

SINGULAIR® BIO-KINETIC® SYSTEM DISCHARGE (SEE DETAIL)

CASTING PICK-UP GROOVE, TYPICAL

4" DIAMETER EFFLUENT LINE

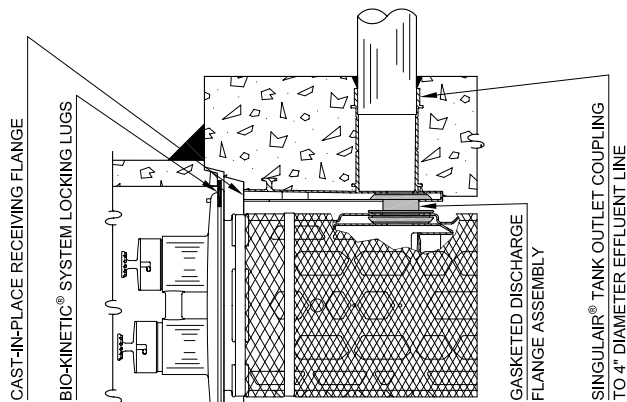
SOLVENT WELD CONNECTION

BIO-KINETIC® SYSTEM MOUNTING CASTING

BIO-KINETIC® SYSTEM LOCKING LUGS

OPTIONAL BLUE CRYSTAL® CHLORINATION SYSTEM

OPTIONAL BIO-NEUTRALIZER® DECHLORINATION SYSTEM



BIO-KINETIC® SYSTEM DISCHARGE DETAIL

BIO-KINETIC® SYSTEM MOUNTING CASTING AND COVER

OUTLET END VIEW

60°

60°

S

T

U

V

W

X

Y

Z

CRITICAL DIMENSIONS

A 1'-0"

B 0'-3"

C 2'-9"

D 0'-6"

E 0'-2 1/2"

F 0'-4"

G 1'-4"

H 2'-3"

I 9'-3"

J 7'-0"

K 1'-0"

L 6'-0"

M 0'-3"

N 0'-3"

O 0'-3"

P 1'-0"

Q 5'-6"

R 5'-8"

S 7'-0"

T 1'-0"

U 5'-6"

V 0'-3"

W 0'-3"

X 1'-0"

Y 0'-2"

Z 5'-6"

GENERAL NOTES:

- SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF, OPERATING 60 MINUTES ON / 60 MINUTES OFF.
- FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
- ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
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- CONTACT THE LOCAL LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
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DATE: _____

NAME: _____

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J	7'-0"
K	1'-0"
L	6'-0"
M	0'-3"
N	0'-3"
O	0'-3"
P	1'-0"
Q	5'-6"
R	5'-8"
S	7'-0"
T	1'-0"
U	5'-6"
V	0'-3"
W	0'-3"
X	1'-0"
Y	0'-2"
Z	5'-6"

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SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL INT-1-750 GPD

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REVISIONS: 6-21-07 B

DESIGNED BY: BDS

DRAWN BY: JMM

DATE: 2-16-06

CHECKED BY: NTS

PROJECT: PC-5-7066

NOTE: TOTAL SYSTEM CAPACITY: 1,600 GALLONS
RATED CAPACITY: 800 GALLONS PER DAY

