Design Manual

Norweco Singulair® Bio-Kinetic® DN and Singulair Green® Bio-Kinetic® DN Wastewater Treatment Systems

12/21/17

DESIGN OF THE SINGULAIR® BIO-KINETIC® DN AND SINGULAIR GREEN® BIO-KINETIC® DN NITROGEN REDUCING WASTEWATER TREATMENT SYSTEM

Singulair® Bio-Kinetic® DN 500, 750, 1,000, 1,250 and 1,500 GPD
and Singulair Green® Bio-Kinetic® DN 500

VENDOR INFORMATION

The concrete Singulair® Bio-Kinetic® DN is a modified version of the Singulair® Bio-Kinetic® system, consisting of the following components:

1. Reinforced precast three-compartmented concrete tank or HDPE
2. Reinforced precast concrete anaerobic tank (for 1,000 GPD, 1,250 GPD, and 1,500 GPD systems)
3. Aerator(s)
4. Bio-Kinetic® System(s)
5. Recirculation well
6. Controls and timer

The system is certified for Nitrogen reduction by the Rhode Island Department of Environmental Management for design flows up to 1,500 GPD. The Singulair Green® Bio-Kinetic® DN is certified to 600 GPD capacity only. It has the addition of a recirculation well with timer. The design and the installation of the Singulair® Bio-Kinetic® DN and Singulair Green® Bio-Kinetic® DN is very similar to that of the Singulair® Bio-Kinetic® and Singulair Green® Bio-Kinetic® Model 960. The differences are explained in this guidance document.

TREATMENT PROCESS DESCRIPTION

The Singulair® Bio-Kinetic® DN system have been designed to treat residential strength wastewater. The treatment process begins with flow entering the pretreatment chamber. Anaerobic bacteria in the wastewater begin the treatment process. This portion of the Singulair® Bio-Kinetic® system functions much like a septic tank. A scum layer will form at the surface and a sludge blanket at the bottom of the chamber. The aeration chamber is where aerobic bacteria oxidize the organic matter in the aeration chamber into harmless gases and liquids. The aerator draws air into the chamber and mixes the contents thoroughly. Oxygen supports the life cycle of the large food chain of micro-organisms that digest the pollutants. The clarification chamber provides a zone where activated sludge and mixed solids can settle to the bottom of the chamber. The bottom half of the clarification chamber is formed into a hopper with sloping walls that direct solids into the sludge return zone where they are returned to the aeration chamber for further treatment. Effluent is mixed with nitrified liquid recirculated from the recirculation well in measured doses back to the pretreatment chamber. Under carefully controlled conditions, bacteria remove nitrogen by consuming nitrate-bound oxygen during their respiratory process. The biomass in the pretreatment chamber is maintained to insure consistent biological denitrification.

DESIGN OF THE SINGULAIR® BIO-KINETIC® DN AND SINGULAIR GREEN® BIO-KINETIC® DN NITROGEN REDUCING WASTEWATER TREATMENT SYSTEM

Singulair® Bio-Kinetic® DN 500, 750, 1,000, 1,250 and 1,500 GPD
and Singulair Green® Bio-Kinetic® DN 500

TREATMENT SYSTEM DESIGN

In the design of the Singulair® Bio-Kinetic® DN and Singulair Green® Bio-Kinetic® systems the following special requirements are to be followed:

1. Selection of the applicable system is based on the design flows. The following is recommended:

Model Number	Number of Bedrooms	Daily Design Flow Range GPD	System Size (GPD)	System Capacity (Gallons)
Singulair® Bio-Kinetic® DN 500 GPD Singulair Green® Bio-Kinetic® DN 500 GPD	3, 4, 5	Up to 600	600	1300
Singulair® Bio-Kinetic® DN 750 GPD	6	601 - 800	800	1600
Singulair® Bio-Kinetic® DN 1000 GPD	7, 8	801 - 1000	1000	2300
Singulair® Bio-Kinetic® DN 1250 GPD	9, 10	1001 - 1250	1250	2850
Singulair® Bio-Kinetic® DN 1500 GPD	11	1251 - 1500	1500	3400

2. The tanks can be installed in parallel to meet the design flow requirements. The system sizing chart still applies.
3. The Singulair Green® Bio-Kinetic® DN system is installed with a maximum of 3’ of fill on top of the tank. This tank is manufactured of high-density polyethylene. Special consideration should be taken if the Singulair Green tank is buried deeper than 18 1/2" below grade. However, the tank should never be buried deeper than 36 1/2" below grade. If deep burial is required, first fill the tank with 12" of clean ballast water. Next, backfill around the entire tank with gravel up to the base of the risers. Once gravel is in place, fill the tank with clean water to the design flow line. Finally, backfill to grade with native soil. For deeper installations, see the Tank Delivery and Setting Instructions.

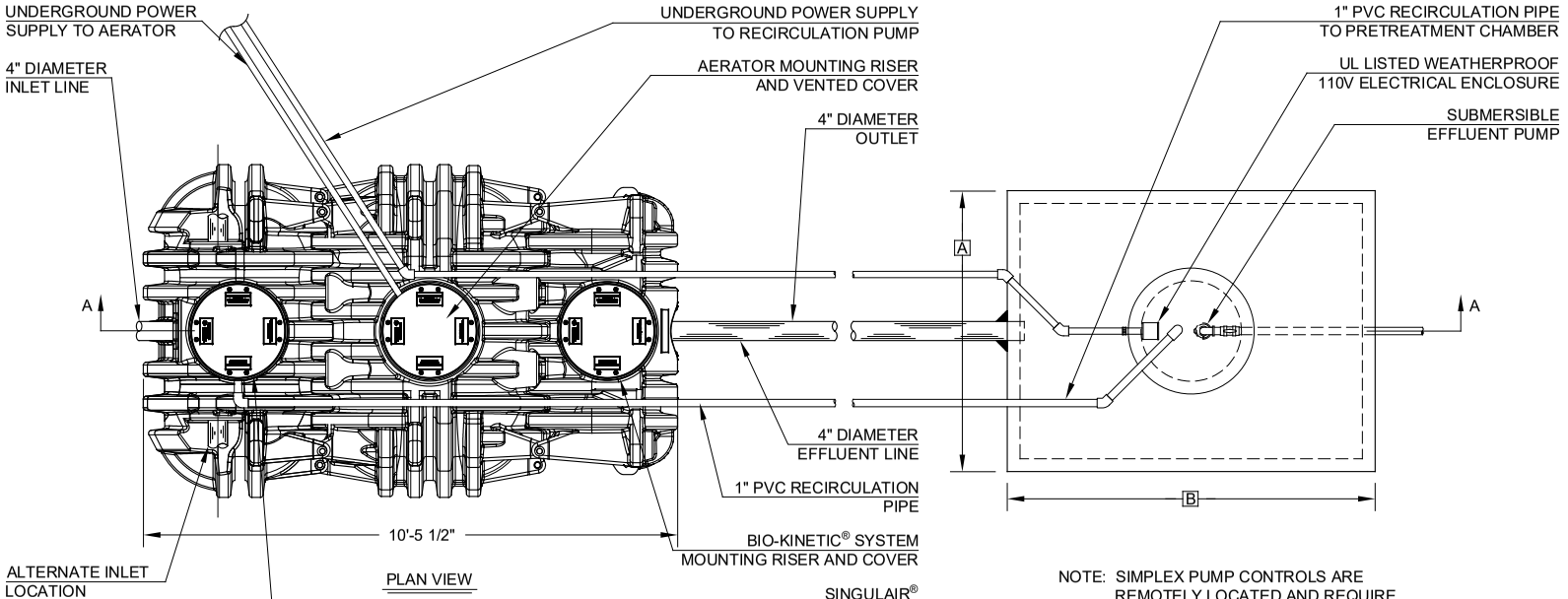
4. In areas where high water is a concern, it may be necessary to provide additional anti-flotation measures to secure the Singulair Green® Bio-Kinetic® DN tank. Anti-flotation is not required when the tank is installed with at least 18" of fill over the tank and the soil density of the backfill is at least 100 pounds per cubic foot.
5. The drop in invert elevations between the inlet and the outlet of the Singulair® Bio-Kinetic® DN tank is always 4”, irrespective of the system size.
6. A pretreatment tank is required for the 1,000, 1,250 and 1,500 GPD systems.

System Size (GPD)	Pretreatment Tank Minimum Requirement (Gallons)
1000	1000
1250	1250
1500	1500

7. NSF rated Class I, after successfully completing the NSF/ANSI Standard 40 test protocol; the Singulair® system averaged effluent of 4 mg/L CBOD, 9 mg/L TSS and 12 mg/L Total Nitrogen.
8. A recirculation well is required immediately downstream from the Singulair® Bio-Kinetic® DN treatment system.
9. The electrical components include a running time clock, to be wired as indicated on the wiring diagrams.

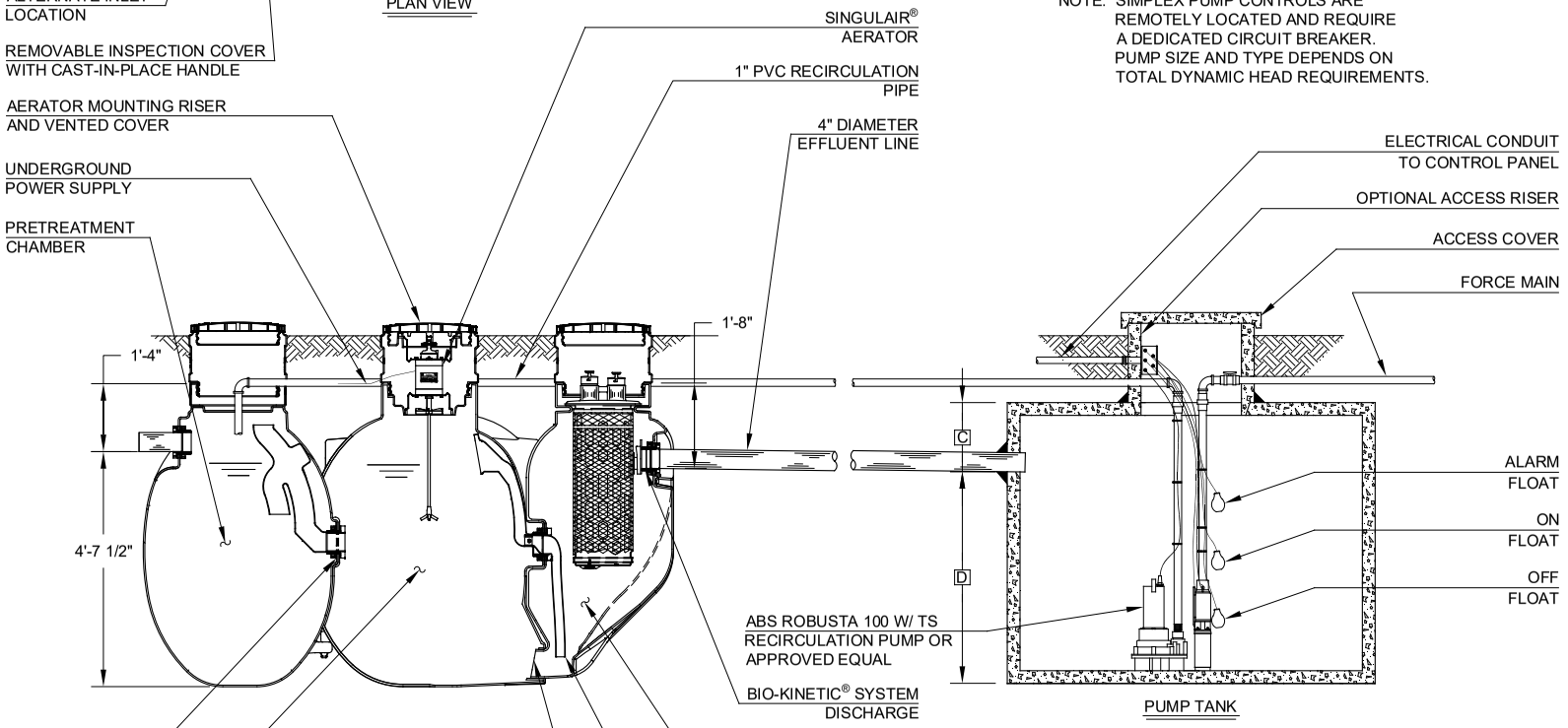
Note: Providing extra capacity in the system is not recommended. The Singulair® Bio-Kinetic® DN will operate better when slightly overloaded than significantly under loaded.

If you require any additional information on the Singulair® Bio-Kinetic® DN system please contact Norweco, Inc. at customerservice@norweco.com.



PLAN VIEW

NOTE: SIMPLEX PUMP CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.



SECTION A-A

PUMP TANK

NOTE: SOME CRITICAL DIMENSIONS ARE INTENTIONALLY LEFT BLANK TO BE FILLED IN PER INDIVIDUAL JOB SITE SPECIFICATIONS. TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 500/600 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② SINGULAIR GREEN SYSTEMS CANNOT BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING.

③ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

④ SINGULAIR GREEN HDPE TANKS MEET ALL RIDEM AND MADEP REQUIREMENTS.

⑤ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

⑥ FOR CONDITIONS WITH HIGH WATER TABLE, BOUYANCY COMPUTATIONS ARE AVAILABLE FROM NORWECO UPON REQUEST.

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

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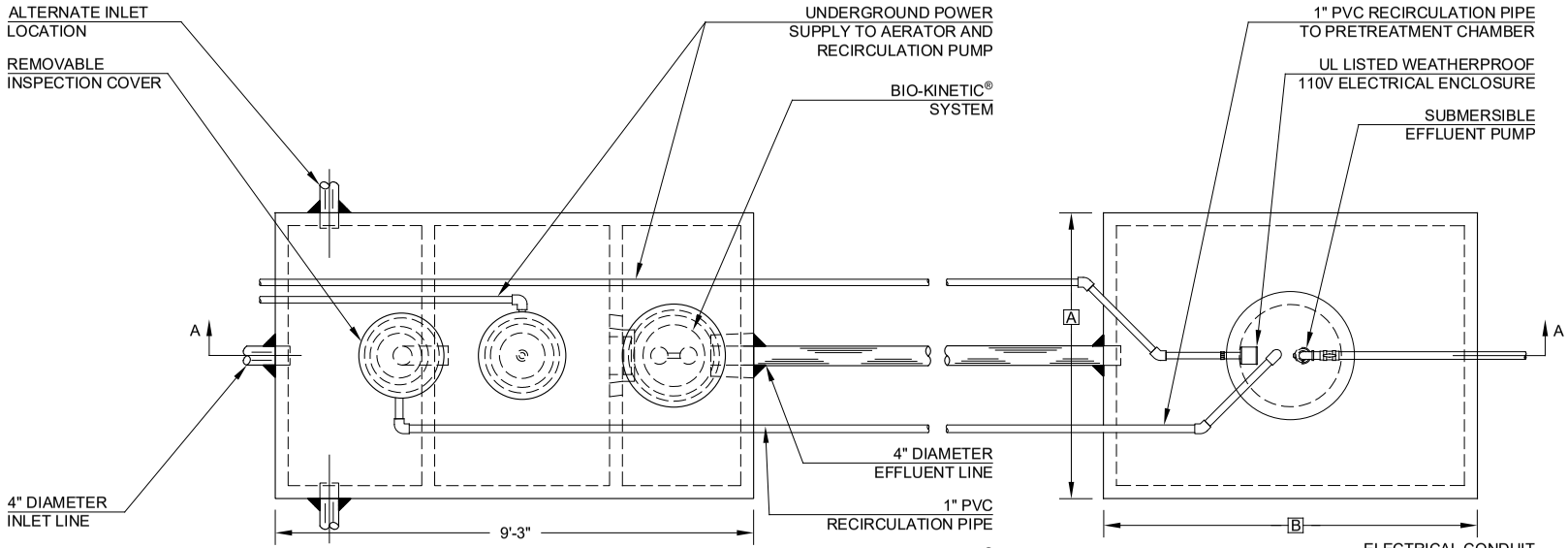
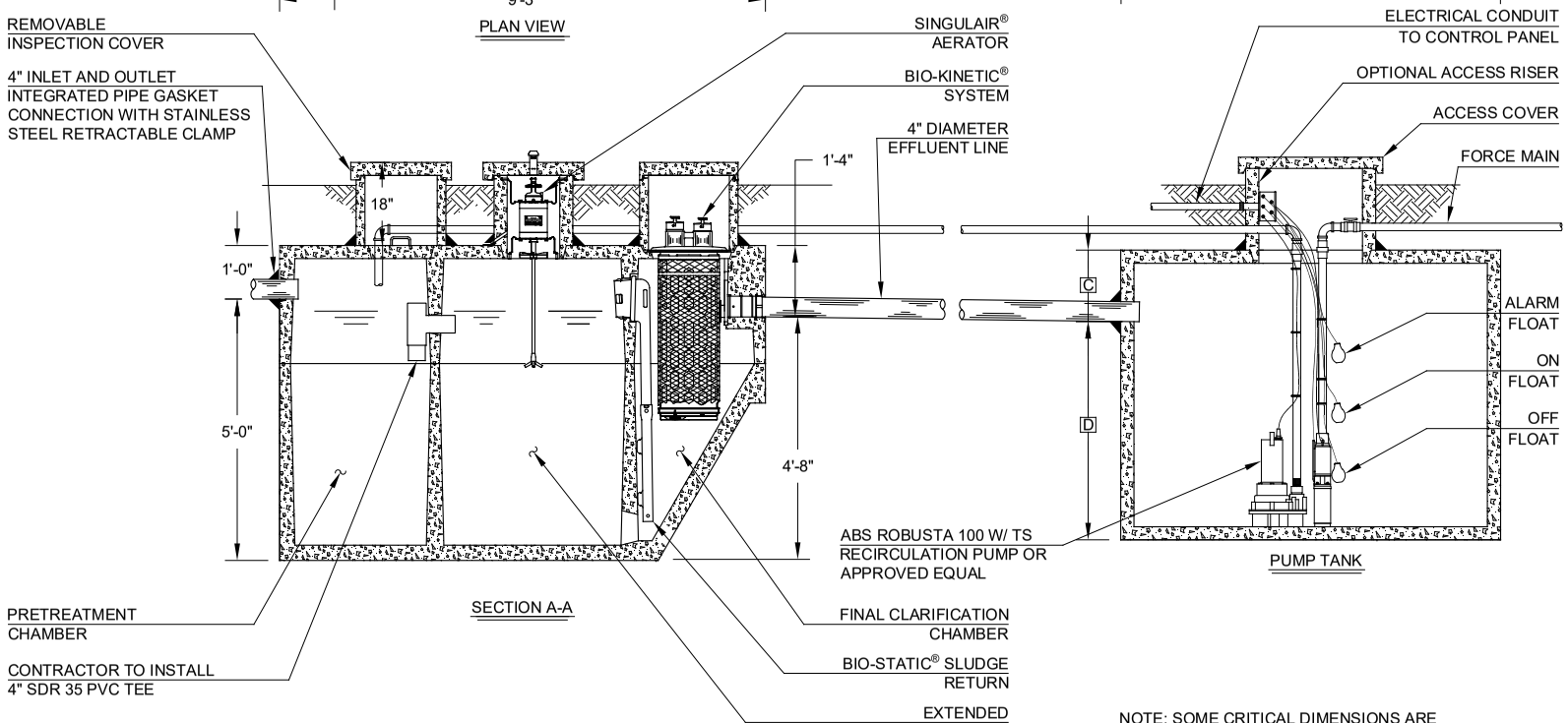
SINGULAIR GREEN® DN 600 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	04-11-2017
REVISION	A
DRAWN BY	NPD
APPROVED BY	JMM
DATE	03-22-2017
SCALE	NTS
DRAWING NO.	PC-5-7172





NOTE: SIMPLEX CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.

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

NOTE: TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 500/600 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② THE RECIRCULATION TANK IS SHOWN WITH A 24" x 48" BASIN. THIS CAN BE EXTENDED ON SITE CONDITIONS.

③ SINGULAIR SYSTEMS UTILIZING CONCRETE TANKAGE MAY BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING IF APPROPRIATELY DESIGNED.

④ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

⑤ CONCRETE TANKS MEET ASTM STANDARD SPECIFICATIONS FOR PRECAST CONCRETE SEPTIC TANKS, C-1227-09.

⑥ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

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CRITICAL DIMENSIONS

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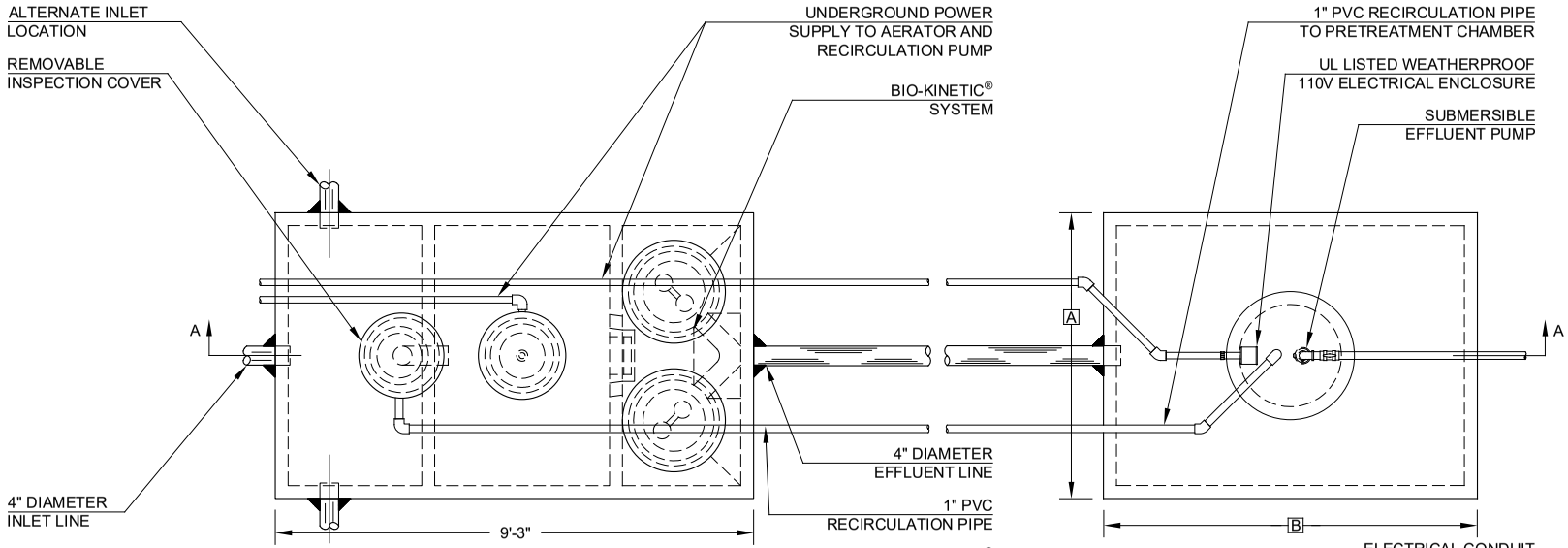
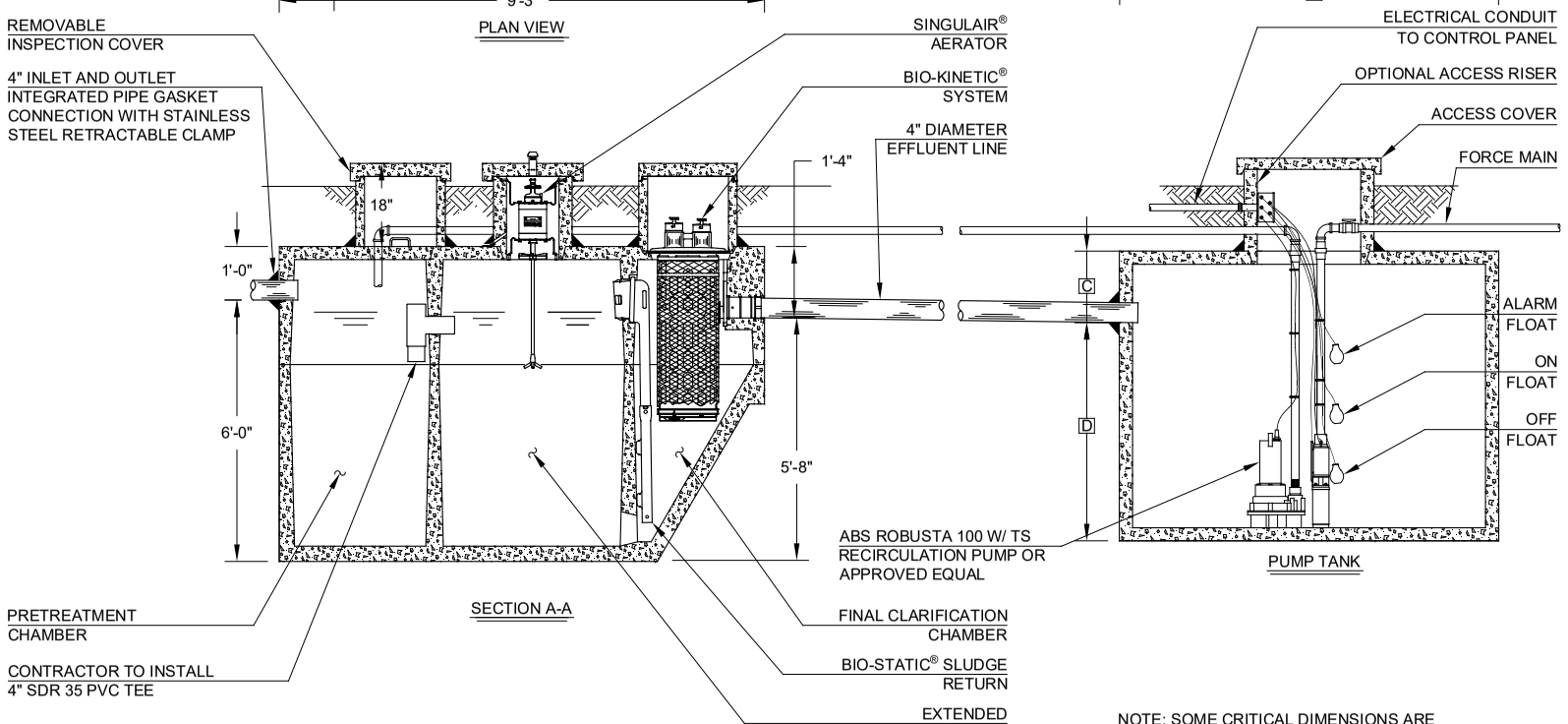
SINGULAIR® DN
600 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	04-11-2017
REVISION	A
DRAWN BY	NPD
APPROVED BY	JMM
DATE	03-22-2017
SCALE	NTS
DRAWING NO.	PC-5-7173





NOTE: SIMPLEX CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.

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

NOTE: TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 750/800 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② THE RECIRCULATION TANK IS SHOWN WITH A 24" x 48" BASIN. THIS CAN BE EXTENDED ON SITE CONDITIONS.

③ SINGULAIR SYSTEMS UTILIZING CONCRETE TANKAGE MAY BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING IF APPROPRIATELY DESIGNED.

④ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

⑤ CONCRETE TANKS MEET ASTM STANDARD SPECIFICATIONS FOR PRECAST CONCRETE SEPTIC TANKS, C-1227-09.

⑥ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

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CRITICAL DIMENSIONS

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SINGULAIR® DN
750 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	REVISION
DRAWN BY	NPD
APPROVED BY	JMM
DATE	04-11-2017
SCALE	NTS
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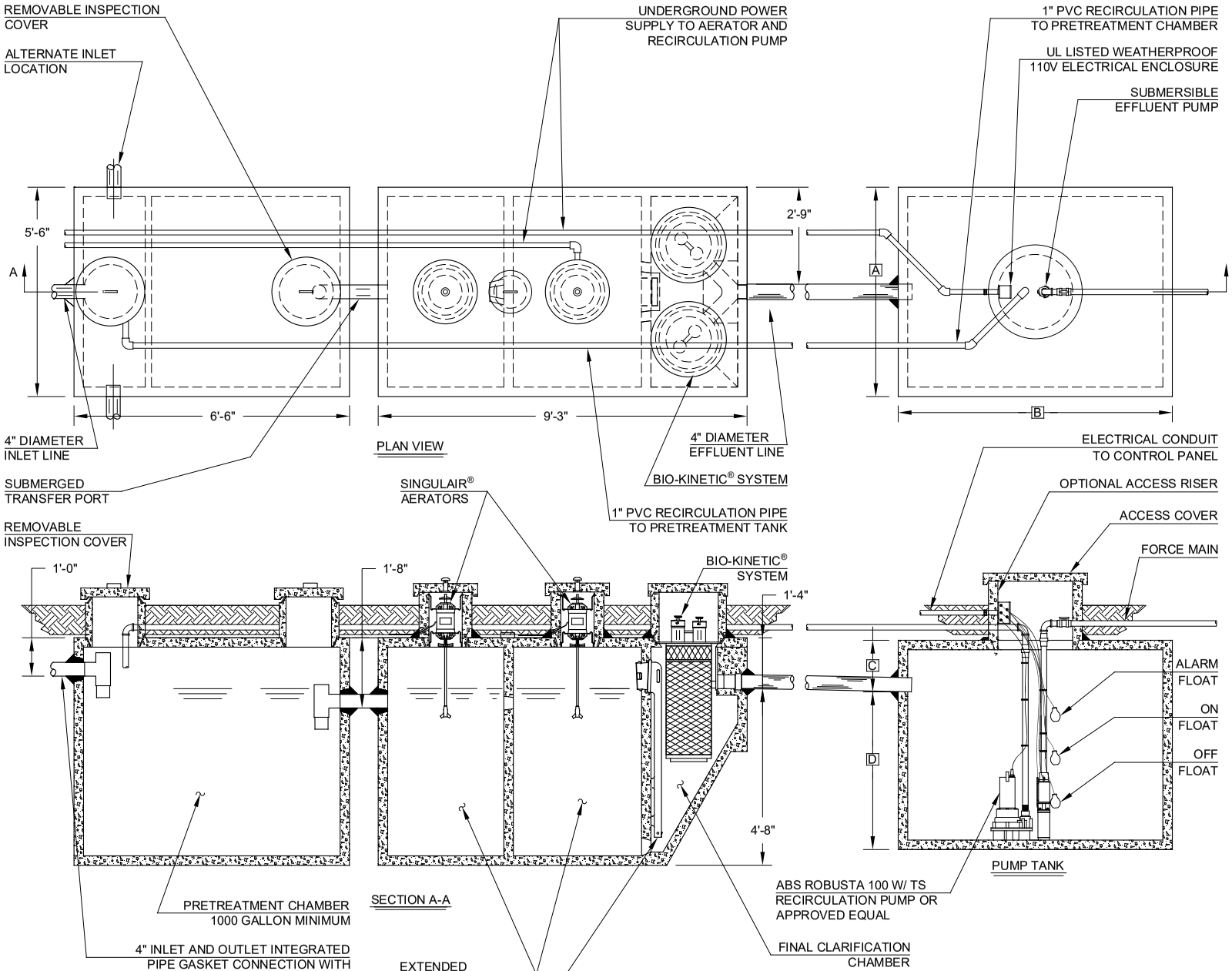

NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1000 GALLONS CAPACITY, 15 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.
NOTE: SIMPLEX CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.

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

NOTE: TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 1000 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② SINGULAIR SYSTEMS UTILIZING CONCRETE TANKAGE MAY BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING IF APPROPRIATELY DESIGNED.

③ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

④ CONCRETE TANKS MEET ASTM STANDARD SPECIFICATIONS FOR PRECAST CONCRETE SEPTIC TANKS, C-1227-09.

⑤ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

⑥ SUBJECT TO APPROVAL, THE PRETREATMENT TANK DIMENSIONS MAY BE DIFFERENT FROM WHAT IS SHOWN, BUT THE TANK CAPACTIY MUST BE MINIMUM 1000 GALLONS 4" BELOW THE INLET INVERT. THE INTERCONNECTION BETWEEN TANKS MUST BE BELOW THE FLOW LINE (SUBMERGED).

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

CRITICAL DIMENSIONS

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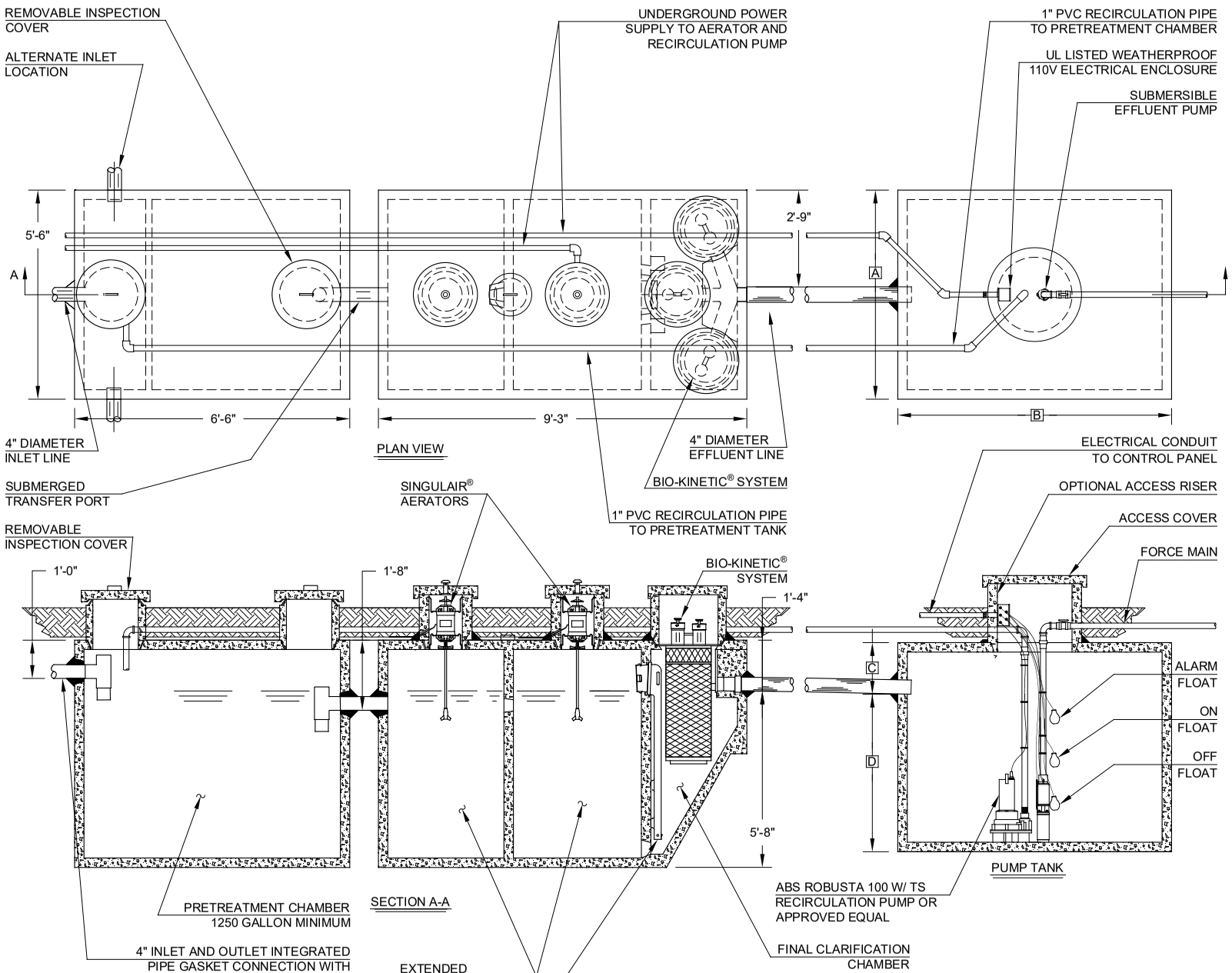
SINGULAIR® DN 1000 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	REVISION
DRAWN BY	NPD
APPROVED BY	JMM
DATE	04-11-2017
SCALE	NTS
DRAWING NO.	PC-5-7175



NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1250 GALLONS CAPACITY, 16 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.

NOTE: SIMPLEX CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.

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

NOTE: TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 1250 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② SINGULAIR SYSTEMS UTILIZING CONCRETE TANKAGE MAY BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING IF APPROPRIATELY DESIGNED.

③ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

④ CONCRETE TANKS MEET ASTM STANDARD SPECIFICATIONS FOR PRECAST CONCRETE SEPTIC TANKS, C-1227-09.

⑤ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

⑥ SUBJECT TO APPROVAL, THE PRETREATMENT TANK DIMENSIONS MAY BE DIFFERENT FROM WHAT IS SHOWN, BUT THE TANK CAPACTIY MUST BE MINIMUM 1250 GALLONS 4" BELOW THE INLET INVERT. THE INTERCONNECTION BETWEEN TANKS MUST BE BELOW THE FLOW LINE (SUBMERGED).

PROJECT ENGINEER'S APPROVAL:
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CRITICAL DIMENSIONS

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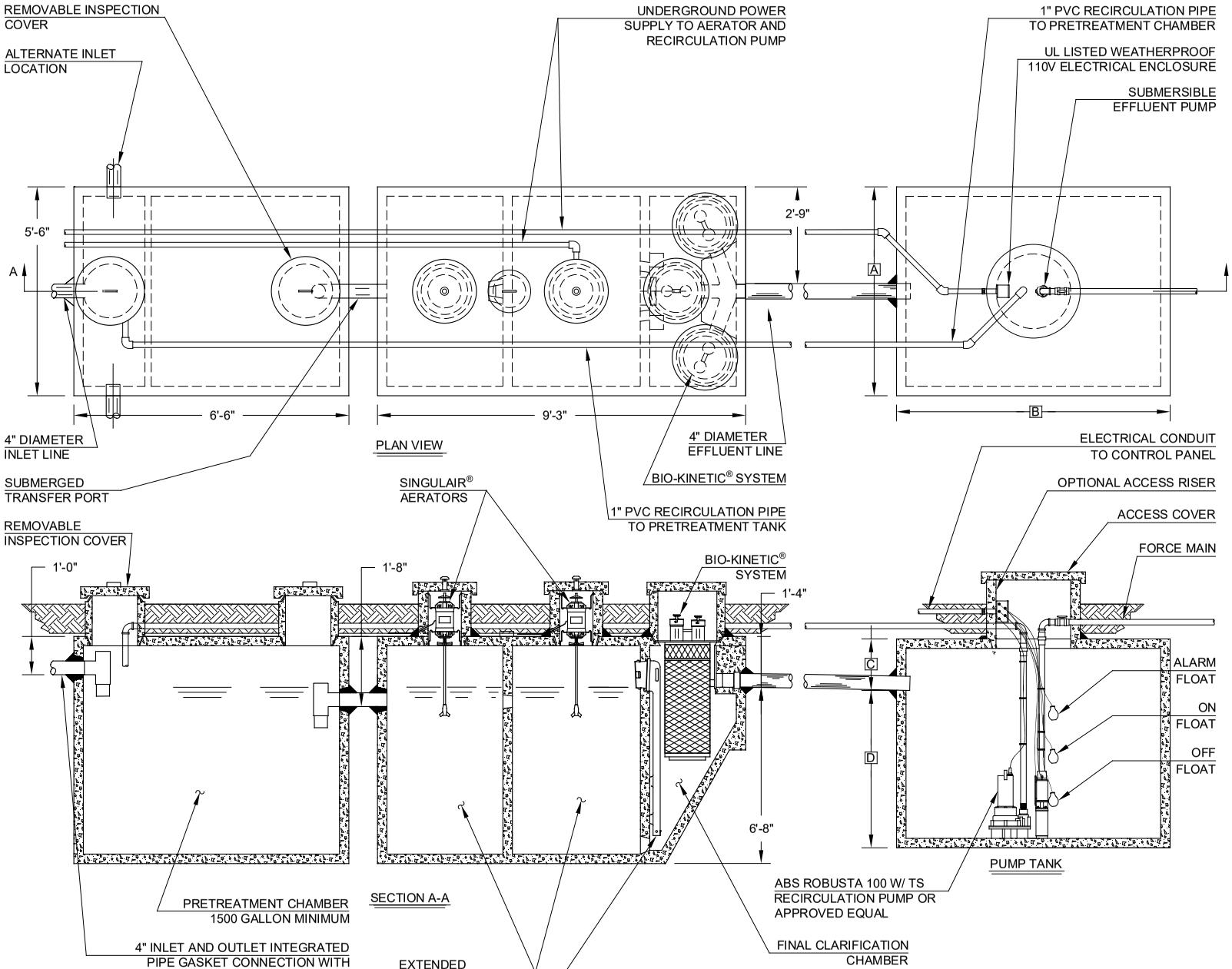
SINGULAIR® DN 1250 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	REVISION
DRAWN BY	NPD
APPROVED BY	JMM
DATE	04-11-2017
SCALE	NTS
DRAWING NO.	PC-5-7176



NOTE: PRETREATMENT CHAMBER MINIMUM REQUIREMENTS SHALL BE: 1500 GALLONS CAPACITY, 22 GALLONS PER INCH OF LIQUID LEVEL AND 12 INCHES OF FREEBOARD.
NOTE: SIMPLEX CONTROLS ARE REMOTELY LOCATED AND REQUIRE A DEDICATED CIRCUIT BREAKER. PUMP SIZE AND TYPE DEPENDS ON TOTAL DYNAMIC HEAD REQUIREMENTS.

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

NOTE: TYPICAL PUMP TANK SHOWN. ACTUAL CONFIGURATION MAY VARY.

NOTE: RATED CAPACITY: 1500 GALLONS PER DAY.

GENERAL NOTES:

① MUST BE SERVICED BY FACTORY TRAINED PERSONNEL.

② SINGULAIR SYSTEMS UTILIZING CONCRETE TANKAGE MAY BE LOCATED IN PAVED AREAS SUBJECT TO HIGH LOADING IF APPROPRIATELY DESIGNED.

③ ALL RISERS AND COVERS MUST BE AT GRADE AND ACCESSIBLE FOR SERVICE.

④ CONCRETE TANKS MEET ASTM STANDARD SPECIFICATIONS FOR PRECAST CONCRETE SEPTIC TANKS, C-1227-09.

⑤ FOR DEEPER THAN NORMAL INSTALLATIONS, CONTACT NORWECO FOR DETAILS.

⑥ SUBJECT TO APPROVAL, THE PRETREATMENT TANK DIMENSIONS MAY BE DIFFERENT FROM WHAT IS SHOWN, BUT THE TANK CAPACTIY MUST BE MINIMUM 1500 GALLONS 4" BELOW THE INLET INVERT. THE INTERCONNECTION BETWEEN TANKS MUST BE BELOW THE FLOW LINE (SUBMERGED).

PROJECT ENGINEER'S APPROVAL:
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CRITICAL DIMENSIONS

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SINGULAIR® DN 1500 GPD DENITRIFICATION WASTEWATER TREATMENT SYSTEM WITH PUMP TANK

REVISION DATE	REVISION
DRAWN BY	NPD
APPROVED BY	JMM
DATE	04-11-2017
SCALE	NTS
DRAWING NO.	PC-5-7177

DESIGN OF THE SINGULAIR® BIO-KINETIC® DN AND SINGULAIR GREEN® BIO-KINETIC® DN NITROGEN REDUCING WASTEWATER TREATMENT SYSTEM

Singulair® Bio-Kinetic® DN 500, 750, 1,000, 1,250 and 1,500 GPD
and Singulair Green® Bio-Kinetic® DN 500

HOUR METER

Hour Meter, LCD, Time Range 0 to 99,999 Hours, Bezel Face 2.23 In, Bezel Face Type Flush Round, Elapsed Time Voltage 115 VAC, Hz 60, Number of Digits 6, Display Units Hours and Tenths, Bezel to Back Length 1.42 In, Ambien to 149 F, Material of Construction ABS, Temp Range -22 to 149 F, Fits 2.0 in Diameter Opening; Mounting Method F Type Spade

	Tech Specs
Item	Hour Meter
Type	LCD
Time Range (Hours)	0 to 99,999
Bezel Face (In.)	2.23
Bezel Face Type	Flush Round
Elapsed Time To	99999.9
Voltage	115 VAC
Hz	60
Number of Digits	6
Display Units	Hours and Tenths
Bezel to Back Length (In.)	1.42
Ambient Temp Range (F)	-22 to 149
Material of Construction	ABS
Temp Range (F)	-22 to 149
Fits	2.0” Diameter Opening
Mounting Method	Flange
Terminal Type	Spade

(Or approved equal)

DESIGN OF THE SINGULAIR® BIO-KINETIC® DN AND SINGULAIR GREEN® BIO-KINETIC® DN NITROGEN REDUCING WASTEWATER TREATMENT SYSTEM

Singulair® Bio-Kinetic® DN 500, 750, 1,000, 1,250 and 1,500 GPD
and Singulair Green® Bio-Kinetic® DN 500

RECIRCULATION PUMP

Magnetic Drive Pump, Power Rating 1/25 HP, Voltage @ 60 Hz 115, Current Rating 1.65 Amps, Outlet 5/8 Inch OD, Maximum PSI 8.2, Maximum Head 19 Feet, Motor Enclosure OPFC, Maximum Temperature 150 F @ 10 PSI, 70 F @ Flow @ 1 Foot of Head 7.6 GPM, @ 3 Feet of Head 7.0 GPM, @ 6 Feet of Head 6.8 GPM, @ 9 Feet of Head 6.0 GPM, Inches, Length 8 ¼ Inches, Width 3 ¾ Inches

	Tech Specs
Item	Pump
Type	Magnetic Drive
HP	1/25
Voltage	115
Full Load Amps	1.65
Motor Type	SP
Motor Enclosure	OPFC
GPM @ 1 Ft. of Head	7.6
GPM of Water @ 3 Ft. of Head	7.0
GPM of Water @ 6 Ft. of Head	6.8
GPM of Water @ 9 Ft. of Head	6.0
Max. Head (Ft.)	19

(Or approved equal)

DESIGN OF THE SINGULAIR® BIO-KINETIC® DN AND SINGULAIR GREEN® BIO-KINETIC® DN NITROGEN REDUCING WASTEWATER TREATMENT SYSTEM

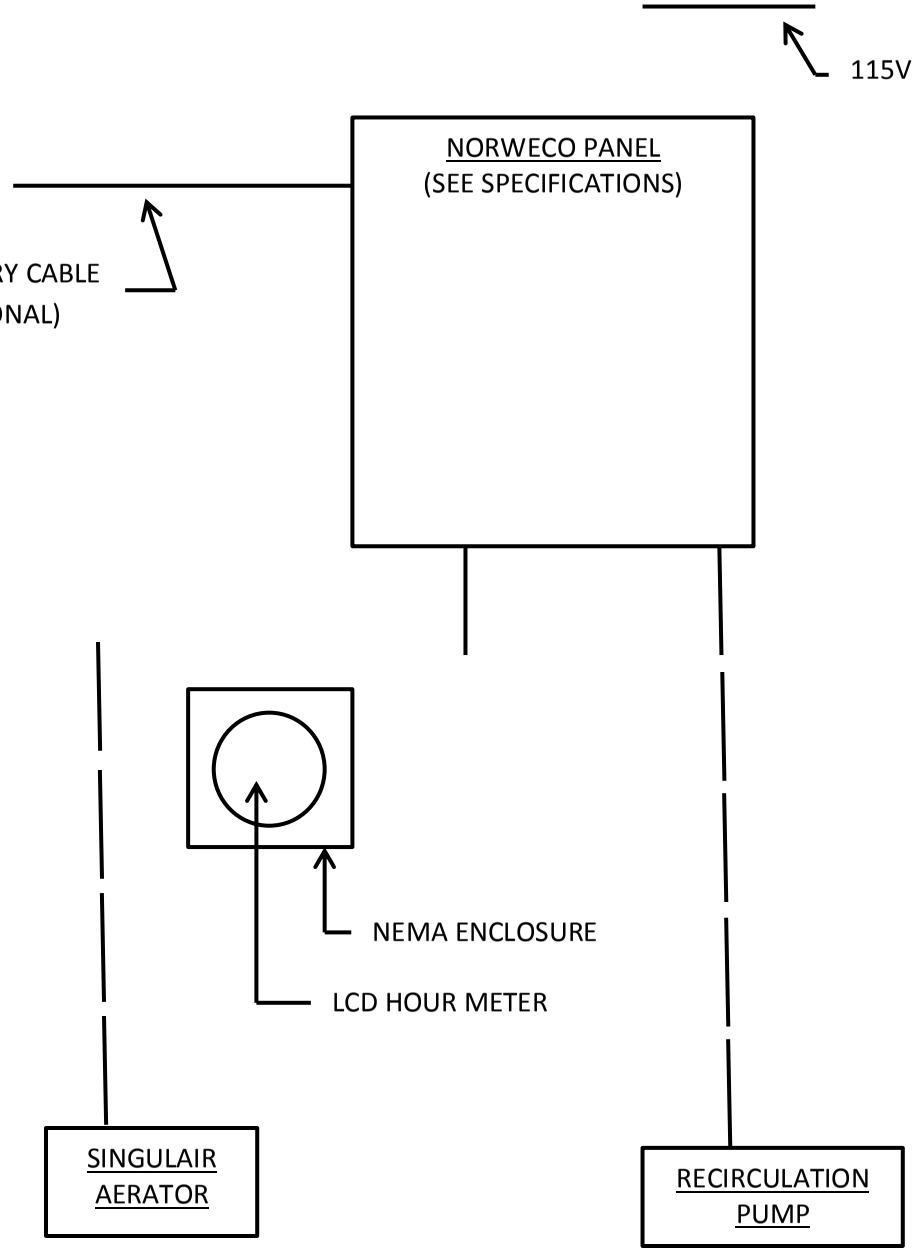
Singulair® Bio-Kinetic® DN 500, 750, 1,000, 1,250 and 1,500 GPD
and Singulair Green® Bio-Kinetic® DN 500

ELECTRICAL ENCLOSURE

Enclosure, Nonmetallic, NEMA Rating 4X, Material of Construction Polycarbonate, Length 4.92 In, Width 3.35 In, Dep Cover Type, One Piece Molded Silicone Gasket, Color Clear Cover and Gray Bottom

	Tech Specs
Item	Enclosure
Type	Nonmetallic
NEMA Rating	4X
Material of Construction	Polycarbonate
Length (In.)	4.92
Width (In.)	3.35
Depth (In.)	2.16
Cover Type	Screw
Gasket	One Piece Molded Silicone
Color	Clear Cover and Gray Bottom

(Or approved equal)



NOTE:
1. Enclosure shall be NEMA 1, 16 Ga. Model SC040404 Wiegmann (or equal)

2. LCD Hour meter shall be Flush Round model T1160EB ENM (or equal) time range 0-99,999 hours, Voltage 115 VAC

ELECTRICAL WIRING DIAGRAM

SINGULAIR® BIO-KINETIC® DN and
SINGULAIR GREEN® BIO-KINETIC® DN

NITROGEN REMOVAL
WASTEWATER TREATMENT SYSTEM

Norweco, Inc.
220 Republic Street, Norwalk, OH 44857
www.norweco.com
Tel: 419-668-4471
Date created: 3/28/17

norweco®

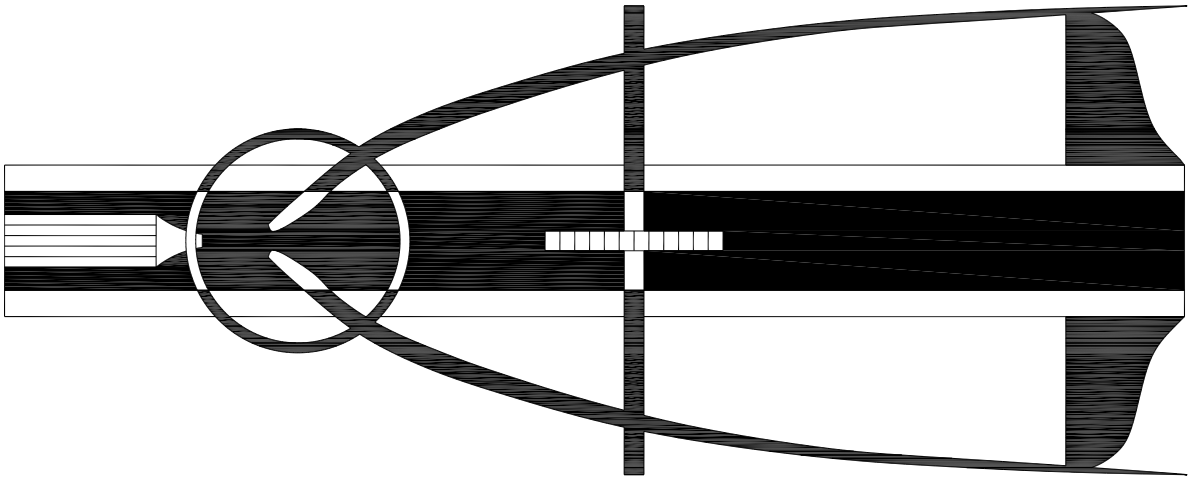
SINGULAIR® BIO-KINETIC®

WASTEWATER TREATMENT SYSTEM

SPECIFICATIONS

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.



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.

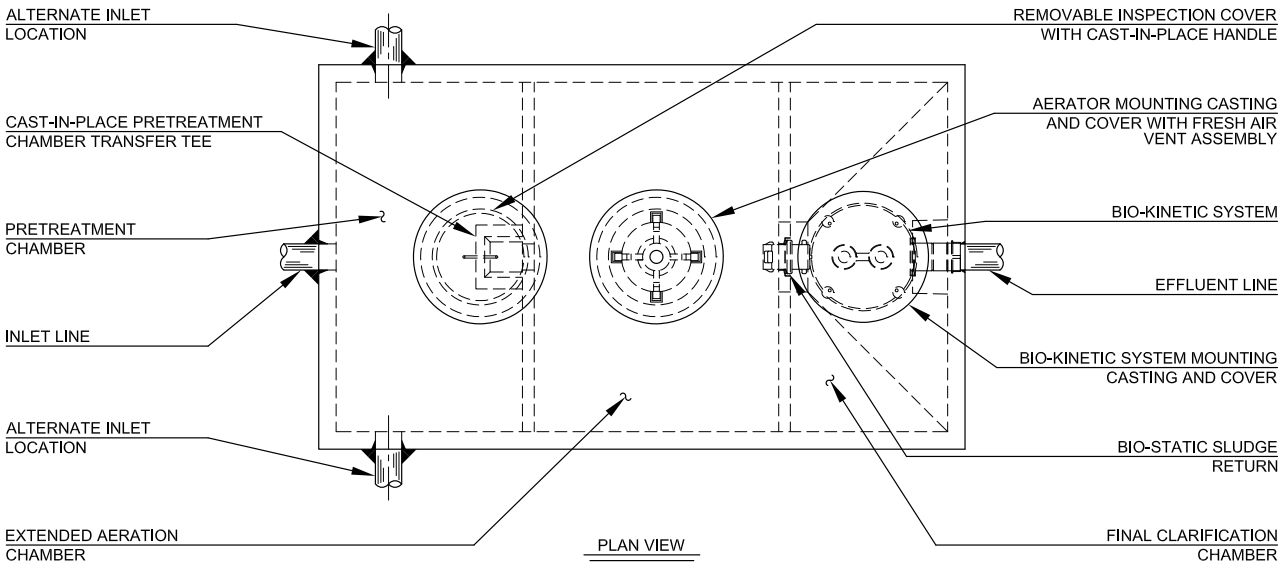
SINGULAIR®

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. 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.

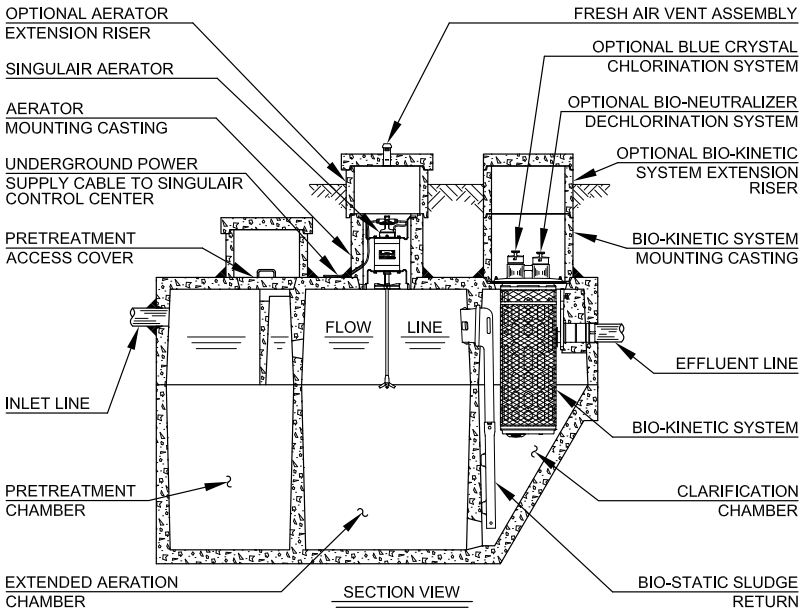


AERATION CHAMBER

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 hoppered 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.

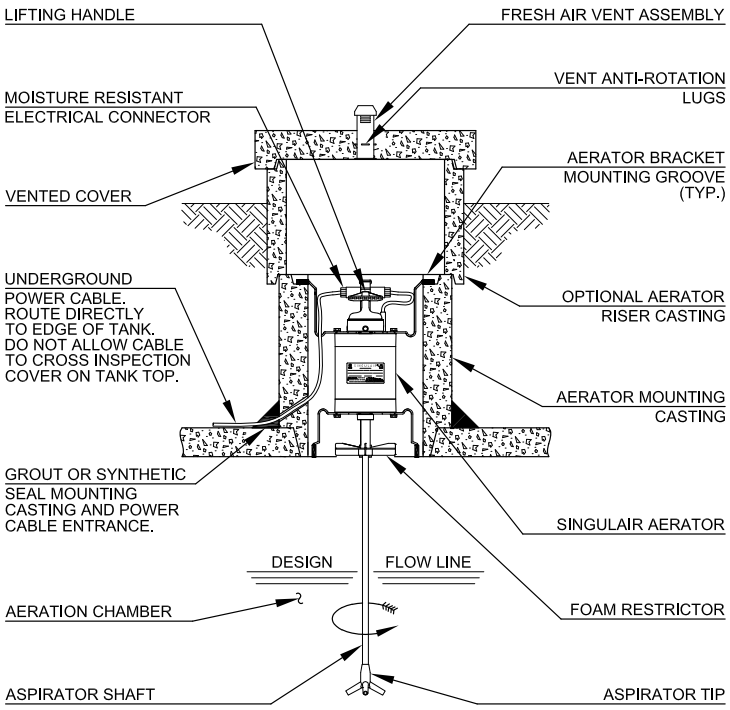


BIO-STATIC® SLUDGE RETURN

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

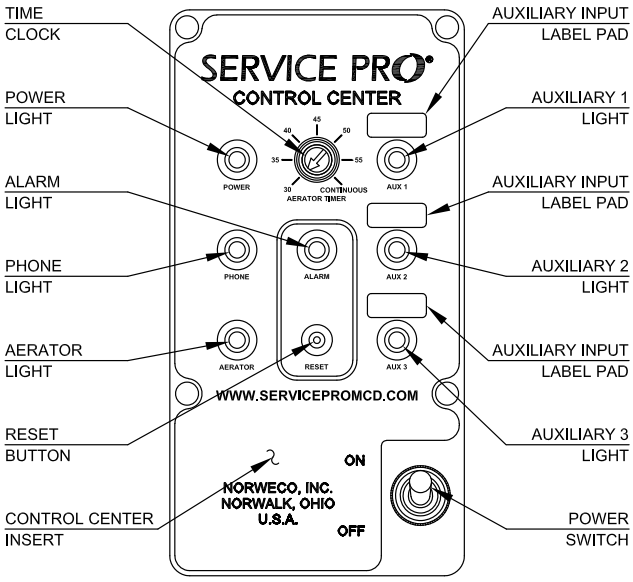
Each Singulair aerator shall be installed in a concrete aerator mounting casting above the aeration chamber. Fresh air shall be supplied through a molded plastic vent assembly cast into the concrete access cover above the aerator. The Singulair aerator shall include plated mounting brackets, NEMA 6 rated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

www.servicepromcd.com

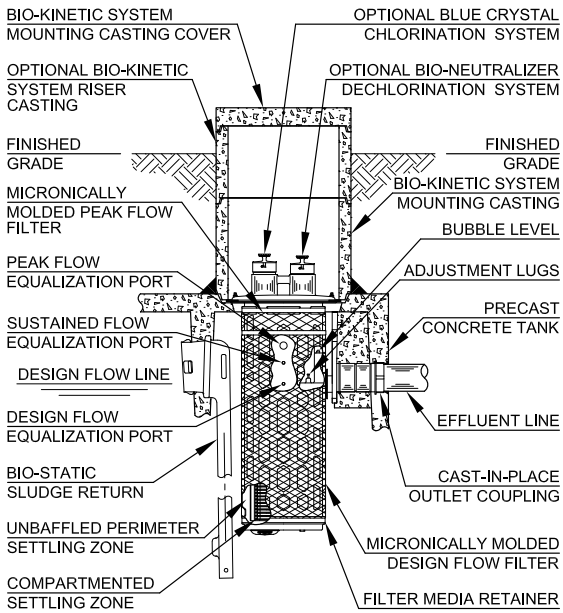
SERVICE PRO® MONITORING CENTER

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 500/600 gallon per day NSF Standard 40 design loading schedule, minimum performance of the device shall equalize daily flow an average of 50%.

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® DATA CHART

Designation: Model	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

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SINGULAIR GREEN® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

WITH SERVICE PRO® CONTROL CENTER

SPECIFICATIONS

SPECIFICATIONS

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Singulair Green 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 a single tank which shall be manufactured using high density polyethylene resin. The wastewater treatment system shall be a Singulair Green as manufactured by Norweco, Inc., Norwalk, Ohio, USA. Systems not including integral pretreatment or non-mechanical flow equalization shall not be considered for this application.

The wastewater treatment system shall include high density polyethylene tankage providing separate pretreatment, aeration and final clarification chambers. The tankage shall be furnished with a Schedule 40 PVC inlet hub, removable sealed pretreatment cover, submerged transfer ports, aerator mounting riser with removable vented cover, molded outlet coupling, Bio-Kinetic system mounting riser with removable sealed cover and Schedule 40 PVC outlet hub. Principal items of electro-mechanical equipment supplied with the Singulair Green wastewater treatment system shall be a UL Listed 1725 RPM mechanical aerator, UL Listed Service Pro electrical control center, Bio-Static sludge return and a Bio-Kinetic tertiary treatment device for flow equalization and final filtration of system effluent.

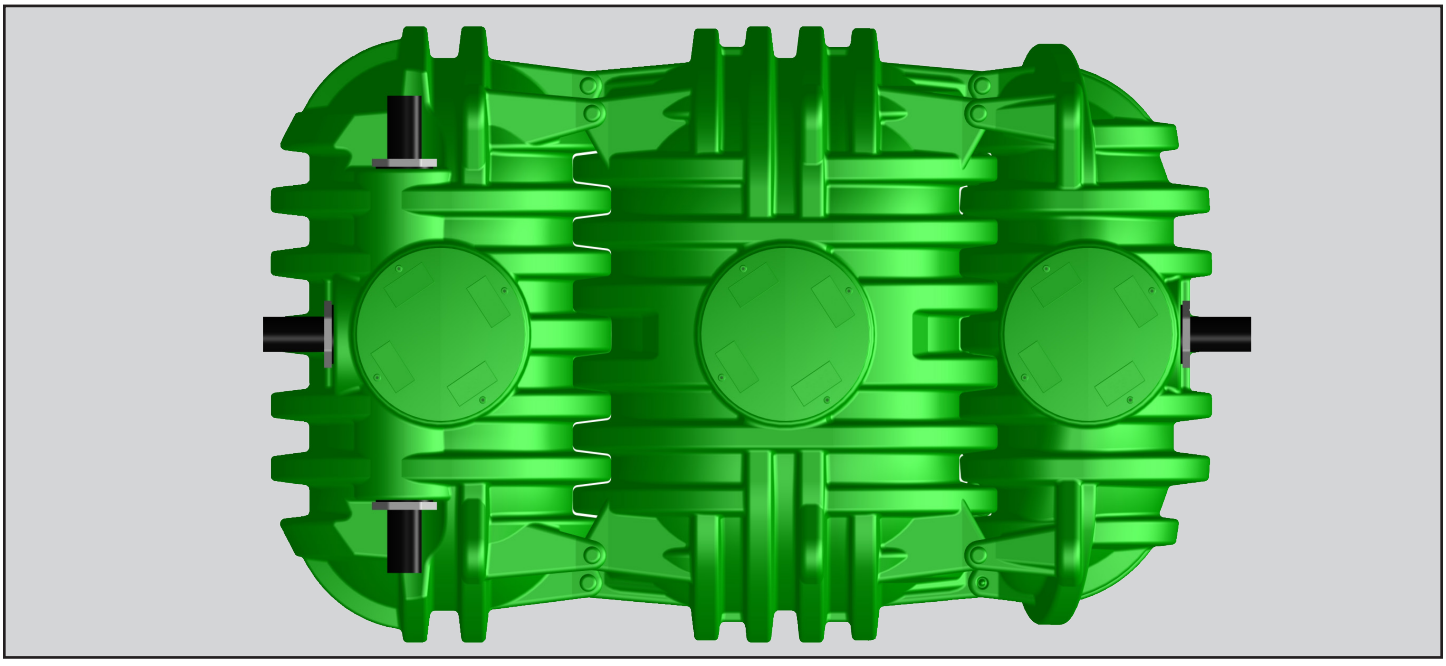
SINGULAIR GREEN®

OPERATING CONDITIONS

The Singulair Green system shall be certified to treat up to 500/600 GPD (gallons per day) of domestic wastewater. 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 a 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 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 incorporated into the top of the pretreatment chamber to allow tank and transfer tee inspection.

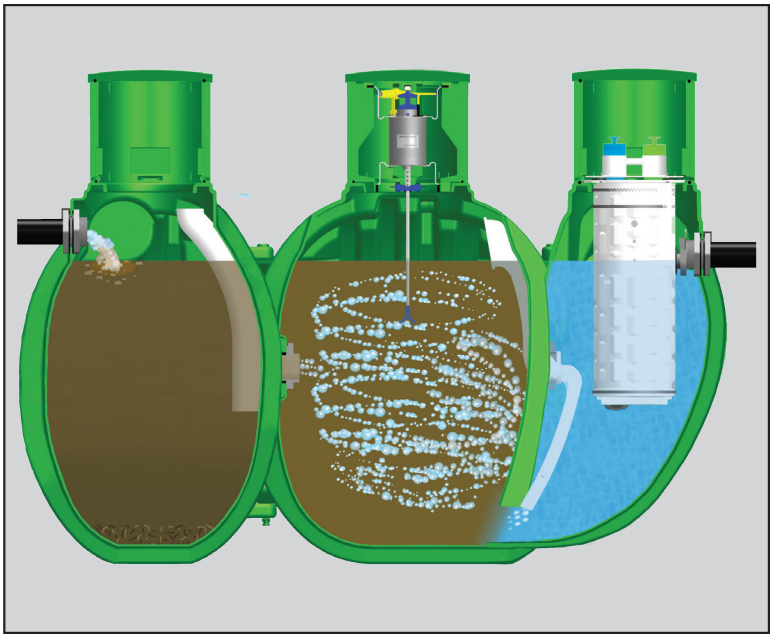


AERATION CHAMBER

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 shall be an integral part of the system flow path and configured to insure effective mixing of microorganisms, wastewater and fresh air. No area of the chamber shall be isolated from process mixing, thereby eliminating dead or quiescent areas of the treatment chamber which are detrimental to the treatment process. Influent into the aeration chamber shall be preconditioned, equalized flow from the pretreatment chamber and settled solids via the Bio-Static sludge return.

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 hoppered 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 displaced to the outlet zone for final filtration and discharge from the system. Non-mechanical equalization of the flow, through all 5 zones, shall provide optimal settling and clarification.

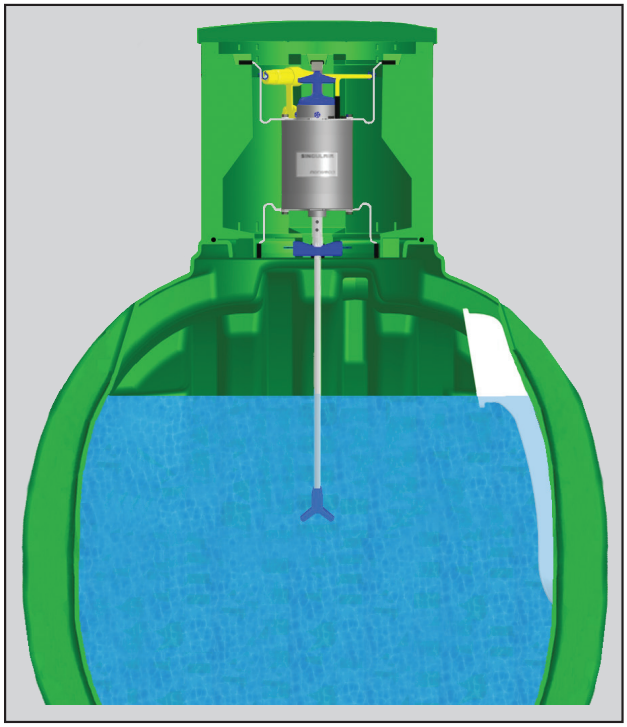


BIO-STATIC® SLUDGE RETURN

A Bio-Static sludge return shall be mounted into the opening in the aeration/clarification chamber wall to provide positive return of settled solids. Aeration chamber hydraulic currents shall enter the sludge return and be directed through the Bio-Static device into the second 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

The Singulair aerator shall be installed in a rotationally molded, heavy duty, high density polyethylene aerator mounting riser above the aeration chamber. Fresh air shall be supplied through an injection molded, heavy duty, glass-filled polypropylene access cover above the aerator. The vented access cover shall be secured to the mounting riser with four fasteners. The aerator shall be UL Listed and include plated mounting brackets, NEMA 6 rated electrical connector, 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. Molded Viton elastomer shaft seals shall protect the bearings from contamination. Only the stainless steel aspirator shaft and glass-filled nylon aspirator tip shall be in contact with the liquid. There shall be no submerged electrical motors, bearings or fixed air piping in the aeration system. The Singulair aerator motor shall not exceed the motor nameplate rating when installed and operated as recommended. 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 4.0 amps when operating at the rated nameplate voltage. Aerators without UL listing 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 shall control all aspects of treatment plant operation using a microprocessor based platform. The prewired control center shall contain nonvolatile memory to prevent the loss of programming in the event of a power failure. For protection of wiring and components, the electrical controls shall be mounted in an injection molded, lockable, corrosion proof, NEMA rated enclosure designed specifically for outdoor use. The enclosure shall be equipped with a tamper evident seal to discourage unauthorized access. The Service Pro control center shall be a UL Listed assembly and shall include a time clock, alarm light, audible alarm, reset button and power switch. 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.

TIME CLOCK

The aerator run cycle shall be controlled by an adjustable, prewired 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). The Service Pro TNT controls shall include a non-adjustable time clock. 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.

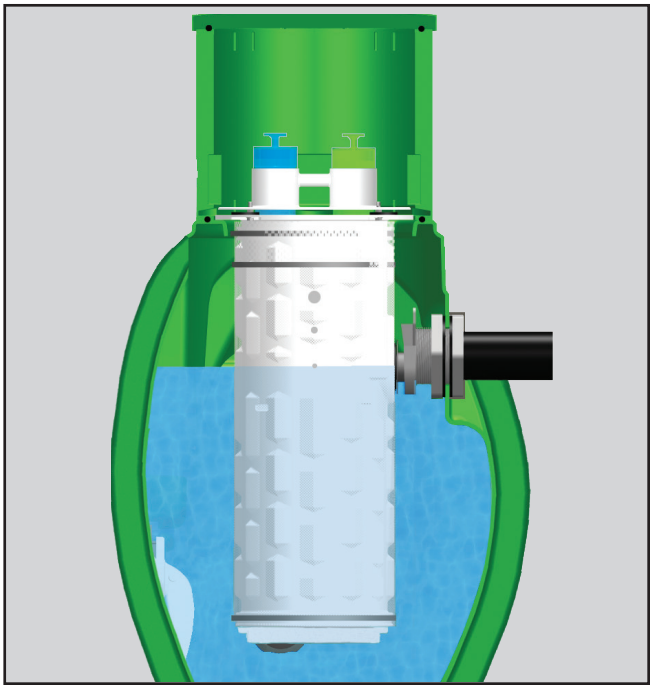
SERVICE PRO® ADVANCED CONTROLS (Optional)

Advanced system control options shall be available for all Singulair Green Bio-Kinetic wastewater treatment systems. Service Pro control center options include the Service Pro control center with Monitoring, Compliance and Diagnostic (MCD) technology.

The Service Pro control center with MCD technology shall be a UL Listed assembly and shall include a time clock, integral telemetry system, main alarm light, power light, phone light, aerator alarm light, three auxiliary alarm lights, reset button and power switch. 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.

SPECIFICATIONS

BIO-KINETIC® SYSTEM



A Bio-Kinetic system shall be installed in the mounting riser above the clarification chamber. The 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. The 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. Optional Blue Crystal and Bio-Max tablet feed tubes shall be positioned such that the flow-activated chemical cannot contact the liquid upstream of the feed tubes.

FLOW EQUALIZATION

The wastewater treatment system shall include a demand use, non-mechanical, 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 GPD (gallons per day) NSF Standard 40 design loading schedule, minimum performance of the device shall equalize daily flow an average of 50%.

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 dealers, service providers, regulatory agencies and individual system owners. Dealers 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.

WARRANTY AND EXCHANGE PROGRAM

The manufacturer shall provide a three year limited warranty for each Singulair aerator, control center, Bio-Kinetic system and any other electro-mechanical components purchased from the manufacturer. The comprehensive aerator exchange program offers a lifetime of equipment protection. The dealer shall provide warranty and exchange information 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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