Installation Manual

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

INSTALLATION 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

INSTRUCTIONS TO INSTALLERS

(A) Responsibilities

Installer:

All excavation and backfill
Grading and leveling pad installation (if required)
Installation of all piping and risers as detailed below:

1. Install standard T baffle on the inlet wall of the first chamber of the Singulair® Bio-Kinetic® tank. (concrete only)
2. Install a modified T baffle (14" deep and 10" above flow line into the cast-in flange on the outlet wall of the first chamber. (concrete only)
3. Install the recirculation well and T baffle
4. Install the electronic control panel and time clock, wiring and conduits
5. Install 1" flexible conduit from the recirculation well to the inlet riser (or to the alternate location).
6. Provide approximately 10 feet of 3/8" clear, flexible recirculation line.

Precaster:

Tank and riser delivery
Setting of tank in the prepared excavation

Licensed Distributor:

Treatment system equipment:

1. Aerator(s)
2. Bio-Kinetic® filter(s)
3. Control panel and time clock
4. Recirculation well and pump
5. Installation of aerator(s) and filter(s)
6. Installation of recirculation pump
7. Green tank and components (if Green installation)

System start-up and certification of completion

(B) Instructions to Installer:

The precaster will deliver but not install the access risers and covers that are required for the Singulair® Bio-Kinetic® DN. The Installer is required to perform the following work for the proper installation of the system, in strict compliance with these instructions:

1. Install the small diameter riser(s) with tapered end down and seal it with Conseal CS-102B, or approved equal, to the top of the tank. Complete the electrical work.
2. Install the large diameter riser(s) over the holes of the third chamber and seal it with Conseal CS-102B, or approved equal, to the top of the tank.
3. Install immediately downstream from the tank the PVC or PolyLok recirculation well. The ground must be prepared to the correct elevation and the bottom of the excavation compacted. The well shall be set level in all directions. The interconnection between the recirculation well and the first chamber of the Singulair® Bio-Kinetic® tank shall be 1" conduit with a downward slope to the riser on top of the chamber.
4. Install the T baffles in the recirculation well.
5. Do not backfill the excavation above the top of the Singulair® Bio-Kinetic® tank unless approved by licensed distributor field technician.
6. Complete all piping from the building and to the D-box, fill the Singulair® Bio-Kinetic® tank with clean water. Check for leaks (if any found, notify the precaster for repair). Note that licensed distributor will not install the aerator(s) and filter(s) unless the tank is full.
7. Green tanks are delivered with components in the tank.

(C) Electrician:

The electrical work is to be completed in accordance with the applicable codes by a licensed electrician. The requirements are the following:

1. The electrician shall run two (2) 12 gauge power cords in conduit from the control panel supplied by licensed distributor, through the hour meter to the aerator and the recirculation well. A 20A breaker is to be used in the main panel in the building.
2. One cable terminates in the riser above the middle chamber with the watertight electrical plug supplied by licensed distributor. Leave approximately 12" to 18" of cable within the riser.
3. The second cable terminates in the recirculation well with an outdoor rated outlet with cover.

4. Ensure that both the aerator plug and the recirculation outlet are powered for the installation of the aerator and recirculation pump.
5. Wiring diagrams are included in the control panels.

(D) General Notes:

1. The difference in elevation between the inlet invert and the outlet invert of the Singulair® Bio-Kinetic® tank is always 4”.
2. Maintenance considerations require easy access to the risers and covers. Locate the Singulair® Bio-Kinetic® so as not to make service unduly difficult. DO NOT locate a Singulair® Bio-Kinetic® under decks with inadequate space for service work. Provide an outside faucet in the near vicinity of the tank.
3. Locate the electronic controls outside the building in the near vicinity of the Singulair® Bio-Kinetic®. The location should always be accessible to maintenance personnel and visible/audible for the home owner.
4. For tank dimensions and for other components refer to the design drawings and to the diagrams included with the installation instructions.
5. Please call licensed distributor for system activation at least one (1) day in advance.

(E) Final check and startup:

The responsibility of licensed distributor for final check and start-up is limited to the components the company supplies. Specifically, the following is checked and certified by licensed distributor:

1. The installation of the aerator(s) and filter(s)
2. The installation of the recirculation well and equipment
3. Recirculation lines
4. Setting and testing recirculation rates
5. Setting and checking aerator run time
6. Completeness of the installation

After the final check, the system is activated and the required documentation is provided.

norweco® SINGULAIR®

BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

TANK DELIVERY AND SETTING

To insure that all work proceeds safely and efficiently, check these items prior to delivery of the Singulair tankage.

- ✓ Does the driver have complete and accurate directions to the installation?
- ✓ Does the driver have the Singulair installer's tool kit?
- ✓ Are the appropriate number of aerator mounting castings, Bio-Kinetic system mounting castings, extension riser castings and vented and non-vented access covers included?
- ✓ Is there an adequate supply of sealing material for the tank and all plumbing connections?
- ✓ Does the truck have the proper pick-up bar and cable (or chain)?
- ✓ Are the proper quantity and size of Bio-Static sludge returns installed?
- ✓ Are the proper quantity of Service Pro control centers available for delivery with the tanks?
- ✓ Is there sufficient underground electrical cable to reach from the control center location to the tank?

PLEASE NOTE: *The Singulair tank is constructed of monolithic castings and, if possible, the joints should be sealed at your plant before setting. This will minimize tank loading, unloading and setting time at the site. The castings may be set individually and sealed at the site if necessary. These instructions are written as if the castings will be installed separately and sealed at the site. However, the tank should be assembled and sealed in your plant if your tank handling and delivery equipment will allow it. Otherwise, proceed with tank setting as outlined herein.*

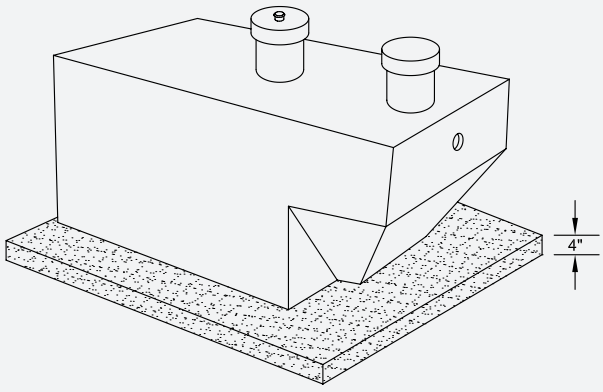
CHECKING THE EXCAVATION

Before tank setting begins, the length, width and depth of the excavation should be checked. The excavation should have sufficient overdig to allow for a minimum of 6" of clearance around the entire perimeter of the Singulair system. Additional overdig will be required on deep installations or where unstable soil conditions exist. Safe working conditions must be established and maintained during the entire installation procedure.

Check the influent and effluent sewer line trenches. The depth should correspond with the Singulair system inlet and outlet connections and the trenches should be smooth to prevent damage to the sewer lines.

A tank leveling pad should be installed in the bottom of the excavation. The pad should be a minimum of 4" thick and leveled to within 1/4" from side to side and end to end. The elevation of the top of the leveling pad should correspond to the outside bottom of the Singulair precast concrete tankage when installed.

Extreme care should be used any time personnel or equipment are in the vicinity of any excavation. A delivery truck can place excessive loading on excavation sidewalls and care must be taken in its positioning. Unstable soil conditions require constant monitoring of the site to insure safety. Construction and installation procedures, equipment, tools, materials and personnel should always comply with applicable safety regulations and federal, state and local codes.



LEVEL PAD END TO END AND SIDE TO SIDE WITHIN 1/4"

SAND OR GRAVEL PAD

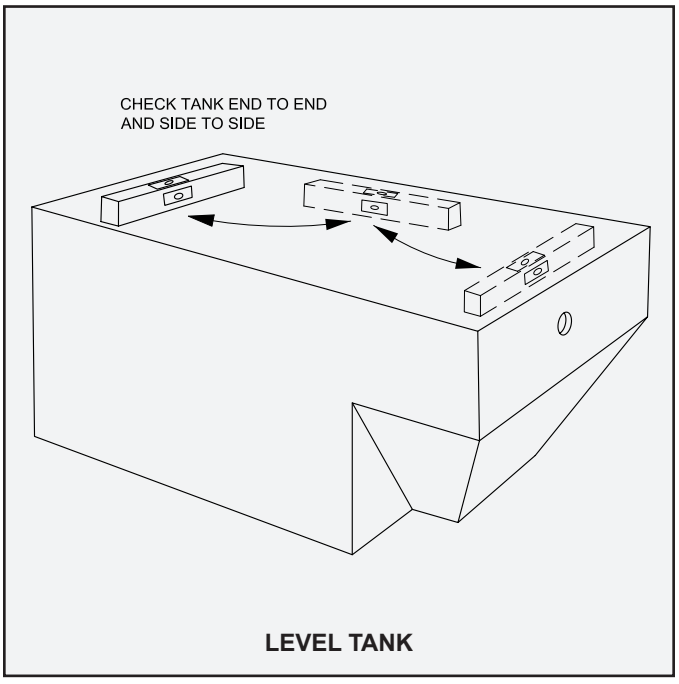
TANK DELIVERY AND SETTING (Cont.)

SINGULAIR TANK SEALING

While the tank bottom is still on the delivery truck, remove any concrete chips, stones, mud or debris from the groove in the casting and from the floor of the pretreatment and aeration chambers. Be sure the transfer port is clean and unrestricted. Apply a good quality mastic sealant into the groove of the bottom casting around the entire perimeter and fully across both internal baffles. Inspect the sealant after application to eliminate any gaps or uneven spots. A non-shrinking grout sealant may be used in place of mastic, but mastic will allow the tank to be filled with water immediately after its installation.

TANK SETTING AND SAFETY

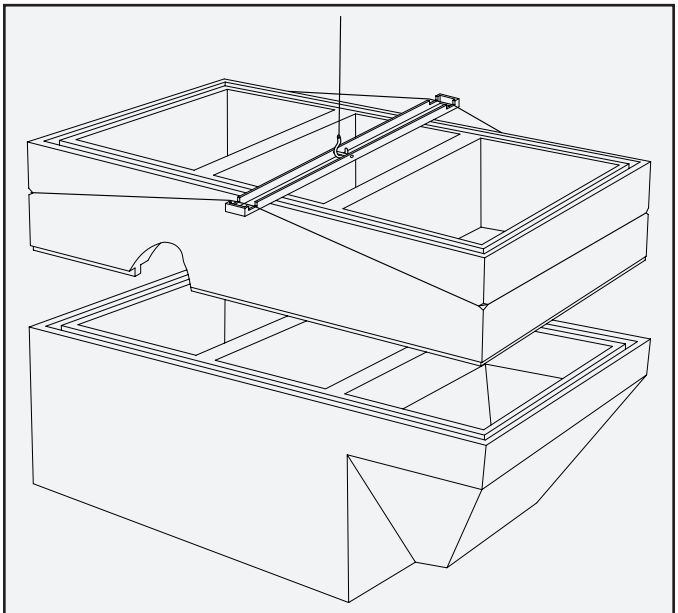
With the delivery truck in position at the excavation, make sure that its outriggers are firmly placed on stable soil. All personnel must be out of the excavation and a safe distance from the tank. Before lifting the tank, check all lifting chains to be sure they are properly seated in the casting pick-up grooves. Lift the tank bottom section and place it directly into the excavation. Do not set it down. Stop the casting several inches above the excavation floor and position it in the desired location. Now lower it carefully until all tension is off the lifting cable or chain.



LEVEL TANK

Place a level on the exposed joint and check the casting for level from end to end and side to side (if the tank is set as one piece, check for level on the top). It must be level within 1/4" from end to end and from side to side. The casting may need to be raised slightly so additional leveling pad material can be applied before level is achieved. If the casting needs to be raised more than six inches to apply leveling material, the contractor's personnel should move to a safe location so the casting can be fully returned to the bed of the delivery truck. The casting should then be reset after the excavation has been properly leveled.

For 750 GPD, 1250 GPD and 1500 GPD systems, the tank ring casting should now be prepared to be set in position. Care must be used to insure the ring casting is not damaged in shipment, handling or setting. While the tank ring is still on the delivery truck, clean the groove in the casting to remove concrete chips, stones, mud or debris. Apply mastic sealant into the groove of the casting around the entire perimeter and fully across both internal baffles. Inspect the sealant after application and smooth out any bubbles or gaps. Remove all debris from the bottom of the casting along the tongue sealing section. Do not reach under or get under any portion of the casting. Carefully position the ring and lower one corner into the groove of the bottom casting. Align the sides of the ring and bottom sections and lower the ring into position.



APPLY MASTIC SEALANT TO GROOVE

The top casting may now be set. Remove all debris from the bottom of the casting along the tongue sealing section. Do not reach or get under any portion of the casting. Carefully position the top and lower one corner into the groove. Align the sides of the casting and lower the top into position. Before proceeding with Bio-Static sludge return assembly and installation, recheck the tank for level from side to side and end to end.

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SINGULAIR® BIO-KINETIC®

WASTEWATER TREATMENT SYSTEM

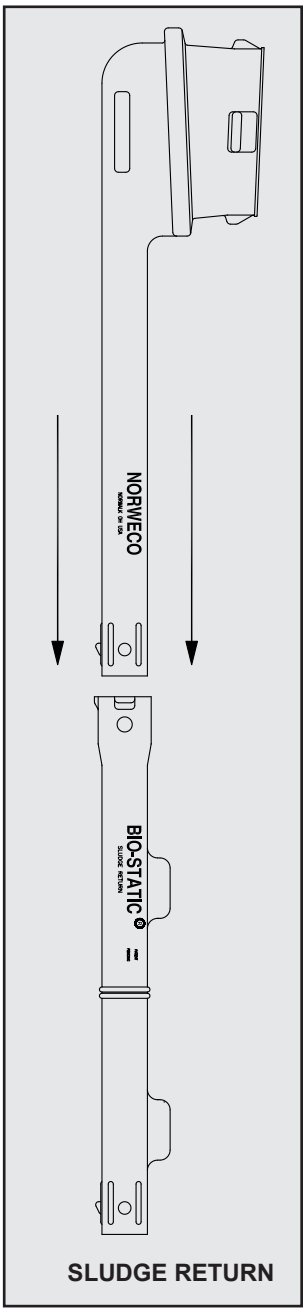
TANK DELIVERY AND SETTING (Cont.)

BIO-STATIC SLUDGE RETURN ASSEMBLY

Bio-Static sludge returns consist of inlet and extension sections and must be assembled prior to installation in the Singulair tank. Insert the small end of the inlet section into the socket end of the extension section until the retainer pins snap into position. A two piece assembly is used for 500 GPD and 1000 GPD systems.

A three piece assembly is used for 750 GPD, 1250 GPD and 1500 GPD systems. For 750 GPD and 1250 GPD systems the second extension section must be cut-off at the double line near the center of the extension. This cut can be made with a carpenter's saw or other suitable tool. After cutting the extension, de-burr the inside and outside perimeter of the extension with a router or sharp knife.

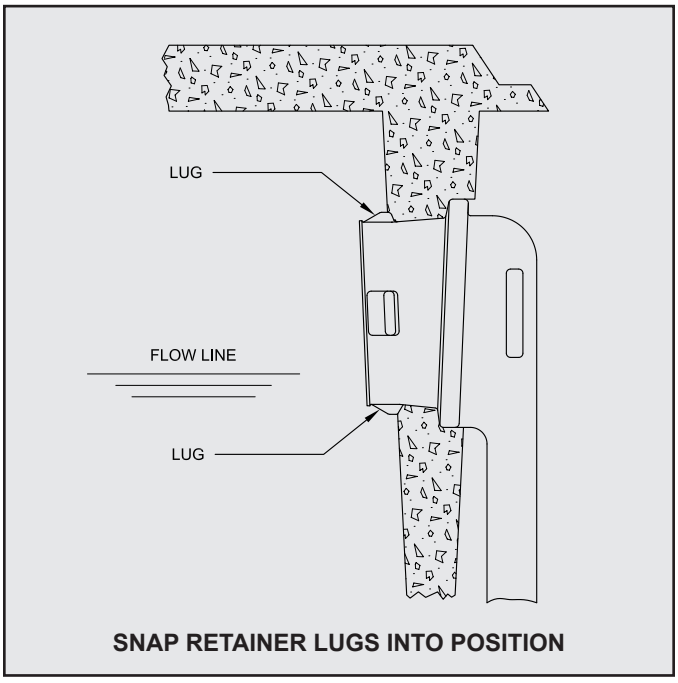
NOTE: Failure to de-burr may cause sludge return plugging. Install the cut-off extension on the bottom of the first extension section until the retainer pins of the first extension snap into place. The 1500 GPD system uses an assembly of one sludge return inlet with two full extensions and no cut-off is required.



SLUDGE RETURN

BIO-STATIC SLUDGE RETURN INSTALLATION

All Bio-Static sludge returns must be installed through the openings in the top of the clarification chamber, prior to installation of the Bio-Kinetic system mounting castings. A single Bio-Static sludge return assembly is installed in 500 GPD, 750 GPD and 1000 GPD systems. Two sludge return assemblies are installed in 1250 GPD and 1500 GPD systems. After the sludge return has been assembled to the correct length, it should be installed into the opening in the clarification chamber wall. Securely grasp the assembled sludge return by the inlet with the opening facing away from you. Lower the assembly through the clarification chamber access opening in the top of the tank. Firmly push the inlet of the sludge return through the opening in the clarification chamber wall until the four retainer lugs snap into position and the assembly is securely mounted. The standoff on the lower most extension piece should be touching the clarification chamber wall just above the transfer port. Repeat these steps when two Bio-Static sludge returns are required.



SNAP RETAINER LUGS INTO POSITION

MOUNTING CASTING AND OPTIONAL EXTENSION RISER INSTALLATION

Locate the power cable entrance in each aerator mounting casting. It should be inspected for flash or sharp edges. Be sure it extends all the way through the casting side wall. Remove the cast-in access cover from the top of each aeration chamber. Apply a strip of mastic sealant around the perimeter of each access opening. Position and install each aerator mounting casting with the power cable entrance facing the tank side wall that is closest to the building. Be sure that each mounting casting is properly seated on the tank top and evenly sealed with mastic. If extension riser castings are required, install them above each aerator mounting casting. Apply mastic sealant to all joints between castings. Do not apply sealant to the top of the mounting casting or riser that will receive the vented access cover.

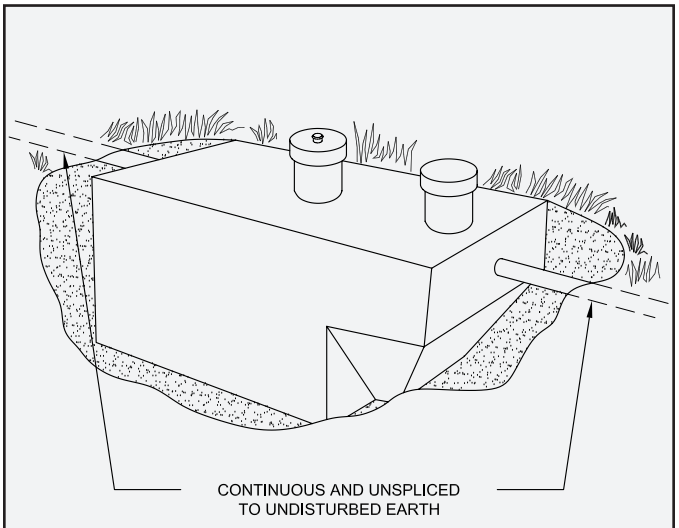
The pretreatment chamber can be made accessible at grade or left below grade, as required by local regulation or owner preference. The inspection cover on the pretreatment

TANK DELIVERY AND SETTING (Cont.)

chamber must at least be developed to within twelve inches of finished grade. Pretreatment chamber access covers should never be vented and should be sealed with mastic. Be sure all cast-in access opening covers that are not extended to grade are properly aligned, seated and securely in place. Tank covers which have been replaced by Bio-Kinetic or aerator mounting castings should be returned to your plant with the delivery truck. Install all covers for aerator mounting castings, Bio-Kinetic system mounting castings, risers and inspection ports before backfilling begins. **DANGER: Never allow access risers to be left uncovered or partially covered. Failure to secure access covers and safety nets could result in bodily injury, illness or death. Riser safety nets are available from Norweco for concrete or plastic risers.**

SEWER LINE INSTALLATION

Sewer lines may be installed as soon as the concrete tankage has been leveled and sealed. Sewer line trenches must be smoothly excavated and free of debris or sharp-pointed objects that could damage the installation. The trenches must allow sewer lines to be laid with 1/8" of fall per lineal foot of run along the entire length of the line. Influent and effluent sewer lines must be at least four inches in diameter. The influent line should be grouted into the Singulair system tank inlet. The effluent line should be PVC pipe, solvent welded into the Singulair outlet coupling. Inlet and outlet lines must be laid continuously and unspliced from the tank to undisturbed earth beyond the limits of the



SEWER LINE INSTALLATION

tank excavation. High quality PVC or other similar materials may be used for sewer lines, subject to the approval of local codes. Be sure the sewer lines are constructed with compatible fittings and joining materials throughout. Underground electrical cable for electrical service to each Singulair aerator should be installed in the sewer line trench before backfilling. Refer to Electrical Wiring and Control Center Installation instructions for complete details.

BACKFILLING

The Singulair tankage should be backfilled immediately after sewer lines and underground electrical cable are installed. Fine, loose earth should be used to backfill the tank excavation and sewer line trenches. Be sure it is completely free of rocks, large clumps of earth and construction debris. Backfill evenly around the entire perimeter of the tank rather than all at once on each side. Take care to completely fill in the cavity beneath the slanted clarifier end wall. Final grading should be six inches below the top of each access cover and should slope away from the tank so surface runoff will drain away from the Singulair system. Use extreme care in backfilling. Do not allow dirt or mud to enter any part of the Singulair system or sewer lines. If dirt or mud enters any portion of the system, it must be removed to insure proper system operation. Removing the dirt or mud may require repeated flushing and tank pumping.

TANK HOLD DOWN WATER

Each compartment in the Singulair system must be filled with clean water. The water should be free of leaves, mud, grit, oils or other materials that might possibly interfere with system operation. The tankage should be filled with water as it is backfilled to reduce stress on the precast concrete tank. Do not fill the Singulair tank with water through the opening in the top of the clarification chamber. The clarification chamber will be filled by adding water to the aeration chamber. In systems with more than one aeration chamber, each aeration chamber should be filled separately. In all systems, pretreatment chambers should be filled through their access openings.

This completes the portion of the installation that requires a delivery truck for tank lifting and setting. Installation of the electrical control center and underground electrical cable are normally completed by the delivery truck driver before leaving the site. Refer to Electrical Wiring and Control Center Installation instructions for details.

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SINGULAIR GREEN® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

TANK DELIVERY AND SETTING

To insure that all work proceeds safely and efficiently, check these items prior to delivery of the Singulair Green tank.

- ✓ Does the driver have the Singulair installer's tool kit and complete and accurate directions to the installation?
- ✓ Are the appropriate aerator mounting riser, vented access cover, Bio-Kinetic system mounting riser, pretreatment riser, sealed access covers and extension risers included?
- ✓ Are additional anti-flotation measures required for this installation?
- ✓ Is a sufficient amount of water, gravel and sealing material available for the installation and plumbing connections?
- ✓ Does the delivery vehicle have the proper pick-up bar, cable, straps and/or chain?
- ✓ Is the proper Service Pro control center available for delivery with the tank?
- ✓ Is there sufficient underground electrical cable to reach from the control center to the tank?

PLEASE NOTE: The Singulair Green tank is constructed of high density polyethylene. All joints have been factory sealed for your convenience. This will minimize tank loading, unloading and setting time at the site. The Singulair Green tank has been designed for underground use only. Do not install the tank in a location that is subject to vehicular traffic. **DANGER: All access covers must be secured with screws provided. Never allow access risers to be left uncovered or partially covered. Failure to secure access covers and safety nets could result in bodily injury, illness or death. Riser safety nets are available from Norweco for concrete or plastic risers.**

CHECKING THE EXCAVATION

Before tank setting begins, verify that the excavation is level and free of sharp stones and construction debris. Clear out any objects that could come in contact with the tank.

The length, width and depth of the excavation should be checked. The excavation should have sufficient overdig to allow between 18" to 24" of clearance around the entire perimeter of the Singulair Green system. In addition, the excavation should allow for a minimum of 6" and a maximum of 18 1/2" of cover over the top of the tank. For deeper installations, consult the Deeper Burial Requirements section of this guide. Failure to follow the excavation and backfilling guidelines may result in tank damage and will void the system warranty.

TANK WITH DELIVERY TRAILER

Check the influent and effluent sewer line trenches. The trench depth should correspond with the Singulair Green system inlet and outlet connections and the trenches should be smooth to prevent damage to the sewer lines.

A tank leveling pad should be installed in the bottom of the excavation. The leveling pad should be a minimum of 4" thick and leveled to within 1/4" from side to side and end to end. The elevation of the top of the leveling pad should correspond to the outside bottom of the Singulair Green tank when installed. In areas with unstable soil conditions, a reinforced concrete pad may be required under the Singulair Green tank.

Safe working conditions must be established and maintained during the entire installation procedure. Unstable soil conditions require constant monitoring of the site to insure safety. Installation procedures, equipment and personnel should always comply with applicable safety regulations as well as all federal, state and local codes.

Do not install the Singulair Green tank in saturated clay, areas with a high water table, bogs, swampy areas, landfills where the soil is soft or wet, areas containing expansive soils or soils with an ultimate bearing capacity of less than 1,500 psf. Failure to follow these directions may result in damage to the tank and will void the system warranty.

TEMPORARY UNIT STORAGE

If a Singulair Green tank is delivered before installation can occur, store the tank on smooth ground with no rocks or sharp objects against the tank. Chock the tank with sandbags to prevent tank movement. If high winds are anticipated, tie the tank down to prevent any damage.

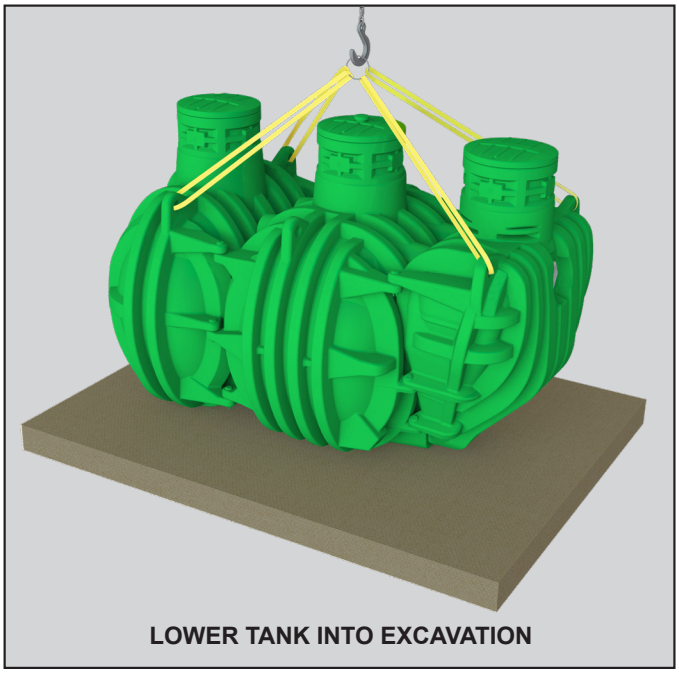
PREPARING THE SINGULAIR GREEN® TANK

Before installing the Singulair Green tank, inspect for signs of damage that may have occurred during transportation or handling. Damaged tanks could leak and should not be installed. Check the inlet and outlet couplings for any signs of damage that would prevent solvent welding to the plumbing. Remove all stretch wrap and instructions from the risers. Inspect all risers and access covers to insure no damage has occurred. Verify that all riser and access cover screws are securely attached.

CAUTION: Extreme care should be used in the vicinity of any excavation. A delivery vehicle can place excessive loading on excavation sidewalls and care must be taken in its positioning. Once installed, no vehicle should operate over the tank or any other part of the treatment system.

TANK SETTING AND SAFETY

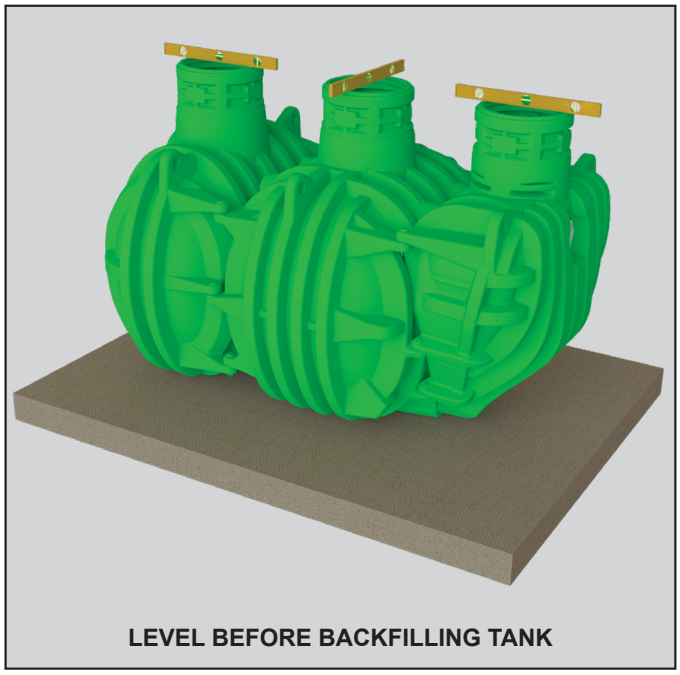
Make sure the delivery vehicle outriggers are firmly placed on stable soil at the excavation site. All personnel must be out of the excavation area and at a safe distance from the tank. Before lifting the tank, check all lifting chains, straps or cables to be sure they are properly secured. Lift the tank using at least four of the molded lifting lugs located on the tank. Carefully lower the tank into the excavation. Stop the tank several inches above the excavation floor and position it in the desired location. Lower the tank carefully until all tension is off the lifting device. Do not remove the lifting chains, straps or cables until leveling has been completed.



LOWER TANK INTO EXCAVATION

LEVELING THE TANK

Remove the access covers and place a level on the risers to verify that the tank is level within 1/4" from side to side and end to end. If the tank needs to be raised more than 6" to apply leveling material, all personnel should move to a safe location so the tank can be fully removed from the excavation. Fall through the system from inlet invert to outlet invert is 4". Therefore, the outlet invert of the system must be installed 4" lower than the inlet invert.



LEVEL BEFORE BACKFILLING TANK

MOUNTING RISER AND OPTIONAL EXTENSION RISER INSTALLATION

If extension risers are required, install them as needed above each mounting riser. To insure a watertight seal, install a gasket in all joints between the risers.

Access to the pretreatment chamber can be developed to grade or below grade as required by local regulation or owner preference. The access cover on the pretreatment chamber must be developed to within 12" of finished grade. Place a sealed access cover on the pretreatment chamber access opening. Place a vented access cover on the aerator mounting riser and a sealed access cover on the Bio-Kinetic system mounting riser before backfilling.

SEWER LINE INSTALLATION

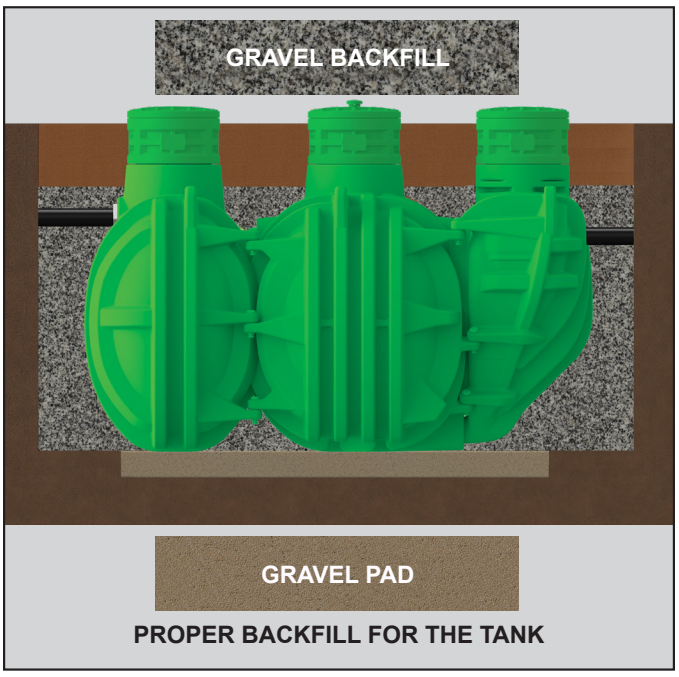
Sewer lines may be installed as soon as the Singulair Green tank has been leveled. Sewer line trenches must be smoothly excavated and free of debris or sharp objects. The trenches must allow sewer lines to be laid with 1/8" of fall per lineal foot. Influent and effluent sewer lines must be at least 4" in diameter. The influent and effluent lines should be PVC pipe and solvent welded into the Singulair Green tank inlet and outlet couplings. Influent and effluent lines must be laid continuously and unspliced from the tank to the undisturbed earth beyond the tank excavation site.

Underground electrical cable for electrical service to the Singulair aerator should be installed in the influent sewer line trench before backfilling the Singulair Green tank. Refer to the “ELECTRICAL WIRING AND CONTROL CENTER INSTALLATION” instructions for complete details.

CAUTION: Do not attempt to adjust the position of the tank or sewer lines with the backhoe bucket. Excessive force may damage the inlet and/or outlet couplings.

BACKFILLING THE GREEN SYSTEM

Prior to backfilling, add a minimum of 12" (250 gallons) of ballast water to the Singulair Green tank to prevent shifting in the excavation. Fill each chamber to an equal level. Do not add water through the clarifier access opening. The clarification chamber will be filled through the transfer opening between the aeration and clarification chambers as the aeration chamber is filled. The Singulair Green tank must be backfilled immediately after the sewer lines, underground electrical cable and ballast water are in place.



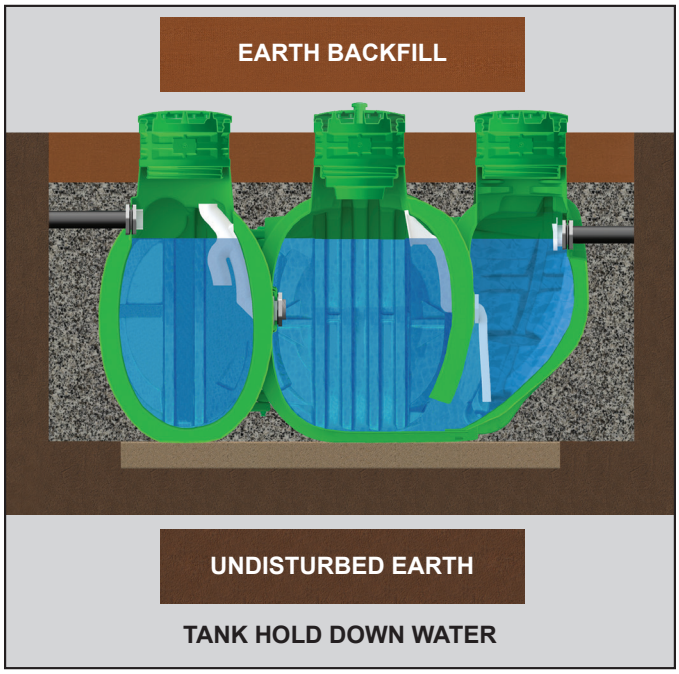
PROPER BACKFILL FOR THE TANK

Cover all openings, then begin backfilling with gravel under and around the sloped clarifier. Continue to add gravel until the discharge line from the Singulair Green tank is covered. Proceed to the inlet end of the pretreatment chamber and add gravel until the inlet line is covered. Fine, loose earth may be used to backfill the remainder of the excavation. Be sure that the backfill is free of rocks, sharp objects, large clumps of earth and construction debris. Never use clay for backfill material. The backfill must flow freely and care should be taken to insure that all recesses formed between the ribs and beneath the area between the pretreatment and aeration chambers are completely filled. Add backfill evenly around the entire perimeter of the Singulair Green tank in 12" increments. Hand tamp each layer of fill to compact soil. When backfilling over the tank, add fill to the area between the risers first. Final grading should be 3" to 4" below the top of each access cover and should slope away from the tank so surface runoff will drain away from the Singulair Green system. Use extreme care when backfilling the excavation. Do not allow dirt or mud to enter any part of the Singulair Green system or sewer lines.

TANK HOLD DOWN WATER

The Singulair Green tank must be filled with clean water to the outlet invert immediately following backfilling. The water must be free of leaves, mud, grit or other materials that might interfere with system operation.

When pumping or dewatering the Singulair Green tank, only pump the pretreatment chamber. Then, promptly refill the tank to capacity with clean water. Dewatering and leaving the Singulair Green tank empty will affect tank integrity and void the Singulair Green warranty.



TANK HOLD DOWN WATER

DEEPER BURIAL REQUIREMENTS

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.

SPECIAL ANTI-FLOTATION SYSTEM

In areas where high water is a concern, it may be necessary to provide additional anti-flotation measures to secure the Singulair Green 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. Failure to follow the anti-flotation recommendations provided in this document may result in damage to the Singulair Green tank or shifting in the excavation and may void all or part of the limited warranty.

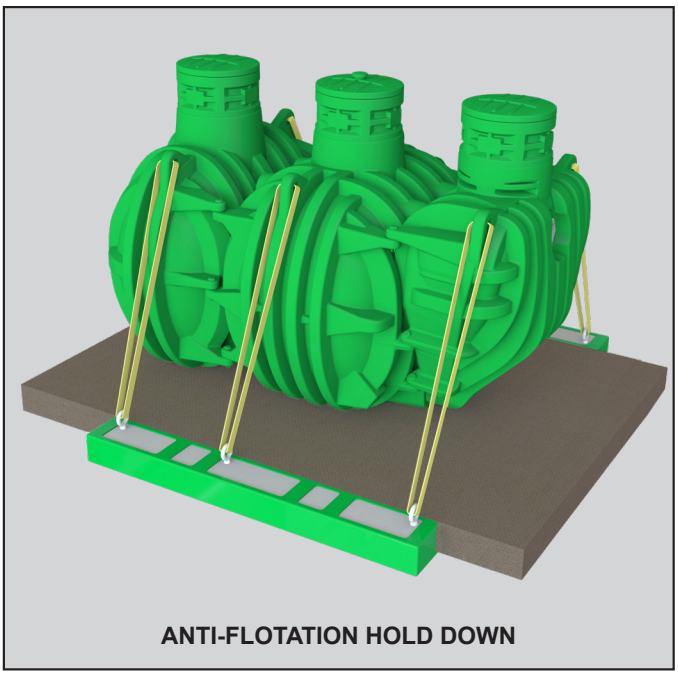
If anti-flotation is required, consult a soil scientist to measure soil density. Once soil density is defined, refer to the SHALLOW BURIAL AND REDUCED SOIL DENSITY HOLD DOWN REQUIREMENTS chart below. After the amount of additional hold down weight is determined, it is recommended that a pair of concrete beams of appropriate size be placed at the base of the excavation. Alternately, 0.60 CCA treated lumber beams may be used. Treated lumber beams and anti-flotation strap assemblies are available from Norweco. Beams must not be placed directly under the perimeter of the Singulair Green tank. The weight of the soil over the beams significantly contributes to the tank hold down forces. Placing beams under the tank will limit the amount of soil anchoring the beams into the excavation and should never be done.

Secure the anti-flotation beams to the Singulair Green tank with properly rated hold down straps that attach to the lifting lugs located at the top of each of the three chambers. The weight of the beams plus the weight of the soil over the beams must be greater than the required hold down weight shown in the table below.

COMPLETING THE INSTALLATION

Once the tank has been filled with clean water, the access openings must be secured. Install a sealed access cover on the pretreatment and clarification chamber risers. Install a vented cover on the aeration chamber riser. **CAUTION: All access covers must be secured with screws provided. Failure to secure covers could result in injury or death.**

Installation of the control center and underground electrical cable are normally completed before leaving the site. Refer to “ELECTRICAL WIRING AND CONTROL CENTER INSTALLATION” instructions for details.



ANTI-FLOTATION HOLD DOWN

SINGULAIR GREEN® SHALLOW BURIAL AND REDUCED SOIL DENSITY HOLD DOWN REQUIREMENTS

Soil Density (lbs. per cu.ft.)	80	90	100	110	120	130
Fill Over Tank (inches)	Additional Weight Required (lbs.)	Additional Weight Required (lbs.)	Additional Weight Required (lbs.)	Additional Weight Required (lbs.)	Additional Weight Required (lbs.)	Additional Weight Required (lbs.)
6	8,073	7,178	6,284	5,389	4,495	3,600
8	7,233	6,234	5,235	4,235	3,236	2,236
10	6,394	5,290	4,185	3,081	1,977	872
12	5,555	4,345	3,136	1,927	718	*
14	4,715	3,401	2,087	773	*	*
16	3,876	2,457	1,038	*	*	*
18	3,037	1,513	STANDARD INSTALLATION	*	*	*
20	2,197	568	*	*	*	*
22	1,358	*	*	*	*	*
24	519	*	*	*	*	*
26	*	*	*	*	*	*

* HOLD DOWN WEIGHT NOT REQUIRED

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

AERATOR INSTALLATION

Installation of the aerator and Bio-Kinetic system should take place when the Singulair system is ready for start-up. Refer to the Bio-Kinetic System Installation instructions for additional details. Your delivery truck driver should have instructed the contractor or owner to contact your office and make arrangements for equipment installation to coincide with occupancy and sanitary sewer use. Review your Singulair tank setting records weekly to insure that you do not have equipment installations that are overdue. If you suspect that adequate time has passed for system start-up and you have not yet heard from the owners, contact them to schedule equipment installation. For Singulair Bio-Kinetic wastewater treatment systems requiring more than one aerator installation, follow these instructions for each aerator to be installed.

PRE-INSTALLATION CHECKLIST

- ✓ The installer should have accurate directions to the facility and a list of service inspections due at other installations in the vicinity.
- ✓ The service vehicle should carry the Bio-Kinetic Tool Kaddy fully stocked with tools, spare parts and test equipment for use during installation.
- ✓ Someone should be present at the location to allow installer access to the control center and electrical service panel.
- ✓ The main electrical service panel wiring must be complete so each aerator may be started-up and tested.
- ✓ All chambers of the Singulair tankage should be full to the flow line.
- ✓ A Bio-Static sludge return should have been installed in each opening in the aeration/clarification chamber wall.
- ✓ The installer must have the proper model and quantity of aerators for the installation.
- ✓ The serial number on each aerator must match the service and warranty record card.

AERATOR START-UP PROCEDURE

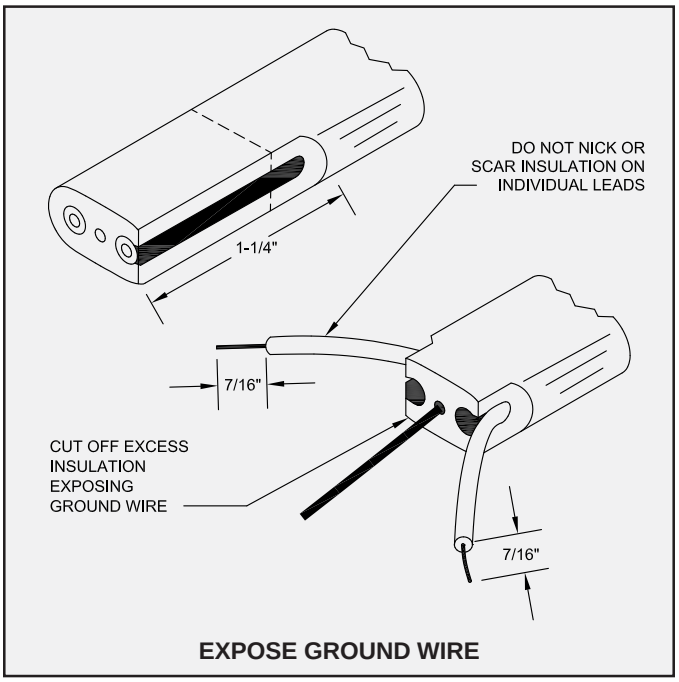
When you arrive on site, introduce yourself to the owner and ask to see the main electrical service panel and Singulair control center. Be certain each circuit for the Singulair system in the main electrical service panel is de-energized and that the selector switch in the Service Pro control center is placed in the “off” position. Explain to the owner that you will be installing the aerator in the tank and you will need access to the main electrical service panel for system start-up after the aerator has been installed. Carry the aerator in its shipping carton to the tank site. Place the Singulair Bio-Kinetic Tool Kaddy nearby for easy access to tools and test equipment. Remove the vented cover from the aerator mounting casting. Carefully remove the aspirator shaft from the shipping carton. Do not bump or bend the aspirator shaft. Lay the shaft on the vented cover. Grip the outside bottom of the shipping carton with your feet and lift the aerator to remove it. Lay the aerator on its side with the brackets resting on the vented cover near the aerator mounting casting. Uncoil the underground electrical service cable from inside the aerator mounting casting and extend it out of the casting. Test the exposed leads with the electrical multi-meter from the Tool Kaddy before proceeding. The circuit should not be energized and voltage should not be evident when the leads are tested with the multi-meter.

WIRING THE ELECTRICAL CONNECTOR

The moisture resistant electrical connector must be properly wired to insure system operation and protect components. Carefully follow these steps to completely wire the electrical connector:

1. Uncouple the two halves of the electrical connector on the Singulair aerator. Unscrew the three captive stainless steel screws from the face of the female half of the assembly. They will stay in the body of the receptacle. Lift out the rigid internal receptacle body.
2. Unscrew the compression nut on the strain relief connector assembly at the small end of the female half of the connector. Do not misplace the compression ring. Insert the electrical service cable through the compression nut, compression ring and neoprene grommet, which is contained in the molded plastic sleeve of the female connector.
3. Strip the outer insulation back $1\frac{1}{4}$" on the underground electrical service cable and expose the three individual leads. Use extreme care to be sure the insulation jackets on the individual black and white leads are not scarred or damaged while stripping the outer jacket. Check them carefully. If even slight damage is noticed, cut off the end of the cable just below your work and begin again.

AERATOR INSTALLATION (Cont.)



EXPOSE GROUND WIRE

4. Strip off the insulation jackets $^{7}/_{16}$" from the ends of the black and white leads.
5. Insert the black lead end into the hole adjacent to the brass-colored screw and tighten the screw securely.
6. Insert the white lead end into the hole adjacent to the silver-colored screw and tighten the screw securely.
7. Insert the bare copper ground lead into the hole that is adjacent to the green colored screw and tighten the screw securely.
8. Inspect your work to see that no two uninsulated leads are in contact with each other and that all screws are tight. Also be sure the wire insulation is not captured in the terminal. All power cable leads must be connected to the correct terminals in the female receptacle for proper aerator operation. The back of the insert body is clear, making it easy to verify that each wire is in place before tightening the terminal screws. Improper wiring or electrical hook-up will void the warranty.
9. Locate the insert key above the grounding pole on the side of the rigid receptacle body and align it with the keyway molded on the inside of the rubber receptacle sleeve. Grasp the connector and insert the receptacle body fully into the sleeve.
10. Engage the three captive stainless steel screws on the face of the receptacle body and tighten them.
11. Press the neoprene grommet onto the small end of the female half of the electrical connector. Tighten the compression nut and clear plastic compression ring against the grommet. The compression nut achieves maximum torque by hand-tightening. Do not over-tighten the compression nut.

NOTE: Any time the female connector is not in use, secure the closure cap in the end of the receptacle.

ASPIRATOR SHAFT INSTALLATION

Each Singulair aerator is manufactured and tested to a critical straightness tolerance from the aerator motor to the aspirator. Remember that the operating life of the aerator often depends on the straightness of the aspirator shaft. It must not be bumped or allowed to contact anything except the aeration tank liquid.

1. With the Singulair aerator lying on its side and the brackets propped up on the vented cover, rotate the foam restrictor until the stainless steel set screws in the intermediate shaft are facing up.
2. Loosen the two set screws that are located closest to the foam restrictor.
3. Examine the upper end of the aspirator shaft and locate the alignment mark permanently affixed during factory testing. Insert the aspirator shaft into the intermediate shaft so that the alignment mark on the aspirator shaft meets the corresponding mark on the intermediate shaft. Be sure both set screws have been loosened before inserting the aspirator shaft. The aspirator shaft must be fully inserted to the depth of the stop shoulder that has been machined in the outside of the aspirator shaft. Use a tee-handle allen wrench to tighten both set screws finger tight only. Overtightening may dish the side of the aspirator shaft and compromise the straightness tolerance.

INSTALLATION IN THE MOUNTING CASTING

1. Lower the aerator into the aerator mounting casting carefully to avoid any contact between the aspirator shaft, aspirator tip and concrete side walls.
2. Make sure that the weight of the aerator is evenly distributed on all four mounting brackets and that the brackets are seated in the four precast grooves on the top of the aerator mounting casting.
3. Arrange the underground power cable in the mounting casting so that it does not touch or come into contact with the side of the Singulair aerator.
4. Make sure the blades on the male half of the electrical connector are clean and dry. Plug the two halves of the watertight electrical connector together making sure the multiple lip seal is securely engaged. Arrange the aerator power cord, electrical connector and underground electrical cable around the aerator, and secure them into the mounting clips attached to the aerator upper brackets. Before replacing the aerator mounting casting lid, make sure these electrical connections are not resting against the top of the aerator.

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BIO-KINETIC® WASTEWATER TREATMENT SYSTEM

INSTALLATION OF THE BIO-KINETIC® SYSTEM

The Bio-Kinetic system is installed in the final clarification chamber of the Singulair tank. This unique device accomplishes tertiary treatment, flow equalization and, if required by local regulations, effluent disinfection and dechlorination in one compact assembly. The Bio-Kinetic system is recommended for use in direct off-lot discharge applications and any other application where extremely high quality effluent is desirable. Installation of the Bio-Kinetic system can take place as soon as the tank is ready for storage or immediately after the tank is installed in a prepared excavation.

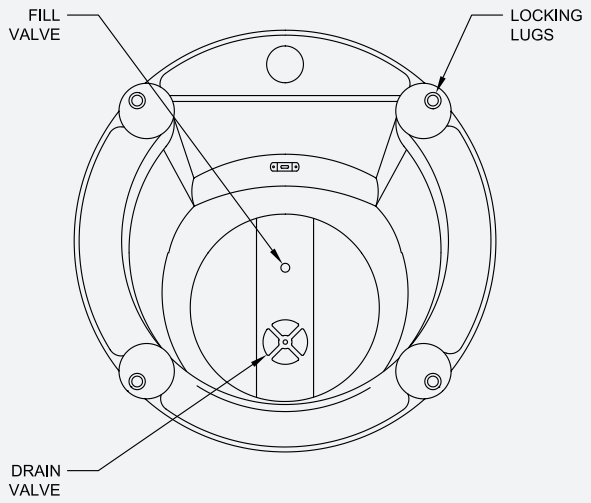
Drain and fill valves built into the Bio-Kinetic system allow it to be installed within the Singulair tank any time after the tank has been poured and stripped. This allows faster Singulair system installation and less time at the installation site. When installing the Bio-Kinetic system before tank delivery, make sure the tank is stored in a level position to avoid stress on the cast-in-place receiving flange, the Bio-Kinetic discharge flange or to prevent damage to the outer chamber filter media.

BIO-KINETIC® SYSTEM PRE-INSTALLATION CHECKLIST

- ✓ All chambers of the Singulair tank should be full to the flow line with clean hold down water as soon as the tank is placed in the excavation and backfilling begins. When the owner calls for start-up, ask him to check the liquid level in the Singulair system. If the liquid level has not reached the outlet invert, have the owner add clean water until full.
- ✓ These instructions consider the use of concrete as well as plastic risers and lids. The Bio-Kinetic system access opening pan, designed to accommodate the locking lugs into the tank top, must be used when installing plastic risers over the clarification chamber access opening.
- ✓ The service vehicle should be fully stocked, including the Norweco Tool Kaddy, Bio-Kinetic lubricant, Blue Crystal disinfecting tablets and Bio-Neutralizer dechlorination tablets.
- ✓ Make sure the proper quantity and model number of Bio-Kinetic systems for the installation are in the service vehicle. Bio-Kinetic systems may be supplied with or without Blue Crystal and Bio-Neutralizer chemical feed systems. Therefore, check your order and Distributor Service and Warranty Record Card carefully to be sure you have selected the proper quantity of Bio-Kinetic systems with the correct service cover, flow distribution deck and feed tube(s), and that they are properly labeled for the correct model Singulair system.
- ✓ For Singulair systems requiring multiple Bio-Kinetic tertiary treatment devices, follow these instructions for each Bio-Kinetic system to be installed.

PREPARING THE SINGULAIR TANK

1. Bio-Kinetic system mounting castings or plastic risers should be used for access to the clarification chamber. Additional riser castings or plastic risers may be added as necessary to reach finished grade.
2. When a mounting casting is used, it must be carefully sealed to allow the locking lugs of the Bio-Kinetic system to engage into the groove created when the mounting casting is installed on the tank top. Excess sealant in this groove may prevent the locking lugs from properly engaging. Other sealing procedures for the tank, mounting castings and risers are detailed in Singulair Tank Delivery and Setting instructions.
3. When plastic risers and lids are used to replace the concrete system mounting castings, make sure that the proper access opening pan has been used to create the grooves that are necessary for securing the locking lugs. Seal and secure the plastic risers to the manufacturer's specifications.
4. The Bio-Kinetic system should only be installed in a



BIO-KINETIC® SYSTEM
AUTOMATIC DRAIN AND FILL VALVES

INSTALLATION THE OF BIO-KINETIC® SYSTEM (Cont.)

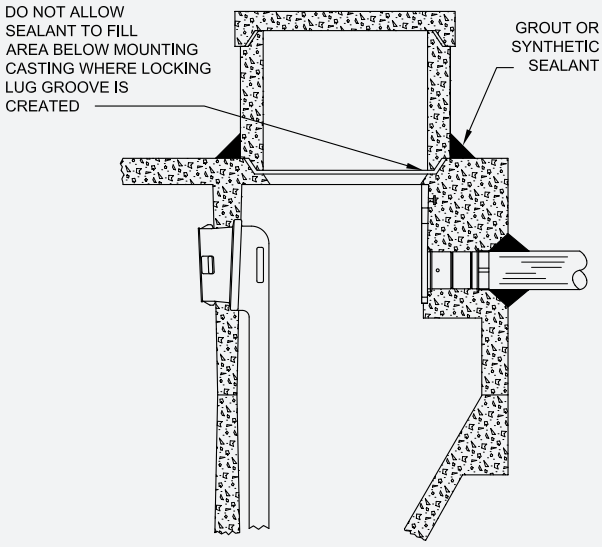
concrete mounting casting or plastic riser with a non-vented concrete or plastic cover above it. Do not seal the cover to the mounting casting or plastic riser. All mounting castings, risers and covers must be in place before backfilling the tank to prevent fill material from entering the Singulair tank.

5. The proper quantity of Bio-Static sludge returns should have been installed in the aeration/clarification chamber wall when tank delivery and setting was completed. Check to be sure that a Bio-Static sludge return is installed in each of the cast-in opening(s) in the aeration/clarification chamber wall.
6. If the Singulair tank is in an excavation, it should already be filled with clean water. The water should be free of dirt, mud, leaves, grit, oils or other materials that might possibly interfere with operation of the system. The tank should be filled with water inside, at the same time it is backfilled outside, to reduce stress on the precast tank. The aeration and clarification chambers will both be filled if the hose is installed in the aeration chamber access opening. The pretreatment chamber should be filled separately through its access opening.
7. Influent and effluent sewer lines must be installed and connected to the system as soon as it is set and before backfilling to prevent entry of mud or debris.
8. When a Singular system is being installed to replace a failed onsite wastewater treatment system, the old septic tank need not be abandoned. However, be sure the Singulair system is installed downstream of the old septic tank and that the entire obsolete system is completely pumped and cleaned before the Singulair tank is installed. If the owner prefers, the obsolete system may be totally removed or filled in and abandoned in the ground.
9. Check to see that roofing down spouts, footer drains, sump pump piping or garage and basement floor drains are not connected to the sanitary sewer. The Singulair system may not operate properly if hydraulic flows greatly exceed the rated treatment capacity. If the facility is equipped with a water softener, locate the backwash discharge line. The backwash line must not be connected to the Singulair system.

BIO-KINETIC SYSTEM INSTALLATION PROCEDURE

Remove the Bio-Kinetic system from the shipping carton. Lift off the Bio-Kinetic system service cover and set it aside. Rotate the round, black locking lugs inward to allow installation.

The Bio-Kinetic system discharge flange must engage the plastic receiving flange that has been cast into the outlet of the Singulair tank. Carefully examine the condition of the outlet coupling and receiving flange. Any concrete residue or aggregate that has accumulated in the grooves of the receiving flange or inside of the outlet coupling must be removed and the grooves and face of the receiving flange should be wiped clean. Use the swab tool to 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 the grooves are thoroughly coated. Locate the gasketed discharge flange assembly installed in the outlet of the Bio-Kinetic system. Make sure that the assembly is tight and fully engages the discharge opening of the Bio-Kinetic system. Using the swab tool, apply a liberal amount of lubricant to the exterior surfaces of the gasketed discharge flange. Apply the lubricant evenly over the entire face of both sides and along the edges of the discharge flange.



LOCKING LUG GROOVE

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.

SELF FILL VALVE

Use the lifting tool to lower the Bio-Kinetic system into the mounting casting. Be careful to align the discharge flange with the receiving flange cast into the tank. The Bio-Kinetic system is equipped with a pressure sensitive valve to aid in the filling process for new systems that are not yet filled and the draining process during service or removal. The fill valve is engineered to open when the pressure outside the Bio-Kinetic system reaches 16" of head. When the tank water level reaches 16" on the outer chamber of an empty

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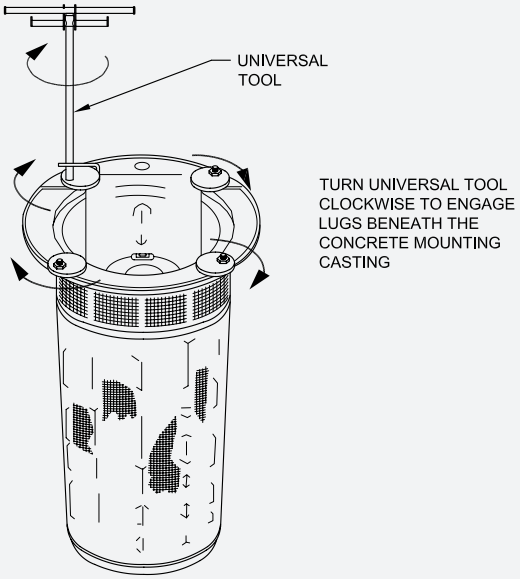
SINGULAIR® BIO-KINETIC®

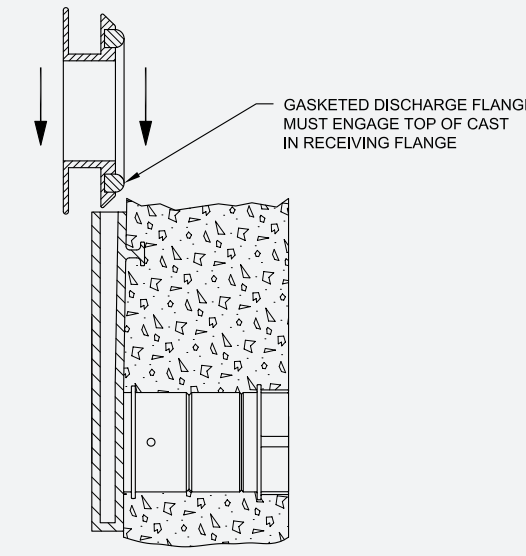
WASTEWATER TREATMENT SYSTEM

INSTALLATION OF THE BIO-KINETIC® SYSTEM (Cont.)



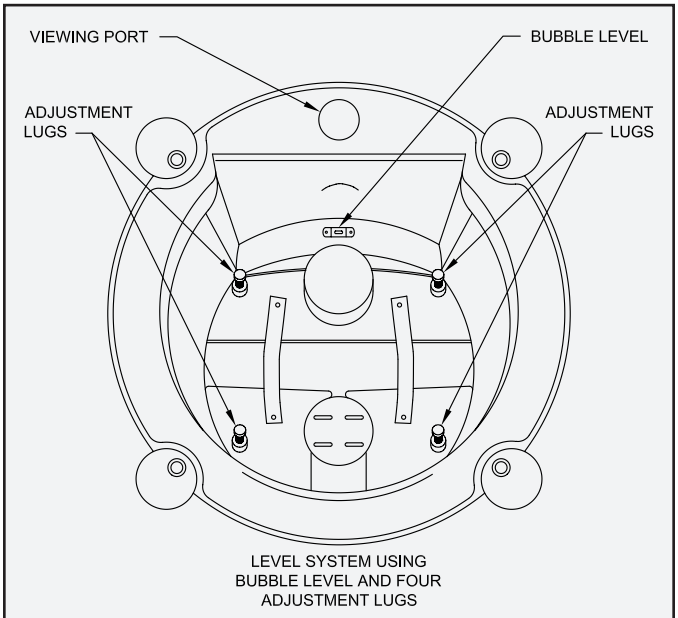
LOCKING DOWN THE BIO-KINETIC SYSTEM

Bio-Kinetic system, the fill valve will open. The valve will remain open until the water level inside the filter reaches 4" below the water level outside the filter. At this point, the valve will close. For instructions on the drain valve system, refer to “Clarification Chamber and Bio-Kinetic Service.” Carefully guide the system through the center of the opening using the lifting tool. Be sure to maintain the Bio-Kinetic system in a vertical position. If tilted, the system could rub the edge of the concrete opening and be damaged. **NOTE:** Use the viewing port to insure proper alignment and engagement of the outlet connection. The discharge flange must engage the top of the cast-in-place receiving flange.



CHECK FOR PROPER ALIGNMENT

Continue to lower the system until the discharge flange fully engages the receiving flange and the top collar of the Bio-Kinetic system rests on the concrete ledge of the clarification chamber access opening. To confirm that the discharge flange and receiving flange are fully engaged, look through the viewing port in the top collar. Use the locking lug tool to twist each of the round, black locking lugs clockwise, so that each locking lug is positioned directly beneath the concrete lip of the mounting casting.



BUBBLE MUST REST BETWEEN THE TWO LINES

PLACING THE BIO-KINETIC SYSTEM ON LINE

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 distribution deck should be leveled using the four adjustment lugs provided for this purpose. With the ratchet drive, extension and $^{7}/_{16}$" socket from the Tool Kaddy, turn each of the adjustment lugs the minimum amount necessary for the bubble to rest squarely between the two lines in the clear plastic case. 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.

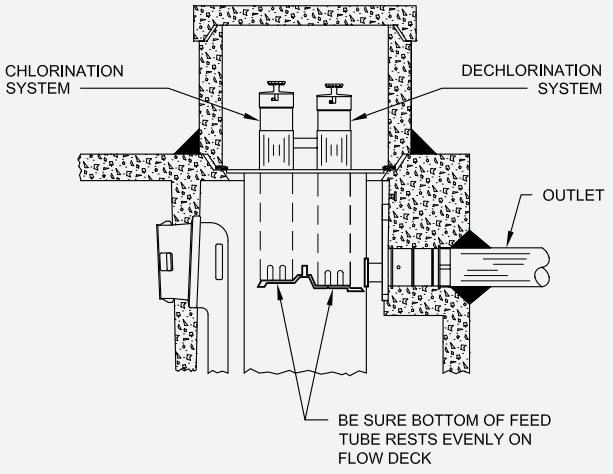
The system service cover can now be placed into position. Install the cover, handle side up, aligning the four holes in the cover with the four locking lug bolts. Be sure the optional chlorination and dechlorination feed tube access

INSTALLATION OF THE BIO-KINETIC® SYSTEM (Cont.)

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.

If the installation requires a Blue Crystal disinfection system, the chlorine feed tube opening in the service cover must be positioned on the inlet side of the system nearest the aerator mounting casting. Before handling Blue Crystal tablets, carefully read the container 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 time, until the tube is filled. 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.

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 openings in the protective cover. The dechlorination feed tube must be installed nearest the system outlet.



BLUE CRYSTAL® AND BIO-NEUTRALIZER® FEED TUBE INSTALLATION

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. Contact with other liquids or chemicals may cause fire. Wear proper protective equipment 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, irritate the nose and throat, and may be fatal if swallowed. If on skin, wash with plenty of soap and water for fifteen minutes, call a doctor if irritation persists. 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 the case of fire, apply liberal quantities of water. It is a violation of Federal Law to use Blue Crystal tablets in a manner inconsistent with the instructions printed on the storage container label.

If the installation requires a Bio-Neutralizer dechlorination system, the Bio-Kinetic system will be supplied with a dechlorination feed tube. Before handling Bio-Neutralizer dechlorination tablets, carefully read the container label and the "Warning" section of these instructions. To fill the dechlorination feed tube, remove the cap, hold the tube (open end down) with one hand and insert the Bio-Neutralizer dechlorination tablets, one tablet at a time, until the tube is filled. Each tablet must lie flat in the stack. When the tube has been completely filled, replace the cap. 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 deck.

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.

Reinstall the Bio-Kinetic system access cover. If a plastic riser and lid are used, secure the plastic lid to the riser using the fasteners provided. Now proceed with the steps outlined in the Singulair System Final Check and System Start-Up instructions. **DANGER: Make sure the system access cover is in good condition and securely installed on the mounting casting. Never allow access risers to be left uncovered or partially covered. Failure to secure access covers and safety nets could result in bodily injury, illness or death. Riser safety nets are available from Norweco for concrete or plastic risers.**

SERVICING THE BIO-KINETIC SYSTEM

Each installation equipped with the Bio-Kinetic system should be inspected and serviced during each six-month service inspection. Refer to the Bio-Kinetic System Service instructions for service and recordkeeping procedures.

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