Rhode Island Design Manual

SoilAir®

May 10, 2024

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1. Introduction

SoilAir is a patented technology that intermittently aerates leaching systems and the surrounding soil. This process allows for rapid rejuvenation of failed leaching systems, extends the life of new leaching systems and enhances treatment.

The SoilAir System generates supra and sub atmospheric air pressure in the OWTS. This results in oxygen flowing through the OWTS and through the surrounding soils. Through this process, the biomat is transformed from anaerobic to aerobic. The aerobic and facultative microorganisms that flourish in a well aerated environment can then reduce the thickness of the biomat through metabolic activity and enhance treatment efficiencies.

2. Designing a SoilAir System

SoilAir may be installed on new OWTS in Rhode Island for enhanced performance or installed for the repair of conventional leachfields.

Residential New Building Construction designs specifying SoilAir are eligible for a 50% reduction of the required leachfield area. This reduction only applies to conventional leachfields.

Commercial New Building Construction designs specifying SoilAir will be required to specify 100% of the required leachfield area and this area must be zoned.

Commercial Repair applications specifying SoilAir must specify as much of the required leachfield area that the lot will accommodate and zoning is required.

All designs specifying SoilAir must be reviewed by Geomatrix. Upon review and approval Geomatrix or its authorized representative will provide a letter to the designer acknowledging suitability of SoilAir for the proposed use, including additional recommendations, if any. This letter must be submitted to RIDEM with each permit application submitted for review and approval in Rhode Island.

A site and system investigation by Geomatrix or its authorized representative is required for all repairs for which SoilAir is to be used. The site and system investigation report and a copy of the originally approved septic system plan, or a system plan based on the Vendor-required site investigation, identifying the location and size of the tank, location and type of distribution box, and the location, type and size of the leaching area in use must be submitted with the OWTS repair application.

In general, system components include controls, a blower, airline, air backflow prevention device to pneumatically isolate the OWTS and a float switch to monitor septic tank levels and control blower operation. The float switch (normally closed) and check valve assembly should be preferably installed inside the septic tank at the outlet. This assembly replaces the outlet baffle. Alternatively, the check valve can be installed just outside the septic tank, directly

adjacent to the tank wall and brought to grade with a riser for ease of maintenance. This may be desirable in situations where access is restricted.

The aboveground SoilAir components typically include a blower and controls, both are installed outside in weatherproof enclosures and installed in unobtrusive locations; typically within 200 feet of the septic system. An air supply line runs from the blower to the OWTS components and to supply air. Power and optional phone or communication lines are run to the equipment enclosure location or control panel. (Note: telemetry is required for all commercial applications of SoilAir in Rhode Island.)

3. Basic Design Parameters

- Speak to Geomatrix or its authorized representative to select appropriate model.

Table 1: SoilAir models and general treatment capacity

	Treatment Capacity *, **
Model	Maximum Number of Bedrooms (Single Family residence)
LA 8.5-173R	3-4
RF3952	5-6
RF5264	7-9
RF9858 **RF15652** **RF21650** **RF29450** **CM1000**	To be customized for commercial systems in consultation with Geomatrix or its authorized representative.

*This table is an over simplification. Model selection should be discussed with Geomatrix or its authorized representative prior to selecting the model.

** This table is predominantly for new systems. For sizing remediation systems contact Geomatrix or its authorized representative.

- Deciding where to connect the airline into the system:

The airline is typically connected between the septic or pump tank outlet and the leaching systems, often in the distribution box. Instances may arise where the airline may be plumbed directly into leach field components or the ends of leachfield laterals. The air line should pitch down towards the leach field or drain to the pump tank to prevent condensation buildup. For typical air line sizing refer to **Table 2.**

In certain instances the air line can be connected to a dedicated air diffuser piping network or to other components such as plastic chambers, etc.

A Fernco fitting or equal rubber coupling should be installed on the airline piping directly adjacent to the equipment enclosure to help minimize the effects of vibration, settling or frost.

The air line should enter the top of the effluent pipe with a tee or saddle tee; this minimizes effluent entering the air line. The air line can also be connected directly to the d-box or wastewater infiltration device such as plastic chamber, etc. In all cases the air line should be connected to the top of the structure or be plumbed so as to minimize the risk of effluent entering the air line and to avoid bubbling the air into the effluent; this will produce bio solids.

Effluent filters are required on all OWTS installed in Rhode Island. See Schematics in Section 4 of this Manual for details of location of effluent filter on OWTS incorporating SoilAir.

- Equipment Enclosure Location

Although the equipment is typically quieter than an air conditioner, it is advisable to install the equipment away from windows, decks, etc. Avoid locating the equipment enclosure in excessively wet locations, such as low spots or downspouts. Care should be exercised to locate the equipment enclosure where it will not be subject to damage from vehicles, snow plowing, lawn maintenance, dust, vandalism, etc. Consideration for protecting and securing the SoilAir enclosure and equipment should be provided. Provisions are provided for use of a padlock on the equipment enclosure.

- Control Panel

Each OWTS that incorporates SoilAir must be equipped with a control panel. When SoilAir is used as part of OWTS utilizing pressure distribution, the control panel must incorporate an event counter, elapsed-time meter, or means of quantifying flow through the system. The control panel is installed outside in a weatherproof enclosure in an unobtrusive location; typically within 200 feet of the septic system. Commercial systems in Rhode Island require Telemetry. Contract Geomatrix for additional information on telemetry.

- Inspection Port

Each OWTS that incorporates SoilAir must have at least one inspection port per zone for monitoring ponding of leachfield. Inspection port location and design will vary based on leachfield design and must comply with the RIDEM OWTS Rules.

- Check Valve Location

A check valve must be installed between the air supply line and the pump, to prevent air flowing backwards through the pump. (Check valve location is identified on Schematics in Section 4 of this Manual.) If necessary, the check valve can be installed at the highest elevation in the force main pump line to facilitate drain back of the force main line to the pump station. This is often accomplished by installing the check valve on the force main inside or adjacent to a D-box and by piping the air supply line to the D-box.

When the blower is lower than the leach field, in addition to a check valve on the air line, a stand pipe should also be utilized to protect against water reaching the blower. This stand pipe

should be sufficiently higher than the top elevation of the leach field to take into account the additional resistance associated with the soil cover.

- Sizing the Airline

Table 2: Typical airline pipe sizing

Residential		
For Runs 50' or less	For Runs 50'-200'	For Runs over 200'
2" Sch 40 PVC	3-4" Sch 40 PVC	Contact Geomatrix

*air line sizing for all applications is largely dependent on the distance from the blower to the air entry point into the OWTS, however if specific parameters are known one can determine airline sizing utilizing **Figure 1 to minimize frictional losses**.

- Determine power requirements from SoilAir specification sheets included with the SoilAir system.
  Warning: All wiring should be performed in accordance with all applicable codes and regulations.

- An airflow membrane may be utilized over leaching systems in certain instances to direct air downwardly. Contact Geomatrix for design review, membrane details, and approval. All membrane details, such as membrane height, will be specified in the authorization letter for each system that requires a membrane.

- Leachfield & Distribution Boxes

A sealed D-box must be used. D-boxes and holes in leach field must be sealed properly to avoid air from short circuiting. When sealing a d-box, make certain that the surfaces are clean and dry, place a generous bead of silicone or foam sealant on the box and place the lid firmly on top. Preferably a sealed distribution box manufactured by Geomatrix should be utilized.

- Leachfield cover

New systems should be designed to have a minimum of 12" cover material over top of the leaching system to properly aerate the system, a minimal slope to ensure drainage is best. The more uniform in depth from end to end, the better. It is recommended that certain new leaching system configurations with SoilAir have a membrane over the top and along the sides of the system to optimally direct airflow. Refer to **Rhode Island Department of Environmental Management's; Onsite Wastewater Treatment Systems Rules and Regulations** for proper Leachfield Cover depth. Although a properly designed and installed airflow membrane will prevent stormwater from entering the leaching system, final grade must still

facilitate stormwater sheet flow away from the leaching system and any areas or holes that can puddle water will be problematic.

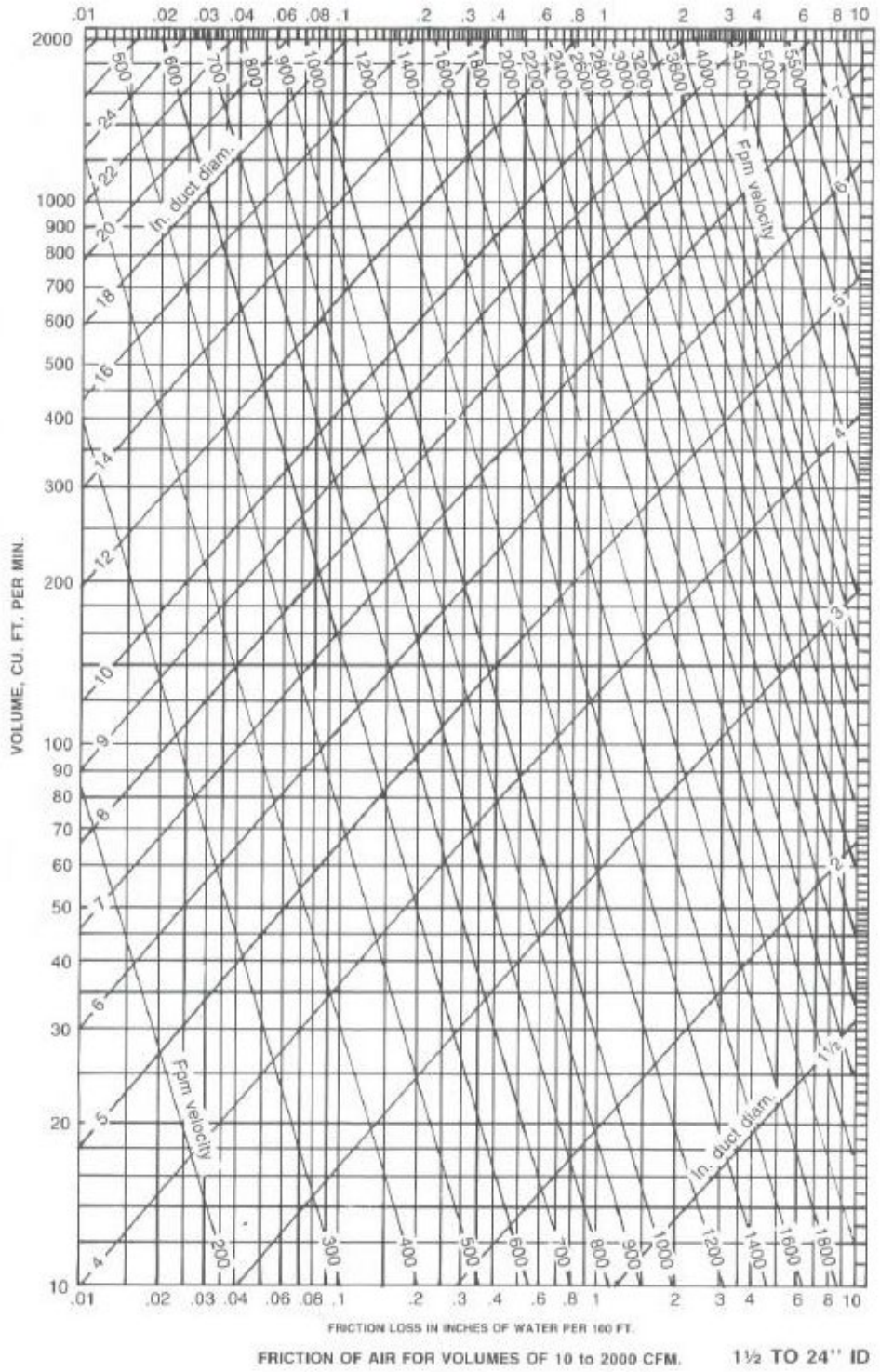
- The float switch on gravity systems is typically located in the outlet baffle of the septic tank (see Figure 2.)

- Float switch on a pumped system is typically located in the pump tank under the pump on float, or a pressure switch on the force main, or a current sensor on the pump wiring, or electrically integrated into the existing pump control panel.

- For SoilAir rejuvenation applications please contact Geomatrix or its authorized representative for design assistance. In certain instances it is advised to condition a pilot study to serve as a design basis.

4. Schematics

Figure1: Frictional air loss nomograph



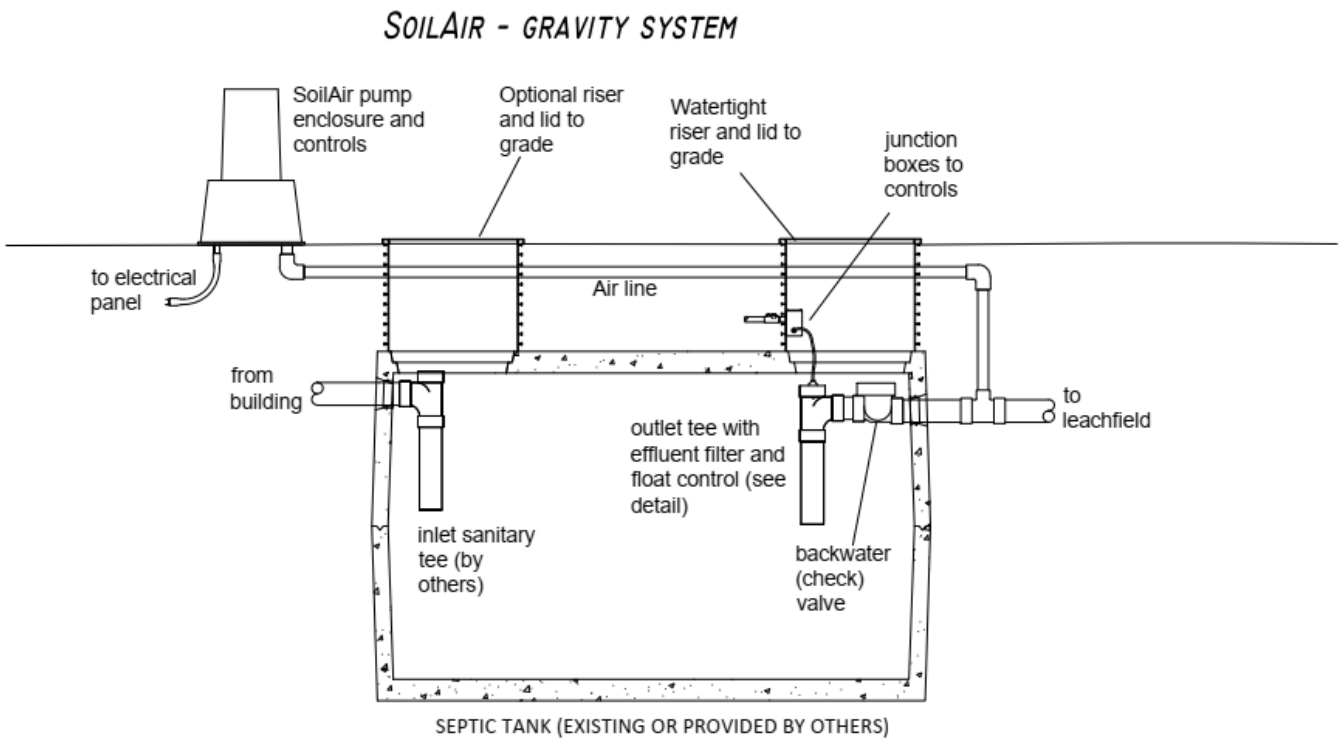

SoilAir - gravity system
SoilAir pump enclosure and controls
Optional riser and lid to grade
Watertight riser and lid to grade
junction boxes to controls
to electrical panel
Air line
from building
to leachfield
outlet tee with effluent filter and float control (see detail)
inlet sanitary tee (by others)
backwater (check) valve
SEPTIC TANK (EXISTING OR PROVIDED BY OTHERS)

FIGURE 2

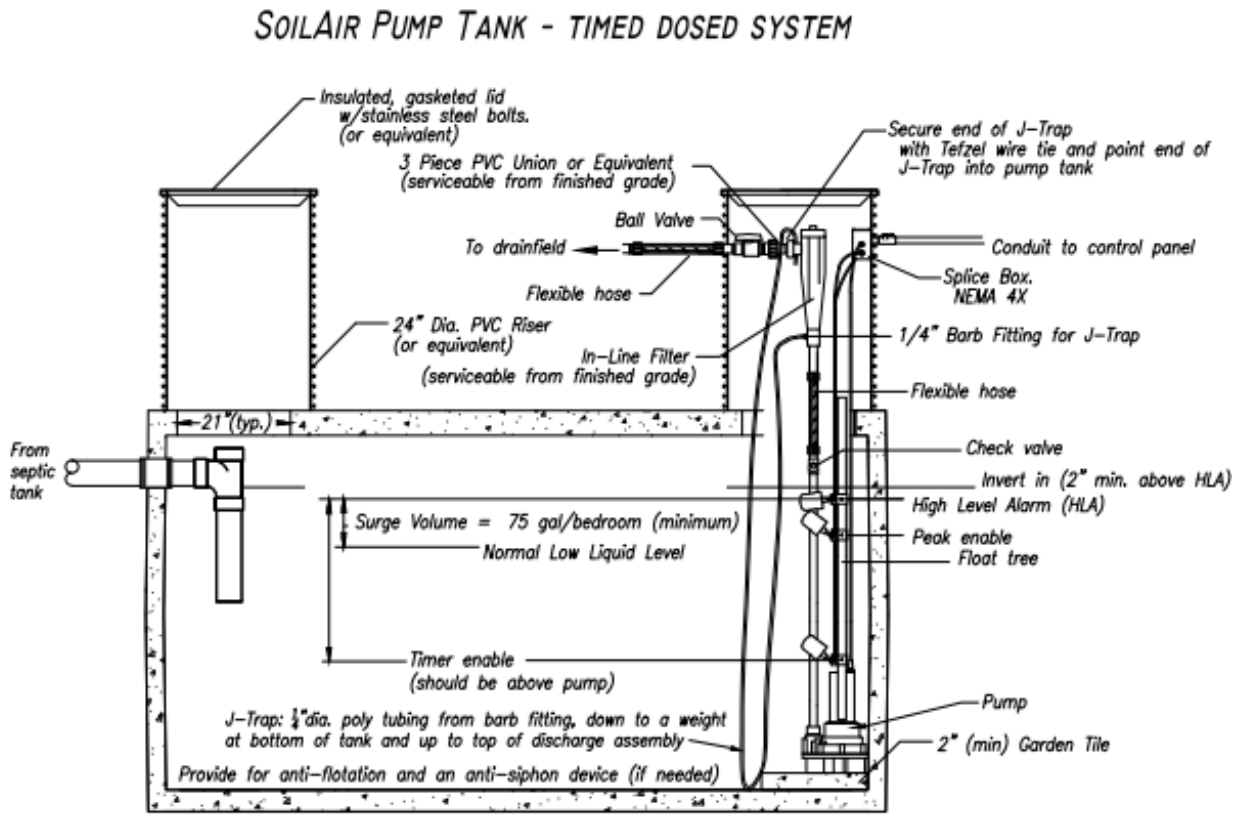

SoilAir Pump Tank - timed dosed system
Insulated, gasketed lid w/stainless steel bolts. (or equivalent)
3 Piece PVC Union or Equivalent (serviceable from finished grade)
Secure end of J-Trap with Tefzel wire tie and point end of J-Trap into pump tank
Ball Valve
To drainfield
Conduit to control panel
Flexible hose
Splice Box. NEMA 4X
24" Dia. PVC Riser (or equivalent)
In-Line Filter (serviceable from finished grade)
1/4" Barb Fitting for J-Trap
Flexible hose
21" (typ.)
From septic tank
Check valve
Invert in (2" min. above HLA)
High Level Alarm (HLA)
Surge Volume = 75 gal/bedroom (minimum)
Normal Low Liquid Level
Peak enable
Float tree
Timer enable (should be above pump)
Pump
J-Trap: ¼" dia. poly tubing from barb fitting, down to a weight at bottom of tank and up to top of discharge assembly
2" (min) Garden Tile
Provide for anti-flotation and an anti-siphon device (if needed)

FIGURE 3

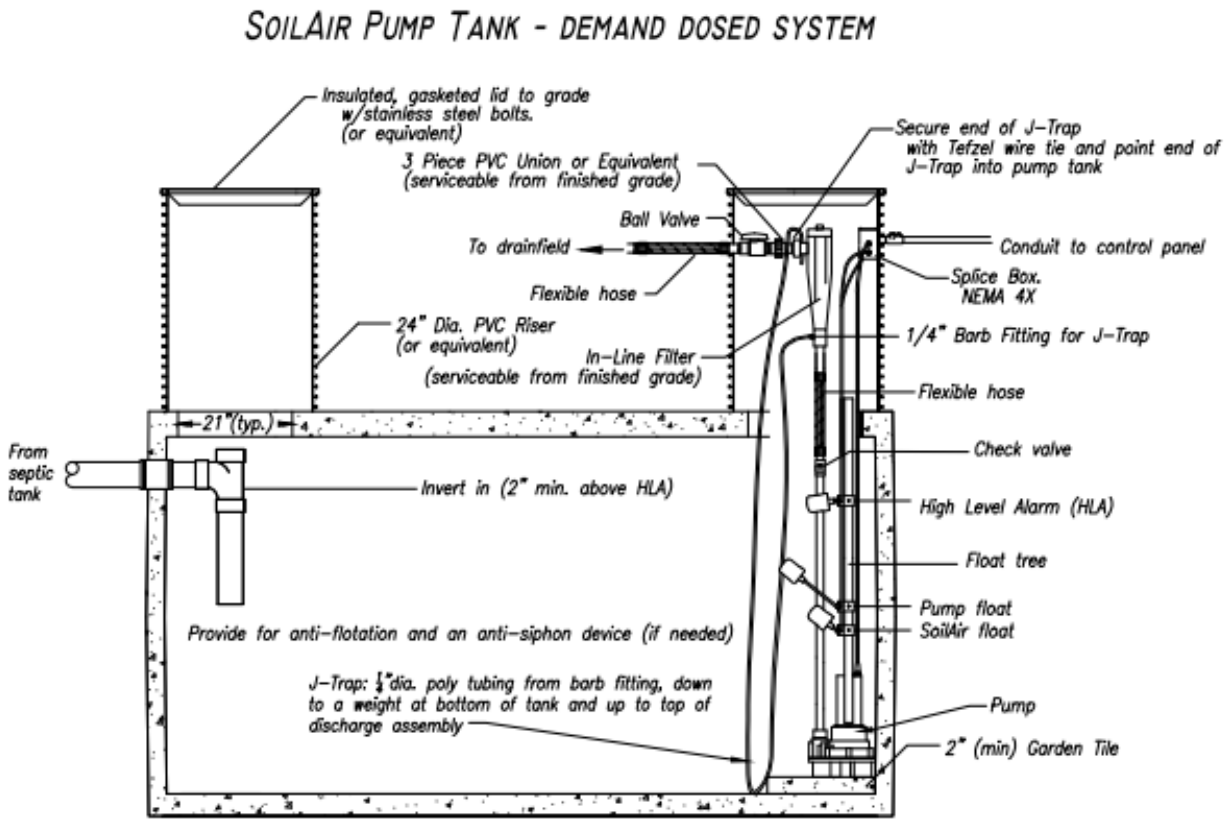

SoilAir Pump Tank - demand dosed system
Insulated, gasketed lid to grade w/stainless steel bolts. (or equivalent)
3 Piece PVC Union or Equivalent (serviceable from finished grade)
Secure end of J-Trap with Tefzel wire tie and point end of J-Trap into pump tank
Ball Valve
To drainfield
Conduit to control panel
Flexible hose
Splice Box. NEMA 4X
24" Dia. PVC Riser (or equivalent)
In-Line Filter (serviceable from finished grade)
1/4" Barb Fitting for J-Trap
Flexible hose
21" (typ.)
From septic tank
Invert in (2" min. above HLA)
Check valve
High Level Alarm (HLA)
Float tree
Pump float
SoilAir float
Provide for anti-flotation and an anti-siphon device (if needed)
J-Trap: ¼" dia. poly tubing from barb fitting, down to a weight at bottom of tank and up to top of discharge assembly
Pump
2" (min) Garden Tile

FIGURE 4

Effluent filter and float control

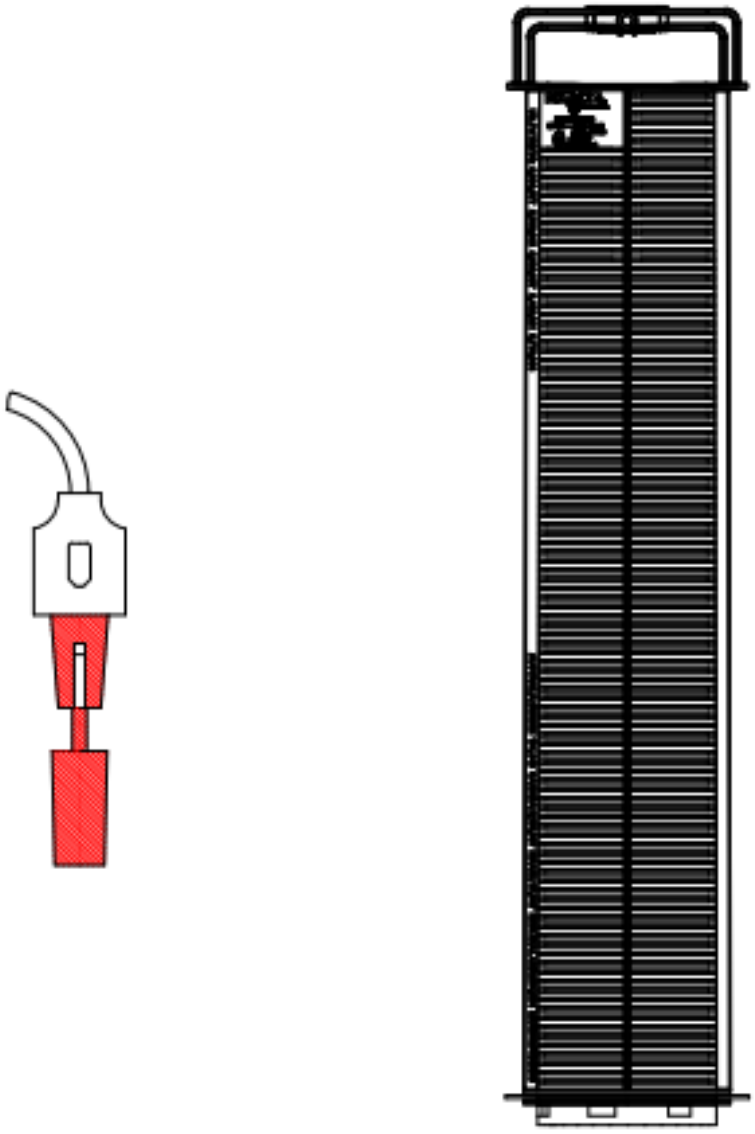
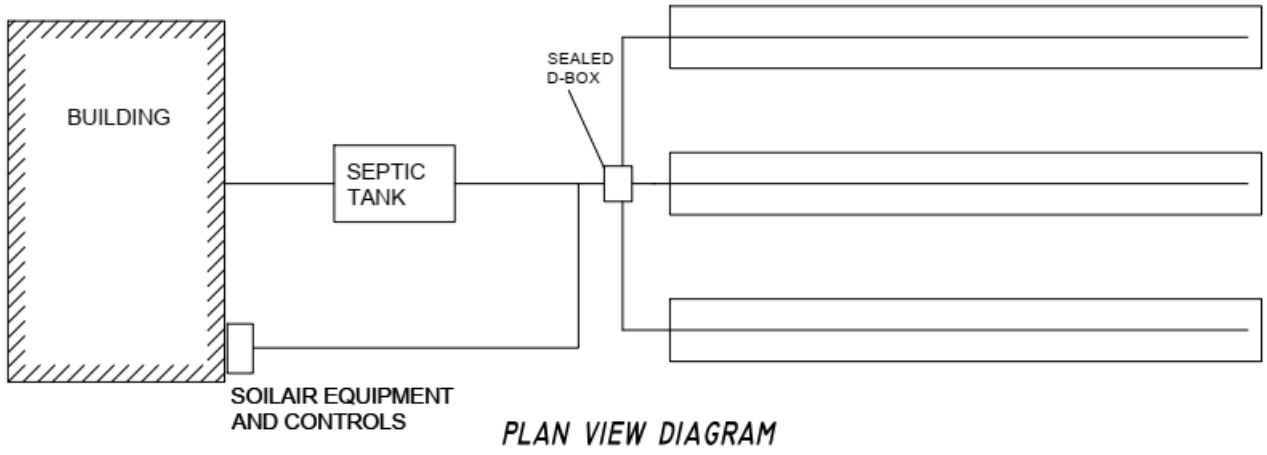


FIGURE 5

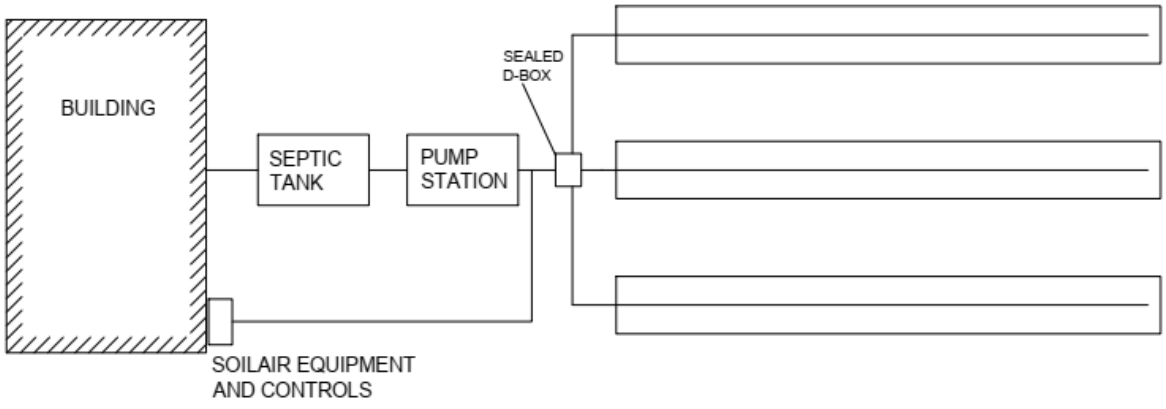
SoilAir - gravity system



PLAN VIEW DIAGRAM

FIGURE 6

SoilAir Pump Tank - timed dosed system

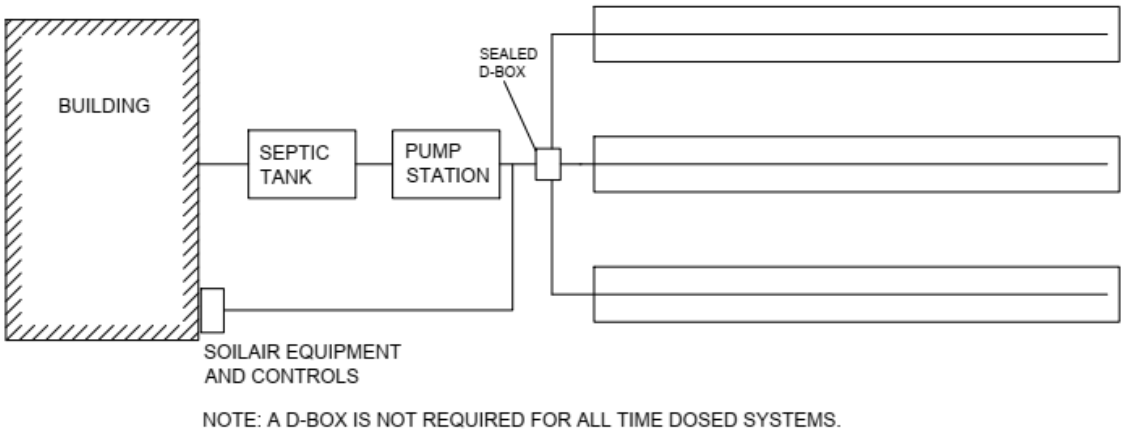


NOTE: A D-BOX IS NOT REQUIRED FOR ALL TIME DOSED SYSTEMS.

PLAN VIEW DIAGRAM

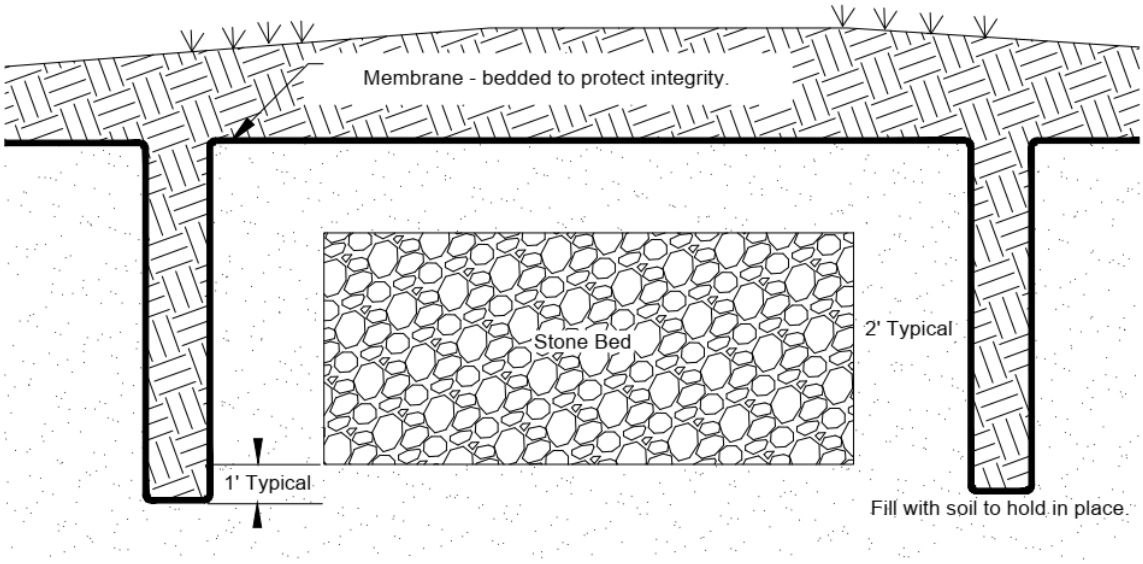
FIGURE 7

SoilAir Pump Tank - demand dosed system



Plan View Diagram

FIGURE 8



Liner Detail
NOT TO SCALE

FIGURE 9

5. Contact Information

Contact us or your local distributor for any questions you may have Monday – Friday 8am – 4pm Eastern Standard Time.

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