

SAND FILTER SYSTEM GUIDE

Overview

Bottomless sand filters are used in place of a drainfield when at least one the following conditions exists:

- The approval area is too limited to fit adequate drainfield trench lengths;
- There is not enough separation from ground water;
- The soil is too rapidly draining for soil treatment to take place.



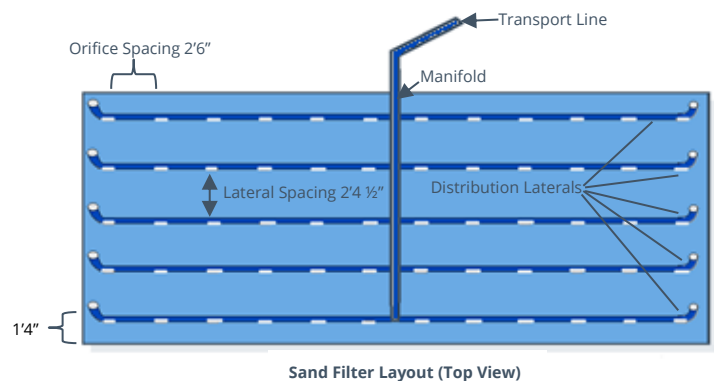
Like a traditional drainfield, bottomless sand filters remove pollutants in the wastewater through biological, physical, and chemical means, although biological activity is the primary treatment process in a sand filter. Sand filters produce high quality effluent, significantly reducing fecal coliform bacteria, removing organics, and nitrifying ammonia.

Septic tank effluent is pumped to the top of the sand filter bed into distribution laterals, which releases the effluent through orifices in the pipe. As the effluent trickles through the sand, bacteria digest the waste before the fluid infiltrates the soil below the sand filter.

System Design

Deschutes County recommends a licensed Department of Environmental Quality (DEQ) installer with experience installing sand filters submit the design and hydraulic calculations. The retailers that sell sand filter components can also help with design and hydraulic calculations.

1. Identify the sand filter dimensions to meet the required surface area. The minimum required sand filter size for each installation is indicated in the site-specific installation permit.
2. Layout the laterals orifices no more than (30) inches apart (one orifice per [6] square feet). Each lateral should be no more than (15) inches from the edge of the container.



3. Determine the correct pump size to allow for a minimum (5) foot squirt height from the distal orifice in each lateral *with no more than 10% height variation throughout the system.*



Community Development Department
117 NW Lafayette Street
Bend, Oregon 97703
www.deschutes.org/cd
(541) 388-6575

To request this information in an alternate format, please call 541-388-6575 or send an email to accessibility@deschutes.org.

Total Dynamic Head and Design Flow Rate

Use the equations below to determine the required hydraulic calculations. Sloping and complicated sites may require a consultant's calculations to verify uniform distribution throughout the system.

A. HOW TO CALCULATE THE DESIGN FLOW RATE

$$(N) \times (R) = \text{_____ gpm (design flow rate)}$$

(N) **Number of orifices:** Total Number of (1/8) inch holes. = _____

(R) **Discharge rate:** Discharge rate per (1/8) inch hole = _____ 0.43 _____ gpm

B. HOW TO CALCULATE THE TOTAL DYNAMIC HEAD (TDH)

$$(A) + (B) + (C) + (D) + (E) = \text{_____ feet (TDH)}$$

(A) **Static Head:** The elevation difference from the low water level in the tank (pump off) to the laterals. = _____ feet

(B) **Friction Head:** Length of transport pipe multiplied by friction loss (refer to manufacturer's tables). = _____ feet

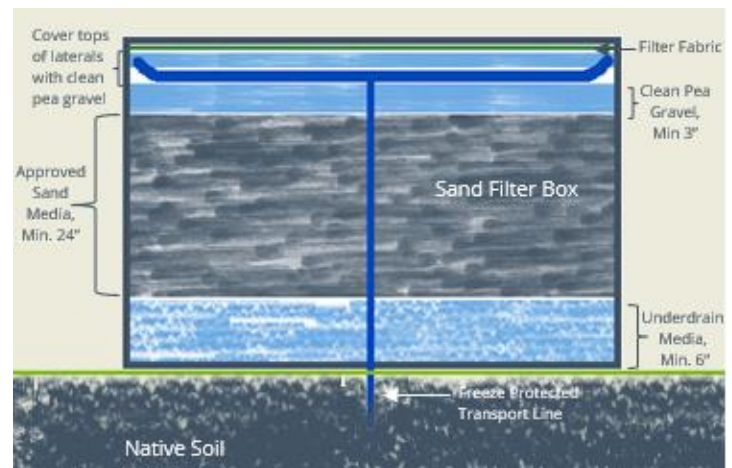
(C) **Discharge Assembly:** Refer to hose and valve assembly tables. = _____ feet

(D) **System Allowance:** Includes distribution piping losses and a residual head discharge at the distribution laterals of (5) feet. Generally, (10) feet is acceptable for this factor. = _____ 10 _____ feet

(E) **Other:** = _____ feet

Installation

1. Build the sand filter container using (2 x 4) foot enforced (¾) inch plywood or oriented strand board, supported by an earthen berm, or a reinforced watertight concrete box. The minimum required contained surface area depends on the identified use of the property and whether the sand filter is preceded by an ATT unit or a septic tank. The minimum required surface area is indicated in the installation permit.
2. Install the transport line to the sand filter deep enough to be freeze protected.
3. Apply a minimum (6) inches of clean underdrain media (e.g. "DEQ Pea Gravel"). **Inspection required after this step.**
4. Install a minimum (24) inches approved, clean, damp sand media. **Inspection required after this step.**



This handout is designed to explain the basic workings of a sand filter system and the basic layout. For construction and material standards for all septic system types refer to

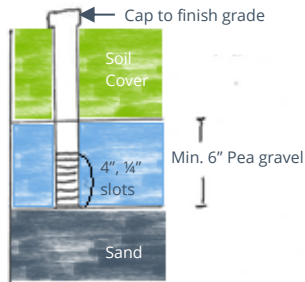
Oregon Administrative Rules (OAR) 340, Division 71 and 73,

available on-line at:

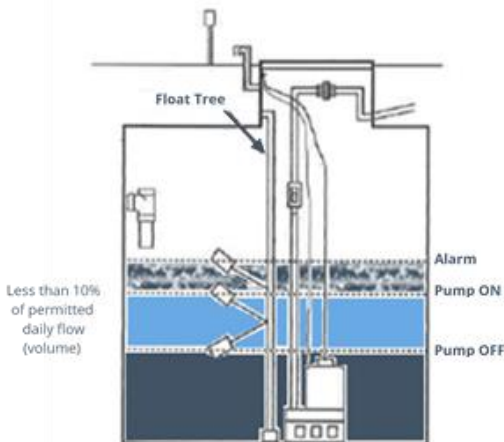
<http://www.oregon.gov/deq/Residential/Pages/Onsite-Rules.aspx>

Installation Continued. .

- Apply a minimum (3) inches of clean drain rock or pea gravel on top of sand.
- Install the pressure distribution laterals level with distribution orifices oriented downward and equipped with removable slotted-faced shields. One orifice at the end of each lateral should be oriented upward. Orifices may be drilled with a (1/8) inch burless bit. The distal end of each lateral should have a clean-out riser consisting of an approved long radius elbow riser or (2) 45 degree elbows.
- Mount a sand filter monitoring port above the sand media with a cap at finished grade.



- Install pump in approved dosing tank. Adjust the alarm float (top float) so that the bracket center is (2) inches below the invert of the tank's outlet. The center bracket of the on float (middle float) should be set (2) inches below the center bracket of the alarm float and the off float (bottom float) should be set so that no more than 10% of the permitted daily flow is pumped to the sand filter per dose.



Pump Setting Tips

For most 1500 gallon tanks with flow-through between compartments:

1" drawdown in pump basket = 35 gallons

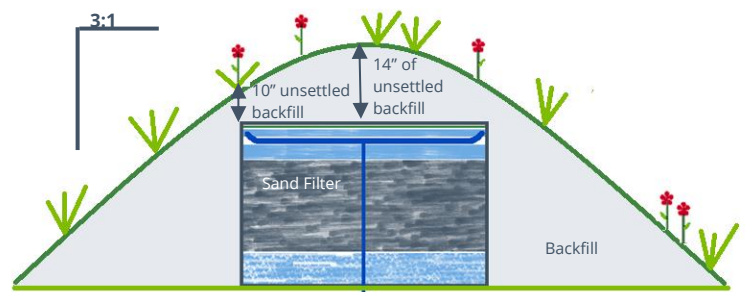
For most 1500 gallon tanks with a compartment separation baffle & sanitary tee:

1" drawdown in pump basket = 10 gallons



Do not forget to set the bottom float to account for volume of effluent in transport piping (system design dependent)!

- Mount the control box at least (3) feet above the ground and within (50) feet of structures to be served. The control box should be visible from the structures being served. **Inspection required after this step.**
- Evenly cover the tops of all laterals and shields with clean underdrain media.
- Completely cover the media with approved filter fabric. **Inspection required after this step.**
- Backfill the sand filter container with (14) inches of unsettled fill [(10) inches settled] over the center of the container and (10) inches of unsettled fill [(6) inches settled] over the side walls. A 3-to-1 slope is required from the top of the container sides to the ground surface. Backfill should be firm but not compacted. **Inspection required after this step.**
- Plant a shallow-rooted vegetative cover (e.g. grasses, wildflowers – no trees) over the top of the sand filter container.



Inspections

A sand filter system installation typically requires five inspections. A complete [As-Built & Materials List](#) form must be submitted in-person at the Deschutes County Community Development Offices or emailed (onsite@deschutes.org) to the Environmental Soils Division prior to scheduling a Squirt Test inspection (#7030).

1. Schedule an Initial Sand Filter inspection (#7230) prior to installing sand media. It will include:
 - Scarification (#7010)
 - Sand Filter Liner/Box (#7260)
2. Schedule a Secondary Sand Filter inspection (#7240) prior to installing the drain media.
3. Schedule a Squirt Test inspection (#7030) prior to installing the top layer of drain media. It will include:
 - Septic Tank Inspection (#7100)
 - Tank Water Tightness Test (#7270)
 - Pressure or Effluent Line Inspection (#7350)
 - Pump/Alarm System (#7310)
4. Schedule a Sand Filter Cover inspection (#7250) to inspect the drain media cover and filter fabric.
5. Schedule a Final inspection (#7999) to inspect the backfill.

Schedule an Inspection:



Online via Oregon's [ePermitting](#) system

<https://aca.oregon.accela.com/oregon/>



On your phone or tablet with Oregon's [ePermitting](#) App. Search for Oregon inspections in the App store for your apple or android device



Call 888-299-2821 | You will need a site specific permit number and 4 digit inspection code for the type of inspection requested

Operation and Maintenance Requirements

Prior to the issuance of a sand filter installation permit, a copy of a maintenance agreement (contract) between the property owner and a DEQ certified maintenance provider is required to be submitted to the Deschutes County Environmental Soils Division. For all sand filter systems permitted on or after January 1, 2014, it is the responsibility of the sand filter owner to maintain an ongoing contract with a maintenance provider for the life of the system [OAR 340-071-0290(7)].

The maintenance provider is responsible for providing the following to Deschutes County on the property owner's behalf:

- An annual report that demonstrates the system has been properly maintained during the reporting year and is operating in accordance with the agent-approved design specifications, or the owner has applied for a repair permit under OAR 340-071-0215;
- Payment of an annual report evaluation fee.

For more information about operation and maintenance of sand filter systems, checkout the DEQ Sand Filter and Pressure Distribution Maintenance Fact Sheet, available online at <http://www.oregon.gov/deq/Residential/Pages/Onsite-Resources.aspx>.

Minimum Separation Distances (OAR 340-071-0220)

Items Requiring Setback	From Subsurface Absorption Area Including Replacement Area	From Septic Tank and Other Treatment Units, Effluent Sewer and Distribution Units
1. Groundwater Supplies and Wells.	*100'	50'
2. Springs: <ul style="list-style-type: none"> • Upgradient. • Downgradient. 	50' 100'	50' 50'
**3. Surface Public Waters: <ul style="list-style-type: none"> • Year round. • Seasonal. 	100' 50'	50' 50'
4. Intermittent Streams: <ul style="list-style-type: none"> • Piped (watertight not less than 20' from any part of the onsite system). • Unpiped. 	20' 50'	20' 50'
5. Groundwater Interceptors: <ul style="list-style-type: none"> • On a slope of 3% or less. • On a slope greater than 3%: <ul style="list-style-type: none"> • Upgradient. • Downgradient 	20' 10' 50'	10' 5' 10'
6. Irrigation Canals: <ul style="list-style-type: none"> • Lined (watertight canal). • Unlined: <ul style="list-style-type: none"> • Upgradient. • Downgradient 	25' 25' 50'	25' 25' 50'
7. Manmade Cuts Down Gradient in Excess of 30 Inches (top of downslope cut): <ul style="list-style-type: none"> • Which Intersect Layers that Limit Effective Soil Depth Within 48 Inches of Surface. • Which Do Not Intersect Layers that Limit Effective Soil Depth. 	50' 25'	25' 10'
8. Downgradient Escarpments: <ul style="list-style-type: none"> • Which Intersect Layers that Limit Effective Soil Depth. • Which Do Not Intersect Layers that Limit Effective Soil Depth. 	50' 25'	10' 10'
9. Property Lines.	10'	5'
10. Water Lines.	10'	10'
11. Foundation Lines of any Building, Including GaraQes and Out Buildings.	10'	5'
12. Underground Utilities.	10'	—
* 50-foot setback for wells constructed with special standards granted by WRD.		
**This does not prevent stream crossings of pressure effluent sewers.		