

4.23 Intermittent Sand Filter

Revision: December 10, 2014

4.23.1 Description

An intermittent sand filter is a bed of medium sand in a container that filters and biologically treats septic tank effluent. Effluent is pressure dosed across the top of the medium sand in small doses and percolates through the filter media. The filter effluent is then collected by an underdrain at the bottom of the filter and is distributed to a disposal trench of reduced dimension. Components of the intermittent sand filter include a septic tank, dosing chamber, pump (or siphon) and controls, distribution network, sand filter, and drainfield.

4.23.2 Approval Conditions

1. The system must be designed by a PE licensed in Idaho.
2. All pressure distribution components shall be designed according to the pressure distribution system guidance (section 4.20).
3. The design engineer shall provide an O&M manual for the system to the health district before permit issuance.
4. The intermittent sand filter container shall meet the same separation distance requirements as a septic tank.
5. The bottom of the filter must not come within 12 inches of seasonal high ground water.
6. Effluent shall not discharge to the drainfield without passing through the filter first.
7. Nondomestic wastewater must be pretreated to residential strength before discharge to the intermittent sand filter.

4.23.3 Design

Minimum design requirements for the intermittent sand filter components are provided below.

4.23.3.1 Intermittent Filter

1. The filter container shall be constructed of reinforced concrete or other materials where equivalent function, workmanship, watertightness, and at least a 20-year service life can be documented.
2. The following requirements must be met for flexible membrane liners:
 - a. Have properties equivalent to, or greater than, 30-mil PVC.
 - b. Have field repair instructions and materials provided to the purchaser of the liner.
 - c. Have factory-fabricated *boots* for waterproof field bonding of piping to the liner.
 - d. Liner must be placed against smooth, regular surfaces free of sharp edges, nails, wire, splinters, or other objects that may puncture the liner. Provide a 4-inch layer of clean sand for liner protection.
3. Application rate of septic tank effluent to the filter must be 0.7 gallons/ft²/day.
4. Filter construction media shall meet the specification in section 3.2.8.1 for drainrock, section 3.2.8.1.2 for medium sand, and section 3.2.8.1.3 for pea gravel.

- a. Medium sand should be placed in a maximum of 8-inch lifts.
- b. Each lift should be wetted before installation of the next lift to minimize settling.
5. Minimum filter construction specifications (i.e., media depth, geotextile fabric placement, cover depth and slopes, filter container height, and piping placement) shall meet the dimensions and locations depicted in (Figure 4-28).
6. The bottom of the filter should be sloped at least 1% to the underdrain pipe for flexible membrane liners.
7. An underdrain must be located at the bottom of the filter to drain the intermittent filter meeting the following requirements:
 - a. May be placed directly on the bottom of the filter.
 - b. Placed level throughout the filter.
 - c. Constructed of slotted drain pipe with 0.25-inch slots 2.5 inches deep and spaced 4 inches apart located vertically on the top of the pipe, or perforated sewer drain pipe with holes located at 5 and 7 o'clock.
 - d. One underdrain should be installed for each filter cell zone.
 - e. The distal end is vented to the atmosphere, protected with a screen, and located within the filter to allow entry of air flow into the bottom of the filter and access for cleaning and ponding observation.
 - f. Connected to solid pipe that meets the construction requirements of IDAPA 58.01.03.007.21, extends through the filter, and is sealed so the joint between the filter wall and pipe is watertight.
 - g. If gravity flow is not achievable from the underdrain to the drainfield, the underdrain must be connected to an approved dosing chamber (section 5.3) or an approved septic tank (section 5.2) modified to a dosing chamber that is sized and constructed as described in section 4.20.3.4 to deliver effluent to the drainfield by pressure transportation or distribution. Dosing of the drainfield may not occur from a pump that is located within the intermittent sand filter.
8. Two observation tubes should be placed in the intermittent sand filter to monitor for ponding and clogging formation.
 - a. The monitoring tubes must be secured and perforated near the bottom.
 - b. The monitoring tubes must extend through the intermittent filter cover and have a removable cap.
9. The surface of the intermittent sand filter shall be covered meeting the following requirements:
 - a. The soil cover shall be graded to divert any surface waters away from the intermittent sand filter.
 - b. Vegetation on top of the soil cover must be managed so that deep-rooting vegetation does not plug the distribution system.
 - c. The design engineer should account for potential freezing conditions in the design of the intermittent sand filter and pressure distribution system.

4.23.3.2 Intermittent Filter Cells

Depending on the volume of effluent and type of structure using an intermittent sand filter, the intermittent filter may need to be split into cells that contain dosing zones. A filter cell is the total filter area that can be served by a single dosing pump or set of pumps. Cell sizing is limited to 600 GPD. The minimum filter design requirements for cells and pumps include the following:

1. Filter cells are hydraulically isolated from one another and shall be constructed according to the minimum requirements in section 4.23.3.
2. Each cell shall be equivalent in surface area and volume.
3. Each cell shall receive equal volumes of wastewater per dose.

4.23.3.3 Intermittent Filter Dosing

1. Timed dosing is required, and the filter dosing cycle should meet the following minimum recommendations:
 - a. Pumps are set to dose each cell once per hour.
 - b. Dose volume delivered to the filter surface for each cycle should be 4% of the daily design flow.
 - c. A pump on override float should be set at a point that equates to 70% of the dosing chamber's volume.
 - d. A high-level audio and visual alarm float should be set at 90% of the dosing chamber's volume.
 - e. A low-level off float should be placed to ensure that the pump remains fully submerged at all times.
2. The pump controls should meet the following:
 - a. Be capable of monitoring low- and high-level events so that timer settings can be adjusted accordingly.
 - b. Have event counters and run-time meters to be able to monitor daily flows.

Figure 4-28 provides a cross-sectional view of an intermittent sand filter cell.

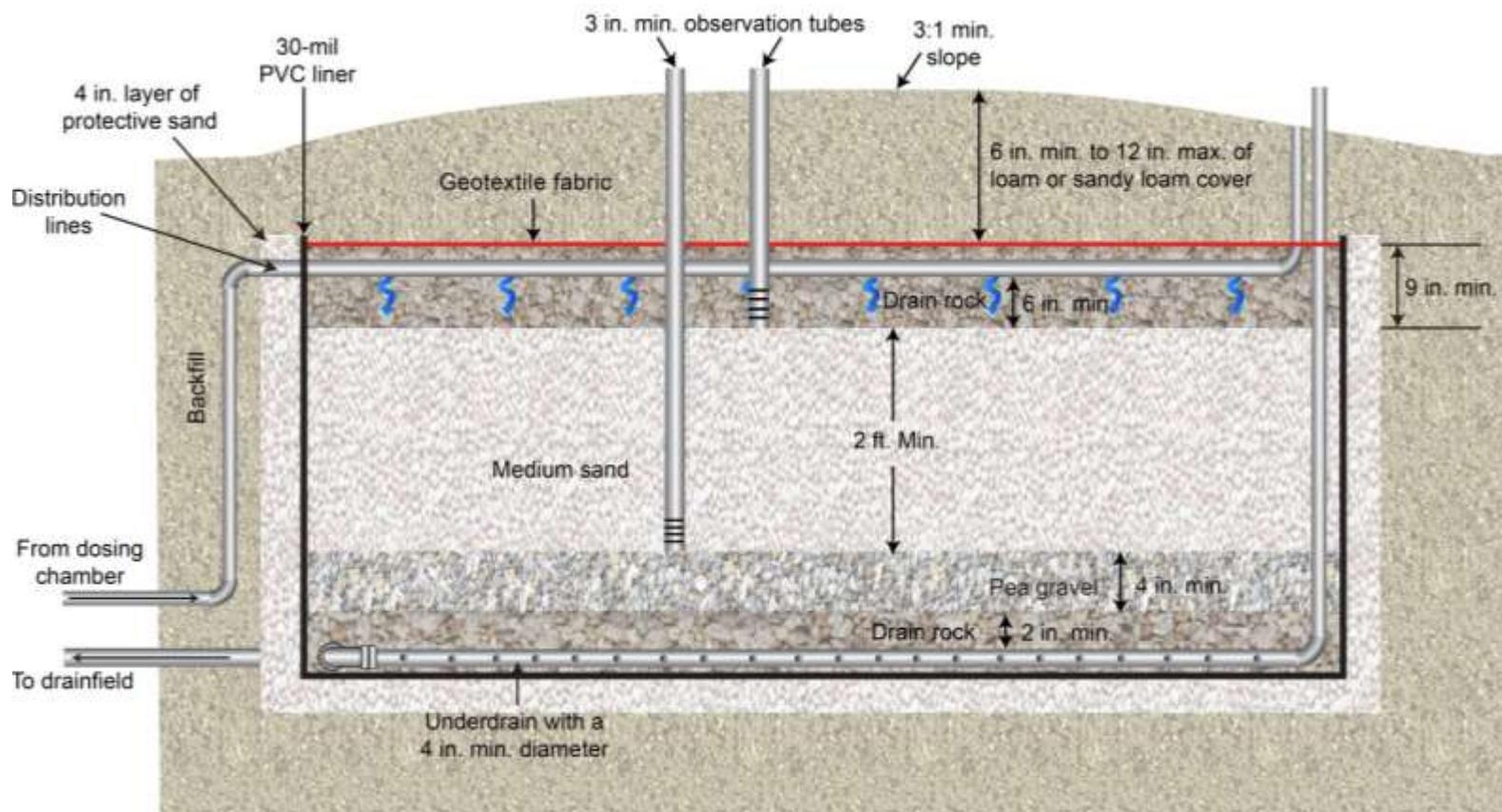


Figure 4-28. Cross section of flexible membrane intermittent sand filter cell.

4.23.4 Drainfield Trenches

1. Distances shown in Table 4-17 must be maintained between the trench bottom and limiting layer.
2. Capping fill may be used to obtain adequate separation distance from limiting layers but must be designed and constructed according to the guidance for capping fill trenches in section 4.5.
3. Pressure distribution may be used with the following design considerations:
 - a. The pressure distribution system related to the drainfield is designed according to section 4.20.
 - b. The dosing chamber for the intermittent sand filter may not be used as the dosing chamber for the drainfield.
4. The drainfield shall be sized by dividing the maximum daily flow by the hydraulic application rate for the applicable soil design subgroup listed in Table 4-18.

Table 4-17. Intermittent sand filter vertical setback to limiting layers (feet).

Limiting Layer	Flow < 2,500 GPD	Flow ≥ 2,500 GPD
	All Soil Types	All Soil Types
Impermeable layer	2	4
Fractured rock or very porous layer	1	2
Normal high ground water	1	2
Seasonal high ground water	1	2

Note: gallons per day (GPD)

Table 4-18. Secondary biological treatment system hydraulic application rates.

Soil Design Subgroup	Application Rate (gallons/square foot/day)
A-1	1.7
A-2	1.2
B-1	0.8
B-2	0.6
C-1	0.4
C-2	0.3

4.23.5 Inspection

1. A preconstruction meeting between the health district, responsible charge engineer, and installer should occur before commencing any construction activities.
2. The health district should inspect all system components before backfilling and inspect the filter container construction before filling with drainrock and filter construction media.
3. The responsible charge engineer shall conduct as many inspections as needed to verify system and component compliance with the engineered plans.
4. The responsible charge engineer shall provide the health district with a written statement that the system was constructed and functions in compliance with the approved plans and specifications. Additionally, the responsible charge engineer shall provide as-built plans to the health district if any construction deviations occur from the permitted construction plans (IDAPA 58.01.03.005.15).

4.23.6 Operation and Maintenance

1. The intermittent sand filter design engineer shall provide a copy of the system's operation, maintenance, and monitoring procedures to the health district as part of the permit application and prior to subsurface sewage disposal permit issuance (IDAPA 58.01.03.005.04.k).
2. Minimum operation, maintenance, and monitoring requirements should follow each system component manufacturer's recommendations.
3. Instructions on how to trouble shoot the pump control panel should be included to allow adjustment to pump cycle timing if the low-level off or high-level alarm switch is frequently tripped in order to maintain the hourly dosing cycle timing.
4. Operation and maintenance directions should be included describing the replacement of the filter construction media and informing the system owner that a repair permit must be obtained from the health district for this activity.
5. Maintenance of the septic tank shall be included in the O&M manual.
6. All pressure distribution system components shall be maintained as described in section 4.20.5.
7. Check for ponding in the intermittent sand filter observation ports.
8. Vegetation over the intermittent sand filter should be maintained regularly.
9. Sludge depth in the septic tank should be checked annually, and the tank shall be pumped when sludge exceeds 40% of the liquid depth.

Figure 4-29 shows a cross section of an intermittent sand filter system with gravity distribution to the drainfield. Figure 4-30 shows a cross section of an intermittent sand filter system with pressure transport to, and/or distribution within, the drainfield.

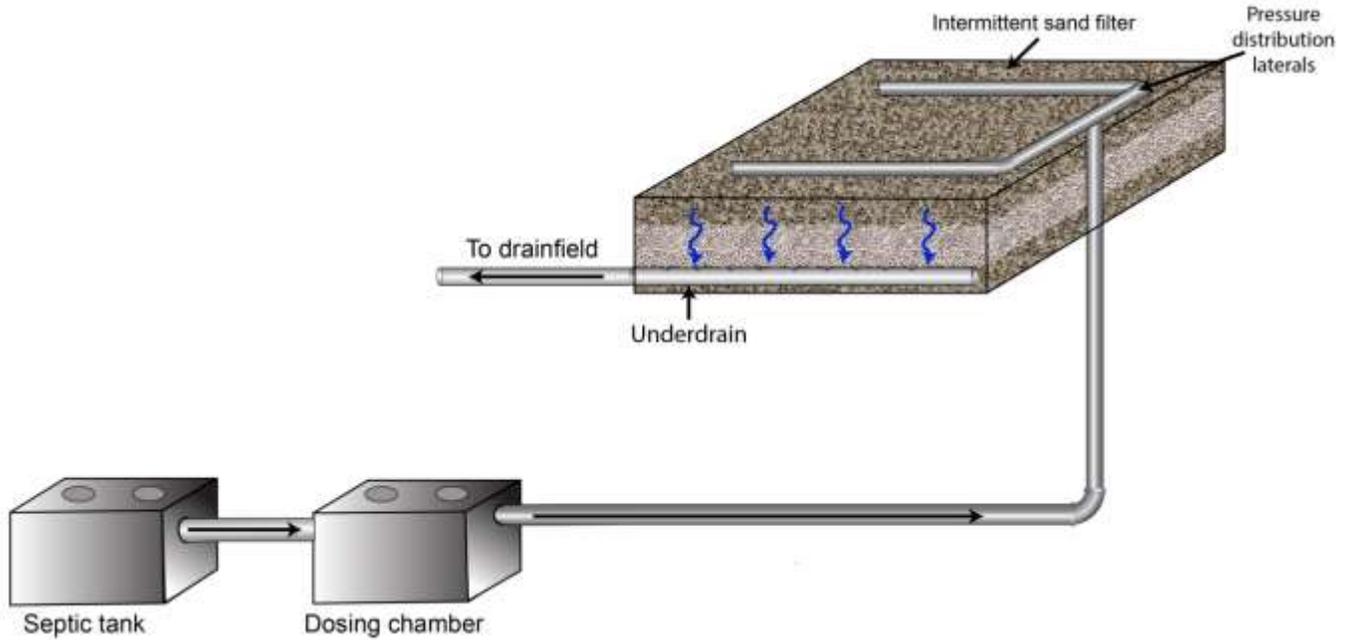


Figure 4-29. Cross section of an intermittent sand filter system with gravity discharge to the drainfield.

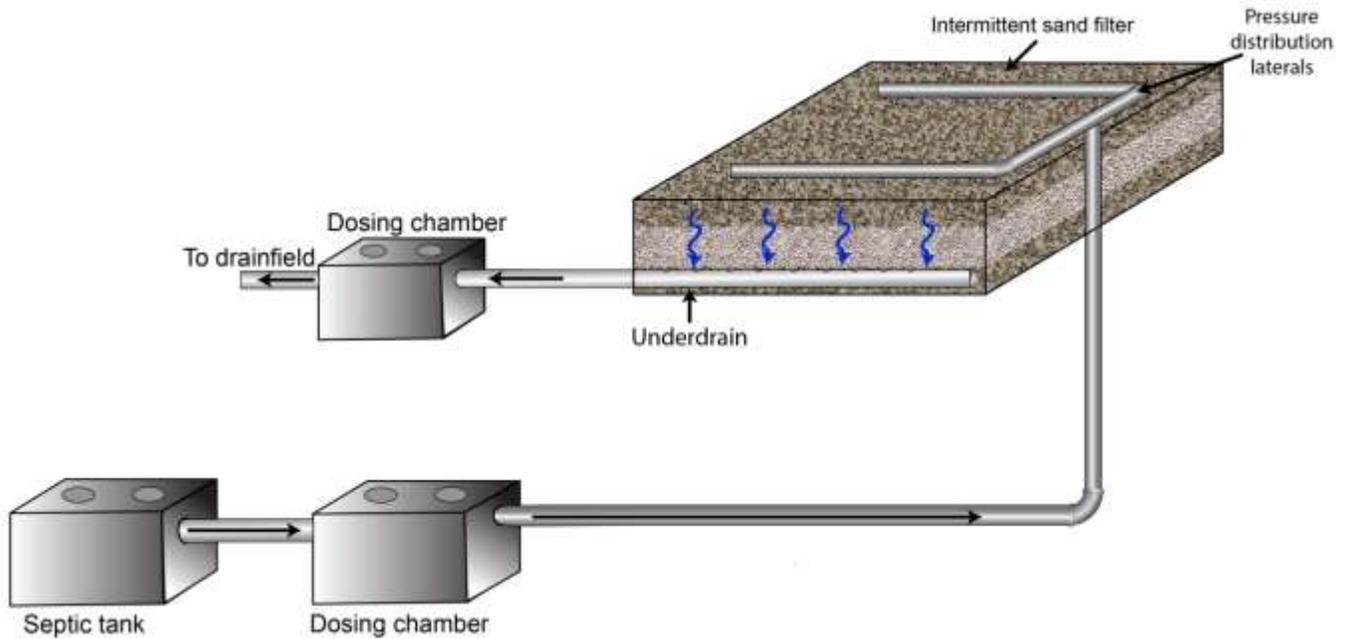


Figure 4-30. Cross section of an intermittent sand filter system with pressure transport to and/or distribution within the drainfield.