4.7 Drip Distribution System

Revision: June 5, 2014

4.7.1 Description

Drip distribution systems are comprised of a shallow network of thin-walled, small-diameter, flexible tubing with self-cleaning emitters to discharge filtered effluent into the root zone of the receiving soils. The drip system is flushed either continuously or noncontinuously depending upon the system design. Minimum system components include, but are not limited to, the following:

1. Septic tank
2. Pretreatment system (not required in grey water system designs):
   a. Intermittent sand filter
   b. Recirculating gravel filter
   c. Extended treatment package system
3. Filtering system: cartridge or disk filters (flushable filter cartridge)
4. Effluent dosing system: pump tank and dose pump
5. Process controller: programmable logic controller (PLC)
6. Flow meter
7. Drip tubing network and associated valving

4.7.2 Approval Conditions

1. Drip distribution systems shall only be installed at locations that meet the criteria in the site suitability subsection of IDAPA 58.01.03.008.02 and 58.01.03.013 (section 8.1).
2. The effective soil depths that are established for the alternative pretreatment systems listed in section 4.7.1(2) may be applied to drip distribution systems when they are used in the system design.
3. All pressurized distribution components and design elements of the drip distribution system that do not have design criteria specified within section 4.7 shall follow the design guidance provided in section 4.20.
4. Pretreatment system design, installation, operation, and maintenance will follow the specific pretreatment system guidance provided in this manual.
5. System must be designed by a PE licensed in Idaho.

4.7.3 Design

The following minimum design elements apply to both continuous and noncontinuous flush drip systems:

1. Application areas up to 2 square feet per foot (ft^2/ft) of drip irrigation line may be used.
2. Drip tubes may be placed on a minimum of 2-foot centers.
3. Drip tubes are placed directly in native soil at a depth of 6–18 inches with a minimum final cover of 12 inches.

4. The design application rate is based on the most restrictive soil type encountered within 2 feet of the drip tubes.
5. The effective soil depth to limiting layers below the drip tubes should meet the depths specified in section 4.22.5, Table 4-15.
6. Effluent is required to be filtered with a 100 micron or smaller disc or flushable filter cartridge before discharge into the drip tubing network.
7. A minimum of two vacuum relief valves are required per zone.
    a. The valves are located at the highest points on both the distribution and return manifolds.
    b. Vacuum relief valves are located in a valve box that is adequately drained and insulated to prevent freezing.
8. Pressure regulators and pressure compensating emitters should be used on sloped installations.
9. Pressure should be between 25 and 40 psi unless pressure compensating emitters are used.
10. Timed dosing is required in all drip distribution systems.
11. Each valve, filter, pressure regulator, and any other nondrip tube component is required to be accessible from grade and insulated to prevent freezing.

4.7.3.1 Additional Design Elements for Noncontinuous Flush Drip Systems

The following additional minimum design elements apply only to noncontinuous flush drip systems:

1. In noncontinuous flush systems, drip laterals are flushed at least once every 2 weeks to prevent biofilm and solids buildup in the tubing network.
    a. Minimum flushing velocity is based on the tubing manufacturer's recommendations for the return ends of the distribution lines and in the drip irrigation tubing during field flush cycles.
    b. The minimum flushing duration is long enough to fill all lines and achieve several pipe volume changes in each lateral.
2. In noncontinuous flush systems, the return manifold is required to drain back to the septic tank.
3. In noncontinuous flush systems, timed or event-counted backflushing of the filter is required.
4. In noncontinuous flush systems, filters, flush valves, and a pressure gauge may be placed in a head works (between the dose pump and drip field).

4.7.3.2 Additional Design Elements for Continuous Flush Drip Systems

The following additional minimum design elements apply only to continuous flush drip systems:

1. Filter must be a flushing type.
    a. The filter is required to be backwashed according to the manufacturer's recommendations, and the process must be automated unless the automated backwashing requirement has been waived.

   b. The automated backwashing requirement may be waived if the filter is configured with an alarm to indicate when velocity is reduced below the manufacturer's minimum recommended flow velocity.
2. Drip laterals are flushed during the dosing cycle.
   a. The continuous flush system must be designed to the manufacturer's minimum recommended flow velocity.
   b. The dose duration must be long enough to achieve several pipe volume changes in each drip tube lateral to adequately accomplish flushing the drip tubing lines.
3. Filters and pressure gauges may be placed in a head works (between the dose tank and drip field), and supply and return pressure gauges are needed to ensure that the field pressurization is within the required range specified by the drip tube manufacturer.
4. In continuous flush systems, both supply and return manifolds are required to drain back to the dose tank.
5. Due to the nature of the continuous flush process, the filter shall be examined after initial start-up and cleaned if necessary to prevent incorrect rate of low readings for the controller.
6. The drip distribution system will operate to the manufacturer's minimum recommended flow velocity for the duration of each cycle, and the total flow minus the emitter uptake flow would be the return and flushing flow.

4.7.4 Construction

1. No wet weather installation is allowed.
2. Excavation and grading must be completed before installing the subsurface drip distribution system.
3. Drip distribution systems may not be installed in unsettled fill material.
4. No construction activity or heavy equipment may be operated on the drainfield area other than the minimum to install the drip distribution system.
5. Do not park or store materials on the drainfield area.
6. For freezing conditions, the bottom drip tube line must be higher than the supply and return line elevation at the dosing tank.
7. All PVC pipe and fittings shall be PVC schedule 40 type 1 or higher rated for pressure applications**.**
8. All glued joints shall be cleaned and primed with purple (dyed) PVC primer before being glued.
9. All cutting of PVC pipe, flexible PVC, or drip tubing should be completed using pipe cutters.
10. Sawing PVC, flexible PVC, or drip tubing is allowed only if followed by cleaning off any residual burs from the tubing or pipe and removing all shavings retained in the tubing or pipe.
11. All open PVC pipes, flexible PVC, or drip tubing in the work area shall have the ends covered during storage and construction to prevent construction debris and insects from entering the pipe.

12. Prior to gluing, all glue joints and tube or pipe interior shall be inspected and cleared of construction or foreign debris.
13. Dig the return manifold ditch along a line marked on the ground and back to the dosing tank.
    a. The return manifold ditch should start at the farthest end of the manifold from the dosing tank.
    b. The return manifold must slope back to the dosing tank.
14. Prior to start-up of the drip distribution system, the air release valves shall be removed and each zone in the system shall be flushed as follows:
    a. System flushing is accomplished by the manufacturer or engineer using the control panel's manual override.
    b. Using an appropriate length of flexible PVC pipe with a male fitting and attach to the air release connection to direct the flushing away from the construction area.
    c. Flush the zone with a volume of water (clean water to be provided by contractor) equal to at least 2 times the volume of the pipes from the central unit to the air release valve or the equivalent of 5 minutes of flushing.
    d. Repeat this procedure for each zone.

    Note: filters are not backflushed during start-up as any clogging could cause incorrect rate of flow readings for the controller.
15. If existing septic tanks are to be used, they shall be pumped out by a permitted septic tank pumper, checked for structural or component problems, and repaired or replaced if necessary.
    a. After the tank is emptied, the tank shall be rinsed, pumped, refilled with clean water, and leak tested.
    b. Debris in the septic tank should be kept to a minimum because it could clog the filter during start-up.
16. Once completed, cap drainfield areas for shallow installations (less than 12 inches) with 6–8 inches of clean soil and suitably vegetate.
    a. Cap fill material shall be the same as or one soil group finer than that of the site material, except that no fill material finer than clay loam may be used.
    b. Cap fill shall be free of debris, stones, frozen clods, or ice.
    c. Suitable vegetation should consist of typical lawn grasses or other appropriate low-profile vegetation.
    d. Trees, shrubs, and any other vegetation that aggressively seeks water should not be planted within 50 feet of the drip tubing network.

4.7.5 Inspection

1. A preconstruction meeting between the health district, responsible charge engineer, and installer should occur prior to commencing any construction activities.
2. The health district shall inspect all components and fill material used in constructing the drip distribution system prior to backfilling or cap fill placement.

3. The responsible charge engineer should conduct as many inspections as necessary 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)

4.7.6 Operation and Maintenance

1. The drip distribution system 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. Additional operation, maintenance, and monitoring may be required for the pretreatment component of the drip distribution system.
   a. The minimum operation, maintenance, and monitoring of the pretreatment component will be based on the manufacturer's recommendations and the minimum requirements specified within this manual for the specific pretreatment system.
   b. Additional operation, maintenance, and monitoring may be based on specific site conditions or pretreatment component type.

4.7.7 Suggested Design Example

1. Determine square feet needed for the drip distribution system, as follows.
   a. Wastewater flow in GPD is divided by the soil application rate (based on the soil classification from an on-site evaluation).
   b. Result is the square feet (ft^2) needed for the system.

   Example conditions: three-bedroom home in subgroup C-2 soils.

   Example calculation: (250 GPD)/(0.2 gallons/ft^2) = 1,250 ft^2

2. System design will use an application area of 2 ft^2/ft of drip tube. Divide the required square feet by the drip tube application area (2 ft^2/ft). This will determine the length of drip tube needed for the system.

   Example: (1,250 ft^2)/(2 ft^2/ft) = 625 feet of drip tube

3. Determine pumping rate by finding the total number of emitters and multiplying by the flow rate per emitter (1.32 gallons/hour/emitter at 20 psi). Adjust output to GPM and add 1.5 GPM per connection for flushing to achieve, for example, a 2 feet/second flushing velocity.

   Note: For continuous flush systems, the number of emitters will vary depending on the product selected.

Example: (625 feet)/(2 emitters/foot) = 312.5, use 313 emitters

(313 emitters) x (1.32 gallons/hour/emitter) = 413.2 gallons/hour

(413.2 gallons/hour)/(60 minutes/hour) = 6.89 GPM, or 7 GPM

10 connections at 1.5 GPM per connection = 15 GPM

Pumping rate: 7 GPM + 15 GPM = 22 GPM

4. Determine feet of head. Multiply the system design pressure (20 psi is standard, but values can vary depending on the drip tube used) by 2.31 feet/psi to get head required to pump against.

   Example: (20 psi) x (2.31 feet/psi) = 46.2 feet of head

   Add in the frictional head loss from tubing

5. Select a pump. Determine the size of the pump based on gallons per minute (step 3 of suggested design example) and total head (step 4 of suggested design example) needed to deliver a dose to the system. The pump selected for this example must achieve a minimum of 22 GPM plus the flush volume at 46.2 feet of head.

Figure 4-2 shows an overhead view of a typical drip distribution system. Figure 4-3 shows a potential layout of a filter, valve, and meter assembly, and Figure 4-4 illustrates a cross-sectional view of the filter, valve, and meter assembly. Figure 4-5 provides a view of the continuous flush system filter and meter assembly.

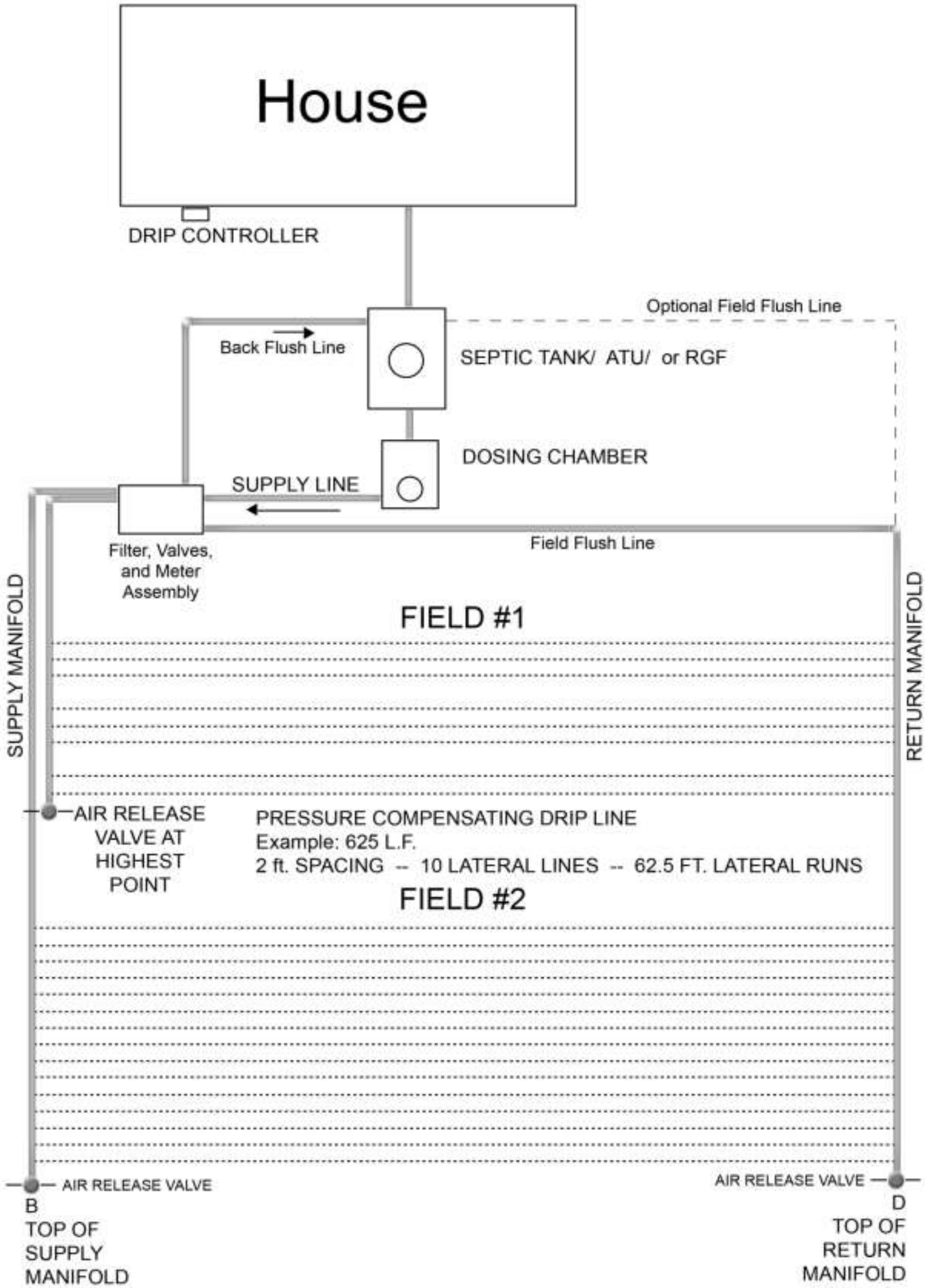

Figure 4-2. Overhead view of typical drip distribution system.

Valve Box Examples

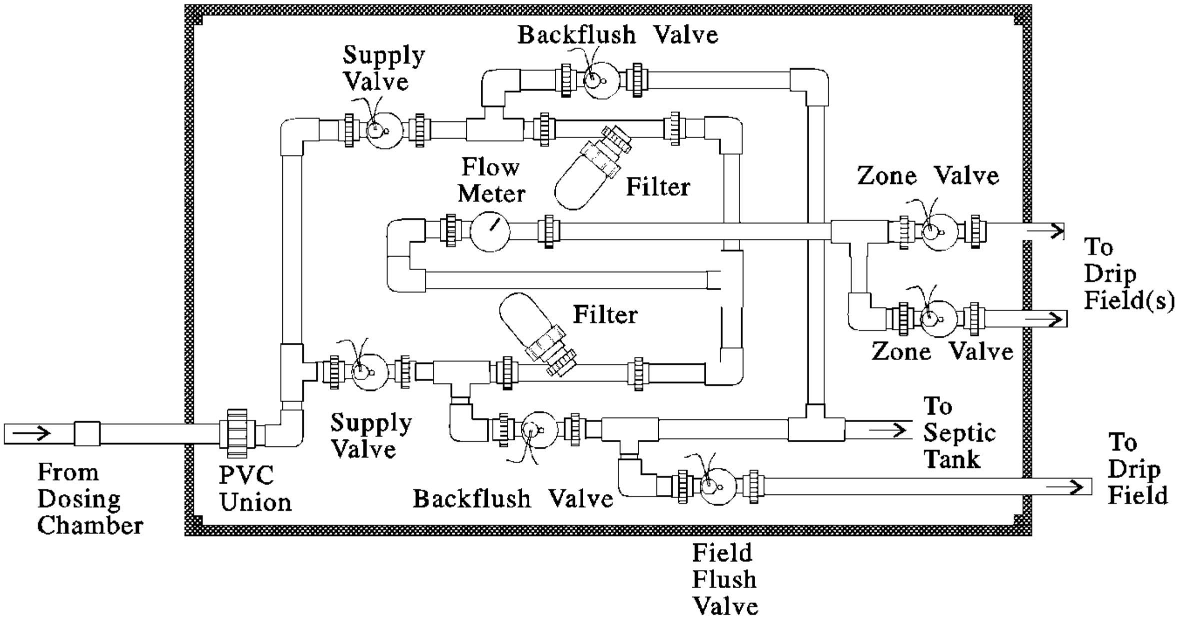

Figure 4-3. Overhead view of filter, valve, and meter assembly.

Valve Box

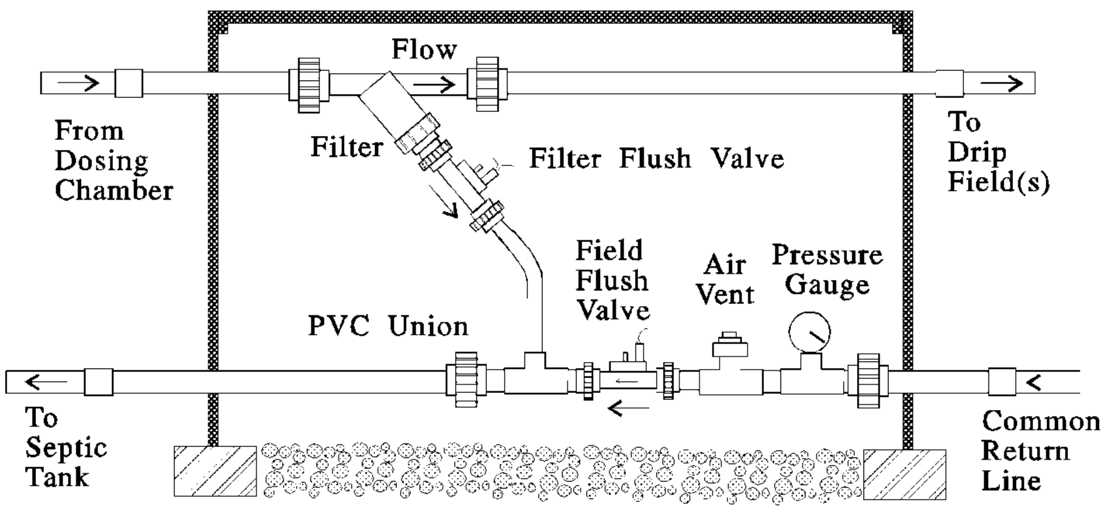

Figure 4-4. Cross-sectional view of typical filter, valve, and meter assembly.

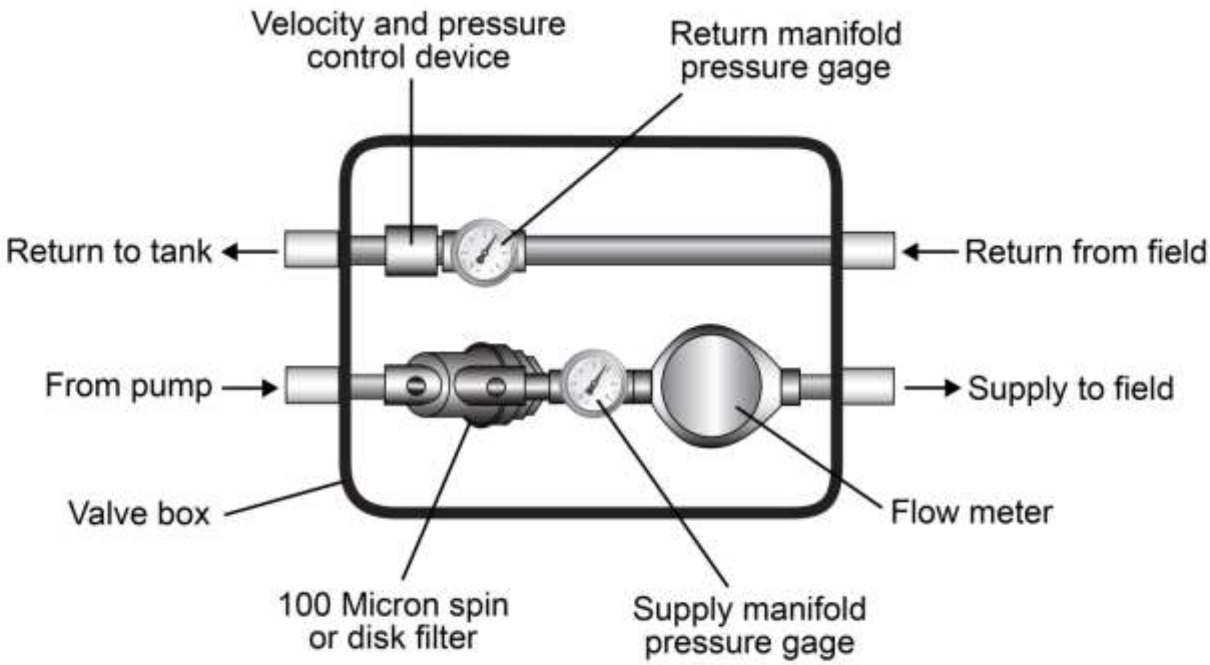

Figure 4-5. Overhead view of continuous flush system filter and meter assembly.