

4.13 Grey-Gray Water System

Revision: ~~September 16, 2004~~ August 18, 2016

Installer registration permit: Property owner or standard and basic (complex if pressurized)

Licensed professional engineer required: No (yes if pressurized)

4.13.1 Description

A gray water system is used to distribute gray water in the root zone of landscaping. Grey water is untreated household wastewater that has not come into contact with toilet waste. Grey-Gray water is domestic wastewater that consists of ~~includes~~ used water from bathtubs, showers, and sinks used only for hand washing bathroom wash basins, and water from clothes washing machines and laundry tubs. Other acceptable gray water sources may be determined on a case-by-case basis as long as the source does not come into contact with blackwaste or food products (e.g., drinking fountain, ice machine). It shall ~~Gray water does~~ not include wastewater from toilets, kitchen sinks, water softeners, dishwashers, ~~or clothes washing machines, or non-domestic wastewater sources laundry water from soiled diapers.~~ A grey-gray water system consists of a separate plumbing system for the approved gray water sources from the ~~blackwaste and kitchen plumbing non-approved wastewater sources~~, a dosing chamber or tank with surge capacity tank to temporarily hold large drain flows, a filter to remove particles that could clog the irrigation system, a pump to move the greygray water from the ~~surge tank~~ dosing chamber to the ~~irrigation~~ drip irrigation field (if necessary), and an drip irrigation system or mini-leachfield to distribute the greygray water.

4.13.2 Approval Conditions

1. Grey-Gray water ~~treatment and disposal~~ systems components must meet all the effective soil depths and separation distance ~~setback~~ criteria and soil application rate criteria as found in the rules (required by IDAPA 58.01.03) for standard systems.
2. Minimum irrigation area shall be based on the landscape area calculated in equation 4-11 and/or 4-12.
3. Specialized-Separate plumbing designs for the gray water and other wastewater sources will need to be approved by the Idaho Division of Building Safety, Plumbing Program Bureau.
4. Grey water surge-tanks for gravity flow systems must be watertight, ~~and~~ noncorrosive, and be included on the approved product lists in section 5.2 and 5.3.
5. Dosing chambers shall meet the requirements of section 4.19.3.4 and should account for surge flows and storage to meet the irrigation needs of the system, and
 - a. Must have an overflow to the subsurface sewage disposal system with an invert elevation lower than the inlet or pressure pipe outlet of the chamber.
 - b. High level audio and visual alarms are not required.
6. The system must be designed by a PE licensed in Idaho if using drip or pressure distribution.

7. ~~Operations and maintenance manuals must be provided to the property owner. The design engineer shall provide an O&M manual for the system to the health district before permit issuance.~~
8. ~~The drip distribution (irrigation) system shall meet the requirements of section 4.5 for pretreated effluent drip distribution systems except that a pretreatment system is not required.~~
9. ~~Mini-leachfields shall meet the design requirements for drainfields outlined in IDAPA 58.01.03.008, except for those deviations allowed in table 4-12, and shall use geotextile fabric for the drainrock-soil barrier.~~
10. ~~Grey-Gray water may not be used to irrigate vegetable gardens.~~
9. ~~Capacity of the septic tank and size of the blackwaste drainfield and replacement area shall not be reduced by the existence or proposed installation of a grey water system servicing the dwelling.~~
11. ~~Grey-Gray water shall not be applied on the land surface or be allowed to reach the land surface.~~
12. ~~All wastewater generated that is not approved to be discharged to the gray water system shall either discharge to a full-sized subsurface sewage disposal system or collection system for a private or public municipal wastewater treatment plant.~~

Table 4-12. Grey-Gray water gravity flow mini-leachfield design criteria.

| Mini-leachfield Design Criteria | Minimum | Maximum |
|---|-----------|-----------------|
| Number of drain lines per irrigation zone | 1 | — |
| Length of each perforated line | — | 100 feet |
| <u>Distribution area square footage</u> | <u>—</u> | <u>1,500</u> |
| Bottom width of trench | 6 inches | 18 inches |
| Total depth of trench | 12 inches | 18 inches |
| Spacing of line, center-to-center | 3 feet | 4 feet |
| Depth of earth cover over lines | 6 inches | 12 inches |
| Depth of aggregate over pipe | 2 inches | — |
| Depth of aggregate beneath pipe | 2 inches | — |
| Grade on perforated pipe | Level | 1 inch/100 feet |

4.13.3 Design Requirements

1. ~~Grey-Gray water flows are determined by calculating the maximum number of occupants or visitors in the wastewater generating structure dwelling. Residences shall be based on the first bedroom with two occupants and each bedroom thereafter with one occupant unless higher usage is proposed by the applicant.~~
2. Estimated daily ~~greygray~~ water flows for each occupant are:
 - a. ~~Showers, bathtubs, and wash basins (total): 25 GPD per occupant~~
 - b. ~~Clothes washer: 15 GPD per occupant~~

Table 4-13. Gray water flows by fixture type connected to system in gallons per person per day.

| Fixture | Gallons/Person/Day |
|----------------------|----------------------------|
| Shower/bath | 18 |
| Hand sinks (faucets) | 12 |
| Other | Case-by-case determination |

Multiply the number of occupants and visitors by the estimated greygray water flow for the fixtures proposed to be connected to the gray water system.

For example: A three-bedroom house is designed for four people. The house has ~~a washing machine connection, shower and hand sinks~~ thus each occupant is assumed to produce 430 GPD of greygray water, resulting in a total of ~~160~~ 120 GPD.

- The formula shown in Equation 4-11 is used to estimate the square footage of landscape to be irrigated:

$$LA = \frac{GW}{ET \times PF \times 0.62}$$

Equation 4-11. Landscaped area needed for greygray water produced.

where:

GW = estimated greygray water produced (gallons per week)

LA = landscaped area (square feet)

ET = evapotranspiration (inches per week)

PF = plant factor, based on climate and type of plants either 0.3, 0.5, or 0.8

0.62 = conversion factor (from inches of ET to gallons per week)

For example: If ET = 2 inches per week, and lawn grasses are grown with a PF of 0.8 (high water using) then the landscaped area is equal to:

$$LA = (\del{160} \u120 \text{ GPD} \times 7 \text{ days}) / (2 \times 0.8 \times 0.62) = \del{1,129} \u847 \text{ ft}^2 \text{ of lawn.}$$

- An alternative to using greygray water for lawns is to irrigate landscape plants. A plant factor depends on the type of plants watered, an ET rate, and plant canopy. Table 4-~~12~~14 is used to calculate square footage of landscape plants that can be irrigated with greygray water.

Table 4-1214. GreyGray water application rates for landscape plants.

| Evapotranspiration (inches per week) | Relative Water Need of Plant (plant factor) | Gallons per Week | | |
|---|--|-------------------------------|-------------------------------|------------------------------|
| | | 200 ft ² Canopy | 100 ft ² Canopy | 50 ft ² Canopy |
| 1 | Low water using 0.3 | 38 | 19 | 10 |
| | Medium water using 0.5 | 62 | 31 | 16 |
| | High water using 0.8 | 100 | 50 | 25 |
| 2 | Low water using 0.3 | 76 | 38 | 19 |
| | Medium water using 0.5 | 124 | 62 | 31 |
| | High water using 0.8 | 200 | 100 | 50 |
| 3 | Low water using 0.3 | 114 | 57 | 28 |
| | Medium water using 0.5 | 186 | 93 | 47 |
| | High water using 0.8 | 300 | 150 | 75 |

Note: square feet (ft²)

Gallons per week (GPW) calculation for this chart was determined with **Equation Error! No text of specified style in document.-1**:

$$\text{GreyGray water flow (GPW)} = ET \times \text{plant factor} \times \text{area} \times 0.62 \text{ (conversion factor)}$$

Equation Error! No text of specified style in document.-1. Gallons per week needed for irrigated plants.

This formula does not account for irrigation efficiency. If the irrigation system does not distribute water evenly, extra water will need to be applied.

For example: A three-bedroom home ~~with a washer~~ will produce ~~1,120,840~~ GPW (7 days x ~~160,120~~ GPD). If ET = 2 inches per week, then with the ~~1,120,840~~ gallons of greygray water a homeowner could irrigate the following :

- a. ~~EightFour~~ small fruit trees: ~~84~~ x 50 = ~~400,200~~ gallons (high water using, 50-foot canopy)
- b. ~~EightSix~~ medium shade trees: ~~86~~ x 62 = ~~496,372~~ gallons (medium water using, 100-foot canopy)
- c. ~~SevenEight~~ large shrubs: ~~78~~ x 31 = ~~2,172,48~~ gallons (medium water using, 50-foot canopy)
- d. Total water use per week: ~~1,113,820~~ GPW

4.13.4 Other Requirements

1. The Uniform Plumbing Code (UPC) GreyGray Water Standards require that all greygray water piping be marked *Danger—Unsafe Water*.

2. Valves in the plumbing system must be readily accessible, and backwater valves must be installed on ~~surge/holding tank~~dosing chamber drain connections to sanitary drains or sewer piping. Ball valves are recommended to be used in the system. Finally all piping must be downstream of water-seal type trap(s). If no such trap exists, an approved vented running trap shall be installed upstream of the connection to protect the building from possible waste or sewer gasses.
3. ~~Surge tank~~Dosing chamber or tank must be vented and ~~have a locking gasketed lid. If the surge tank is within the structure, then the venting must meet the requirements of the UPC. Outside surge tanks shall be vented with a 180° bend and screened. A minimum capacity of 50 gallons is required. The surge tank must be placed on a 3-inch concrete slab or on dry, level compacted soil and the lid labeled Grey Water Irrigation System, Danger—Unsafe Water. Surge tanks shall be constructed of solid durable materials, not subject to excessive corrosion or decay, and shall be watertight. T~~the tank drain and overflow gravity drain must be permanently connected to the structure's septic tank or sewer line. The drain and overflow drain shall not be ~~less in size~~ smaller in diameter than the inlet pipe.
4. Filters with a minimum flow capacity of 25 GPM are required.
5. ~~Pumps are usually required to lift the grey/gray water from the surge tank to the irrigation system (section 4.19). Alternatively if all of the landscape plants are below the building drain lines, then the grey water irrigation system could use gravity to distribute the grey water.~~
6. ~~Irrigation system can be either a mini-leachfield or a subsurface drip irrigation system. Mini-leachfield designs follow IDAPA 58.01.03.008, except for those deviations allowed by Table 4-13, and are required to use geotextile for the drainrock-soil barrier.~~

Notes:

1. The plants listed in Table 4-~~14~~15 are tolerant of sodium and chloride ions or have been reported to do well under grey/gray water irrigation.
2. Different types of media can be used in grey/gray water filtration. These include nylon or cloth filters, sand filters, and rack or grate filters.
3. ~~Table 4-13 lists criteria for the design of mini-leachfields.~~

Table 4-13. Grey water mini-leachfield design criteria.

| Mini-leachfield Design Criteria | Minimum | Maximum |
|---|----------------|-----------------|
| Number of drain lines per irrigation zone | 4 | — |
| Length of each perforated line | — | 100 feet |
| Bottom width of trench | 6 inches | 18 inches |
| Total depth of trench | 12 inches | 18 inches |
| Spacing of line, center-to-center | 3 feet | 4 feet |
| Depth of earth cover over lines | 6 inches | 12 inches |
| Depth of aggregate over pipe | 2 inches | — |
| Depth of aggregate beneath pipe | 2 inches | — |
| Grade on perforated pipe | Level | 1 inch/100 feet |

Table 4-14. Sodium and chloride tolerant plants.

| | | | | |
|-----------------|------------------|--------------------|---------------------|-------------------|
| Agapanthus | Cottonwood | Honeysuckle | Olive | Rosemary |
| Arizona cypress | Crape myrtle | Italian stone pine | Pfitzer bush | Strawberry clover |
| Bermuda grass | Deodar cedar | Juniper | Purple hopseed bush | Star jasmine |
| Bougainvillea | Evergreen shrubs | Oaks | Redwoods | Sweet clover |
| Carpet grass | Holly | Oleander | Rose | |

Figure 4-21 shows a single-tank gravity grey water system, and Figure 4-22 shows a single-tank pumped grey water system.

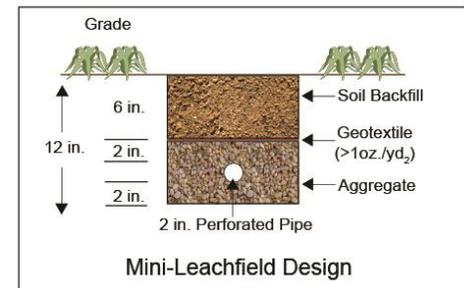
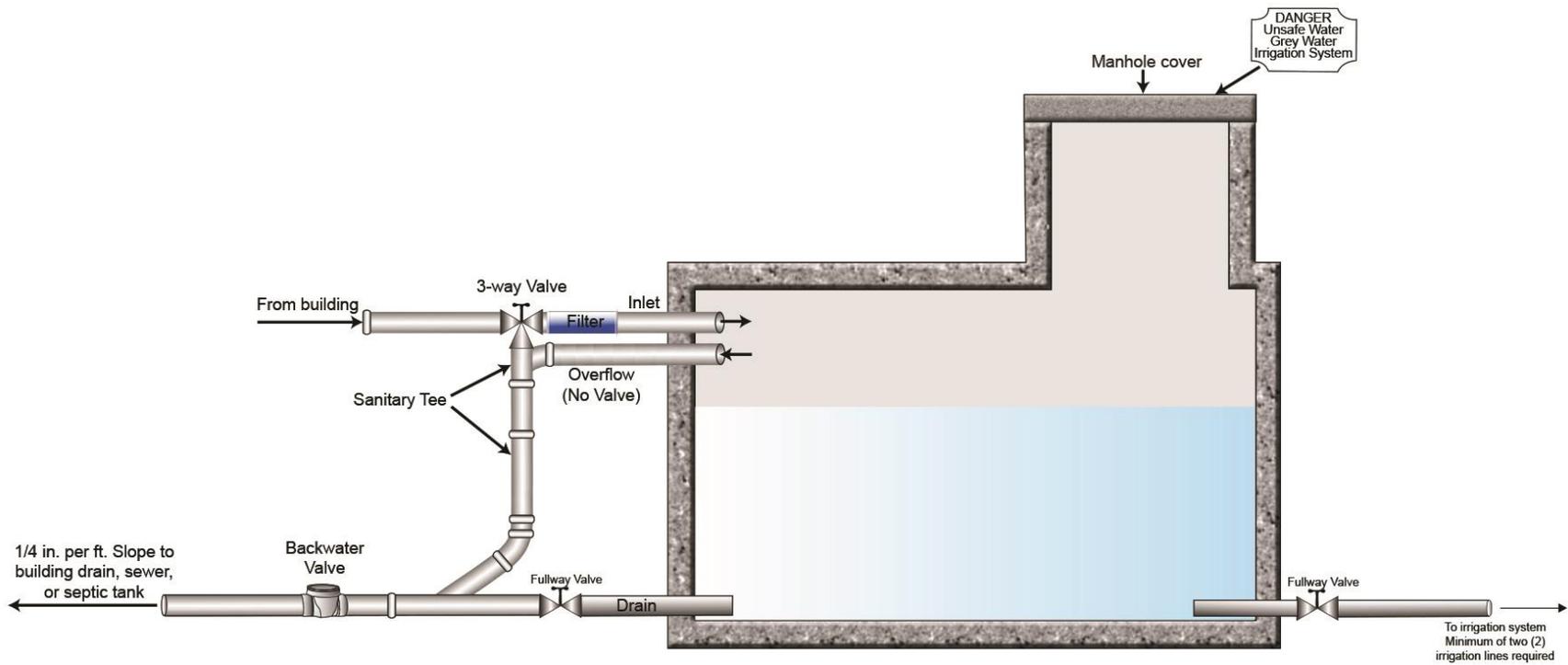
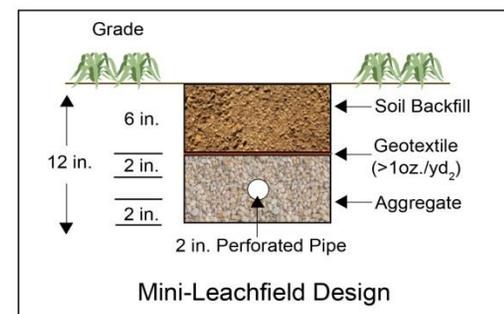
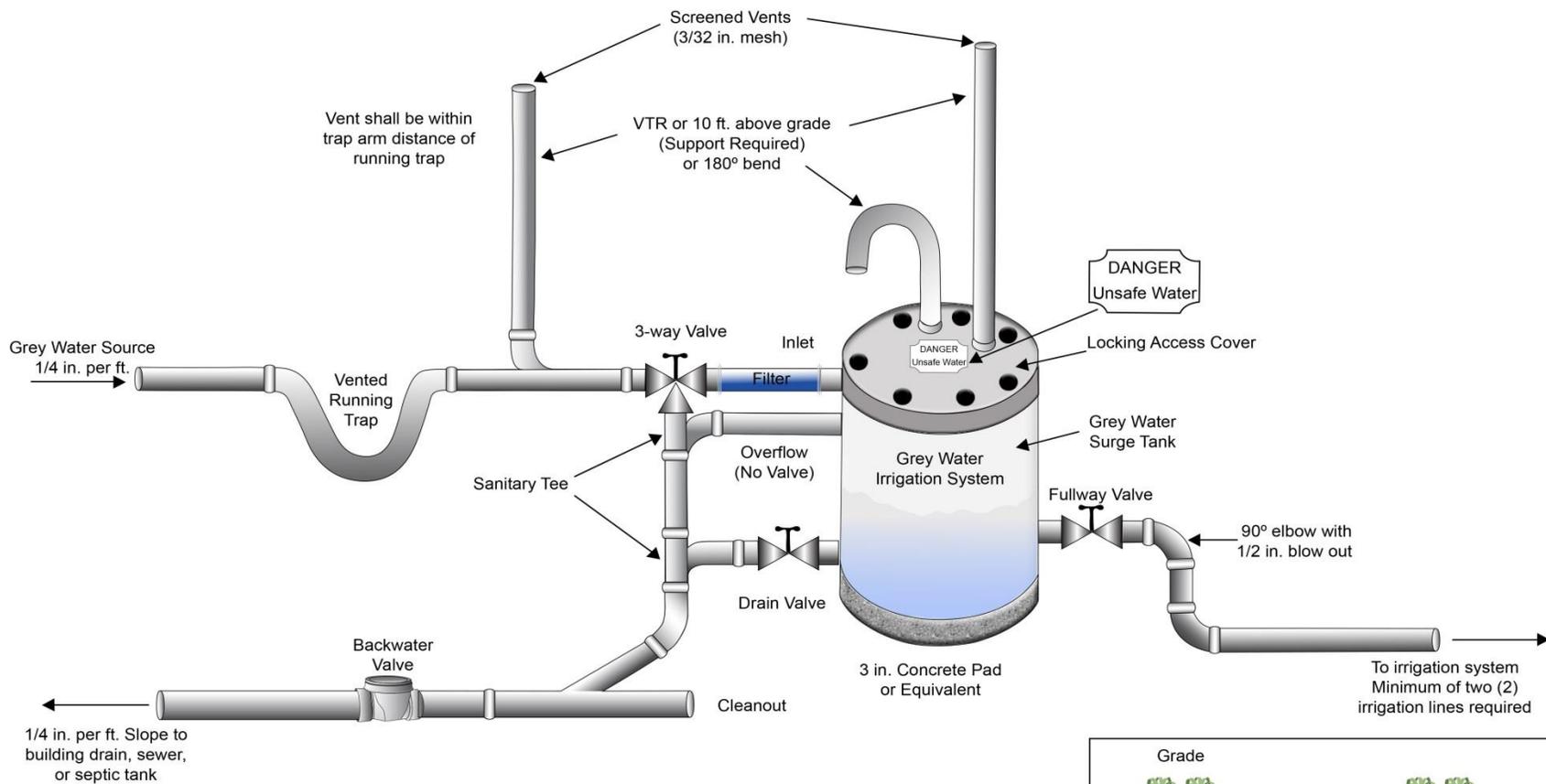


Figure 4-21. **GreyGray** water system (single-tank gravity).



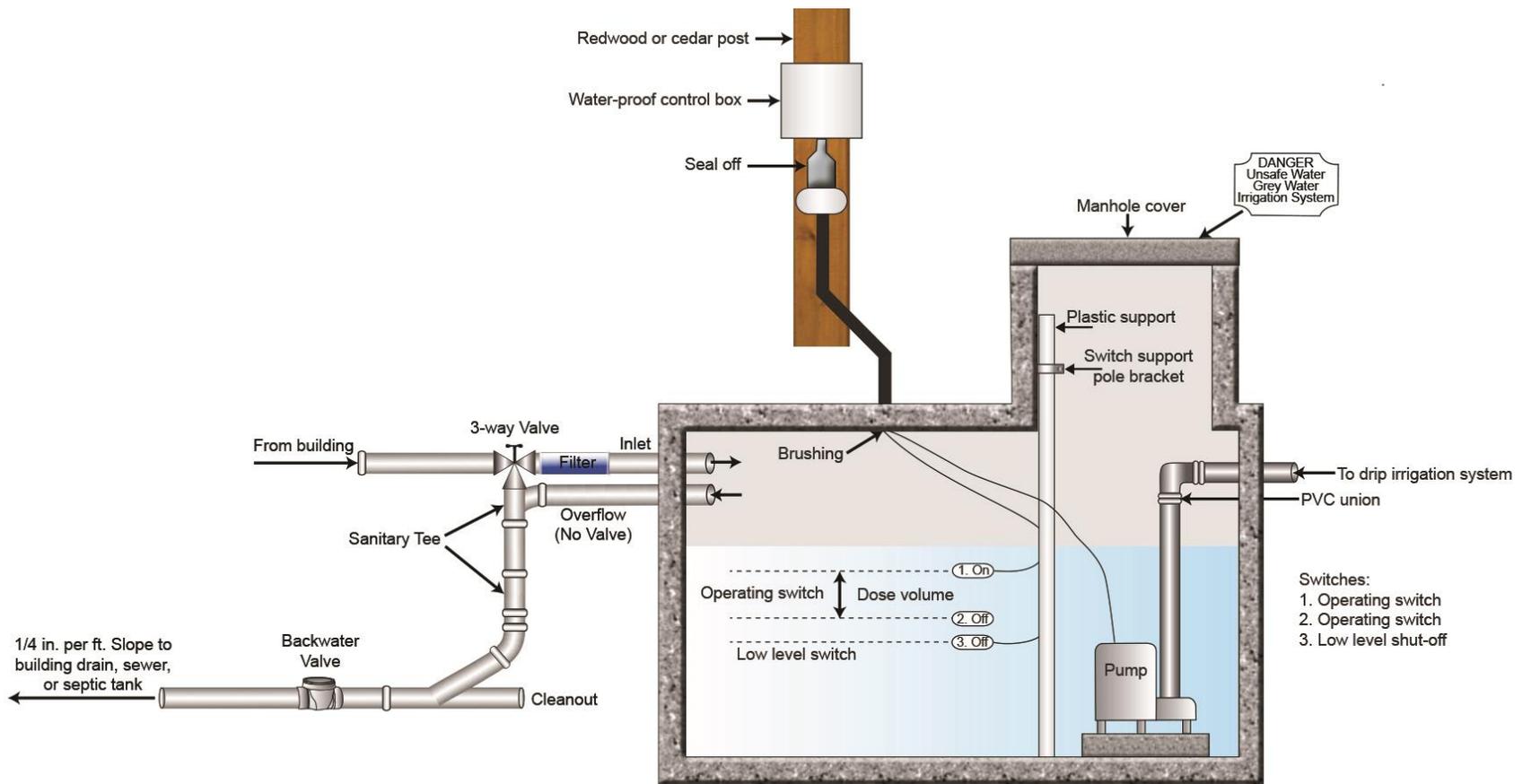
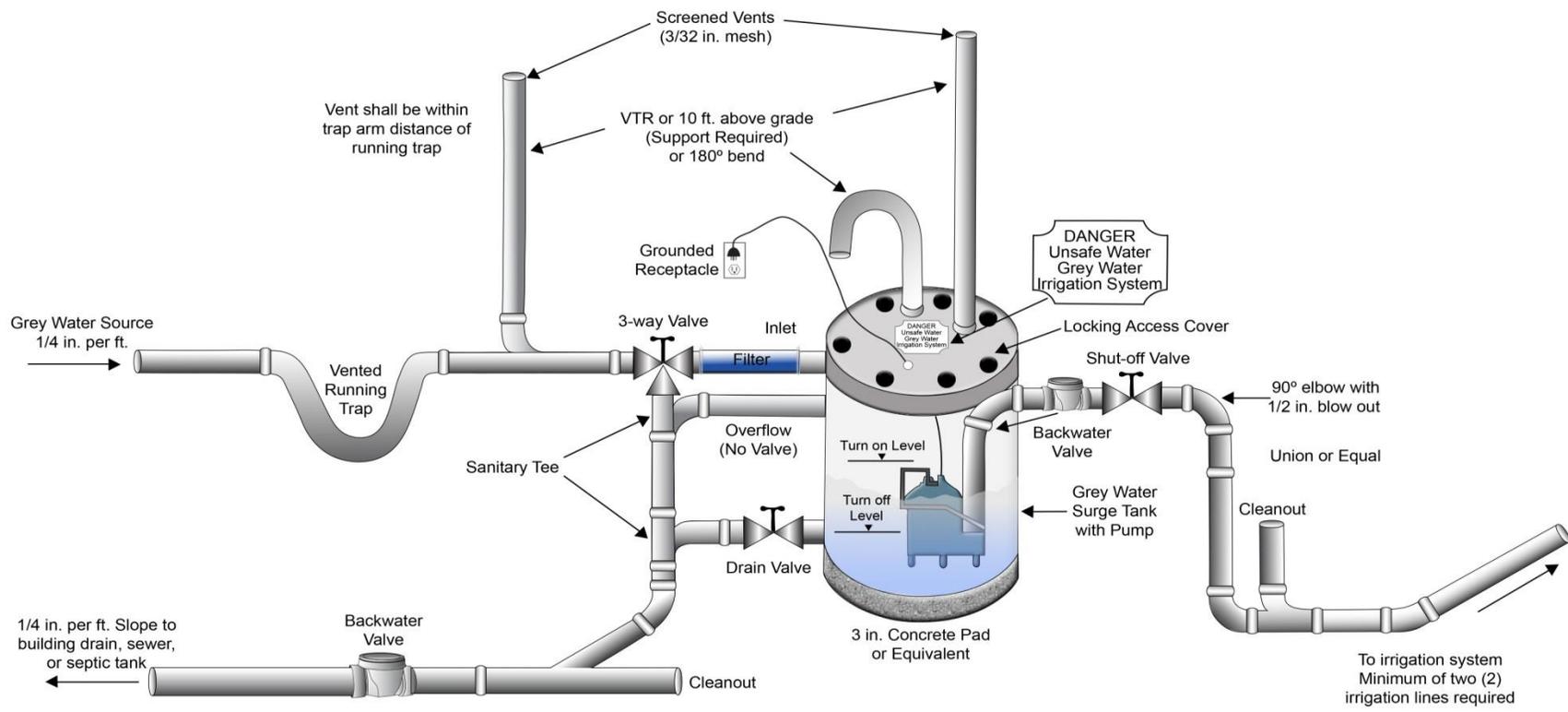


Figure 4-22. **GreyGray** water system (single-tank pumped).



Grey Water Source
1/4 in. per ft.

Vent shall be within
trap arm distance of
running trap

Screened Vents
(3/32 in. mesh)

VTR or 10 ft. above grade
(Support Required)
or 180° bend

Grounded
Receptacle

DANGER
Unsafe Water
Grey Water
Irrigation System

3-way Valve

Inlet

Filter

Locking Access Cover

Vented
Running
Trap

Shut-off Valve

Sanitary Tee

Overflow
(No Valve)

90° elbow with
1/2 in. blow out

Union or Equal

Turn on Level

Backwater
Valve

Grey Water
Surge Tank
with Pump

Drain Valve

Cleanout

1/4 in. per ft. Slope to
building drain, sewer,
or septic tank

Backwater
Valve

Cleanout

3 in. Concrete Pad
or Equivalent

To irrigation system
Minimum of two (2)
irrigation lines required