

BENTON-FRANKLIN HEALTH DISTRICT

Standards for Design and Construction Of Gravity Flow Onsite Sewage Disposal Systems

It is the intent of this bulletin and subsequent bulletins to make information available to installers who must make appropriate field decisions. As problems and situations arise that are not addressed herein, please call the Kennewick or Prosser Offices of the Benton-Franklin Health Department.

We thank the many installers and colleagues whose letters and constructive comments have influenced the revision of this bulletin.

The following topics will be covered:

- Design Criteria.
- Construction Criteria.
- Procedure for final inspection of system.

SERVICE OFFICES:

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Kennewick, WA 99336
(509) 560-4205
1-800-814-4323

Benton-Franklin District Health Department
310 7th Ave. E.
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DESIGN CRITERIA

A. Minimum Horizontal Separations (See Table I)

TABLE I

Items Requiring Setback	From edge of soil dispersal component and reserve area	From sewage tank and distribution box	From building sewer, and nonperforated distribution pipe
Well or suction line	100 ft.	50 ft.	50 ft.
Public drinking water well	100 ft.	100 ft.	100 ft.
Public drinking water spring measured from the ordinary high-water mark	200 ft.	200 ft.	100 ft.
Spring or surface water used as drinking water source measured from the ordinary high-water mark ¹	100 ft.	50 ft.	50 ft.
Irrigation Canals (lined or unlined)	100ft.	50ft.	50ft.
Pressurized water supply line	10 ft.	10 ft.	10 ft.
Decommissioned well (decommissioned in accordance with chapter 173-160 WAC)	10 ft.	N/A	N/A
Surface water measured from the ordinary high-water mark	100 ft.	50 ft.	10 ft.
Building foundation/In ground pool	10 ft.	5 ft.	2 ft.
Property or easement line	5 ft.	5 ft.	N/A
Interceptor/curtain drains/foundation drains/drainage ditches			
Down-gradient ² :	30 ft.	5 ft.	N/A
Up-gradient ² :	10 ft.	N/A	N/A
Other site features that may allow effluent to surface			
Down-gradient ² :	30 ft.	5 ft.	N/A
Up-gradient ² :	10 ft.	N/A	N/A
Down-gradient cuts or banks with at least 5 ft. of original, undisturbed soil above a restrictive layer due to a structural or textural change	25 ft.	N/A	N/A

Items Requiring Setback	From edge of soil dispersal component and reserve area	From sewage tank and distribution box	From building sewer, and nonperforated distribution pipe
Down-gradient cuts or banks with less than 5 ft. of original, undisturbed soil above a restrictive layer due to a structural or textural change	50 ft.	N/A	N/A
Other adjacent soil dispersal components/subsurface storm water infiltration systems	10 ft.	N/A	N/A
Trees, Utility Poles, Driveways, Patio, and other impervious surfaces	10 ft	5ft.	N/A
Natural Drainage areas ³	15ft.+Easement	15ft.+ easement	N/A
Slopes in excess of 20%	10ft.	5ft.	N/A

¹If surface water is used as a public drinking water supply, the designer shall locate the OSS outside of the required source water protection area.

²The item is down-gradient when liquid will flow toward it upon encountering a water table or a restrictive layer. The item is up-gradient when liquid will flow away from it upon encountering a water table or restrictive layer.

³Setback for natural drainage areas shall be measured from the near side high water mark as determined by 100 year storm analysis. Setback shall be 15' + the height of cut or bank from the easement edge. The 100 year storm will determine the easement.

B. General Site Requirements for Initial and Replacement Drainfield Areas.

1. A four-foot minimum vertical separation between the trench bottom and restrictive soil layers or ground water is required.
2. System replacement areas of 100% shall be maintained. Requirements for initial subsurface soil absorption systems will also apply to the replacement system areas. Test holes may be required in replacement areas.
3. Subsurface soil absorption systems shall not be located on slopes in excess of 20%. Systems developed on sites with slopes of 15-20% will require a five-foot minimum vertical separation between the trench bottom and restrictive soil layers or ground water (see sloping ground designs on page 7).
4. Subsurface soil absorption systems shall not be subject to vehicular traffic.
5. Subsurface soil absorption systems shall not be encroached upon by buildings or structures or covered by impervious surfaces including but not limited to asphalt, concrete, and/or swimming pools.

6. Subsurface soil absorption systems shall not be located in areas where surface water flows or accumulates.
7. Subsurface soil absorption systems shall not be located on land forms which are unstable (example: fills).
8. A grade down, when needed on a potentially problem lot, will be required prior to site approval and permit issuance.
9. Each single family dwelling, multiple family dwelling unit, commercial use, etc. must be served by its own individual subsurface soil absorption system unless prior approval from the Health Officer has been obtained.

C. Septic Tank Sizing

1. **Single Family Residences:** with 1-4 bedrooms are required to have a minimum liquid volume of 1,000 gallons. For each additional bedroom, add 250 gallons.
2. **Other uses:** 3 times the projected daily sewage with volume minimum of 1,000 gallons.

D. Drainfield Design

1. Residential Systems:
 - The system shall be designed to receive all sanitary sewage and domestic wastewater from the building served unless otherwise approved by the Health Officer. For individual and/or multi-family residences, flows of one hundred twenty (120) gallons/bedroom/day shall be used for design purposes. (See Table II). Drainage from footing or roof drains or any other type of drain shall neither enter the sewage system nor be directed over the area where the on-site sewage system is located.
 - The minimum sized residential system shall not be less than 2 bedrooms in size nor less than 330 square feet.

TABLE II*Maximum Hydraulic Loading Rate for Residential Sewage¹*

Soil Type	Soil Textural Classifications	Loading Rate (gallons per square foot per day)	Square feet of drainfield per bedroom
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils excluding soil types 5 and 6, all soil types with greater than or equal to 90% rock fragments.	0.727	165
2	Coarse sands.	0.727	165
3	Medium sands, loamy coarse sands, loamy medium sands.	0.727	165
4	Fine sands, loamy fine sands, sandy loams, loams.	0.6	200
5	Very fine sands, loamy very fine sands; or silt loams, sandy clay loams, clay loams and silty clay loams with a moderate or strong structure (excluding platy structure).	0.4	300
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	0.2	600
7 Unsuitable for treatment or dispersal	Sandy clay, clay, silty clay, strongly cemented or firm soils, soil with a moderate or strong platy structure, any soil with a massive structure, any soil with appreciable amounts of expanding clays.	Not suitable	

2. Non-Residential Systems:

- When proposing the use of on-site sewage system for non-residential sewage, the engineer shall provide to the health officer:
 - a. Information to show the sewage is not industrial wastewater;
 - b. Information to establish the sewage's strength and identify chemicals found in the sewage that are not found in residential sewage;
 - c. A design providing treatment equal to that required of residential sewage;
 - d. May require volume information from actual meter readings; and
 - e. Must be designed to accommodate a minimum of 240 gallons per day.

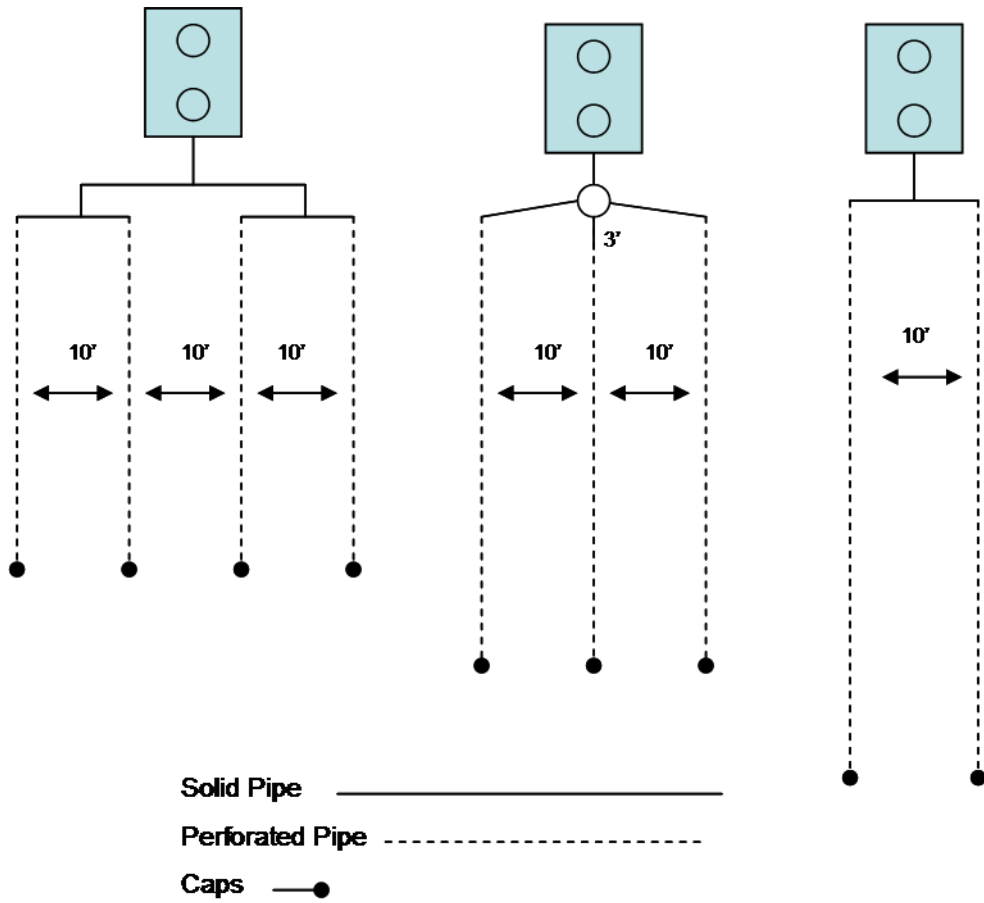
3. Sewage Effluent Lines:

- It is recommended that perforated sewage effluent lines should not be longer than 55 feet. Individual drainfield laterals greater than 83 feet in length are to use pressure distribution; a drainfield in excess of 1,100 square feet shall require dosing and/or pressure distribution.

4. Equal Distribution:

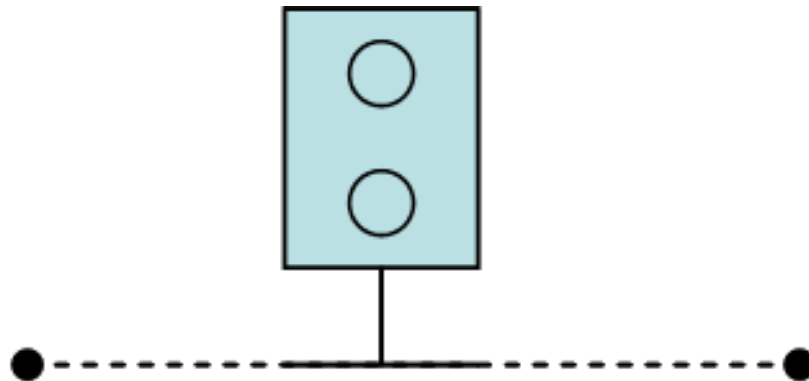
- a. Equal distribution will be required in application approval and field inspection, either by means of a distribution box (D-box) or a header system (see construction standards).
- b. Each line should be equal in length and receive an equal amount of effluent. Examples: In a two-line system, each line should receive 1/2 the flow; In a four-line systems, each line should receive 1/4 of the flow.
- c. Drainfield trenches must be separated by a minimum of 10 feet center to center. (See Figure 1).
- d. Drainfield trenches must be separated by 10 feet, 5 feet on each side of the tee (See Figure 2).
- e. Other designs may be allowed; however, contact the Health Department before installation.

Figure 1



Drainfield Trenches Must be Separated by a Minimum of 10' Center to Center.

Figure 2



Drainfield Trenches Must be separated
By 10' (5' on each side of the tee)

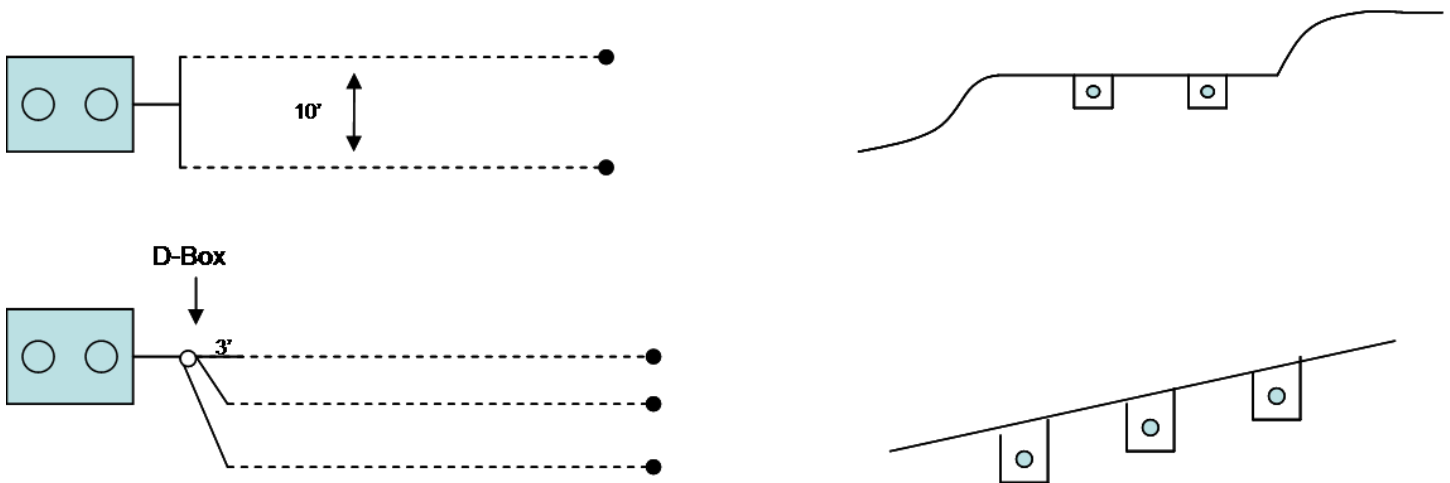
E. Special Modified System

- Special modified Systems (i.e., shallow trench, etc.) may be used with approval of this department, and where soil conditions indicate that these systems would be the preferred means of disposal.

F. Alternative Systems and Proprietary Devices

- Approved alternative systems (i.e., mound, etc.) and proprietary devices must appear on the List of Registered Onsite Treatment and Distribution Products and have guidelines for their use.
- Slope ground designs are required for slopes less than 20% in acceptable soils. All designs must obtain Health Department approval prior to installation.

Figure 3



G. Absorption Beds

- May be allowed if design approval is granted by the Health Officer and they meet the following criteria:
 - a. Bed may be designed in Type 2, 3 or 4 soil.
 - b. Bed must be sized 20% greater than a standard subsurface soil absorption system to accommodate lost sidewall.
 - c. Bed must not exceed 10 feet in width.
 - d. Drainfield must be given prior consideration.
 - e. Enhanced treatment must be provided.

CONSTRUCTION CRITERIA

Any solid line under a road, driveway, etc., should be either schedule 40 PVC or greater, or any material of equal or greater strength as approved by the Health Officer.

A. Septic Tank Inlet Line

1. Minimum slope is 1/8" per foot from the house to tank (plumber's grade). The slope on the last 10' before the tank must not be more than 1/4" per foot.
2. Minimum length of 5' from structure to septic tank is required. Any lines longer than 30 feet must have design approval.
3. Pipe specifications are 4" ABS or PVC, 4000 pound crush strength minimum. (Recommend 4000 pound crush).
4. Turns are undesirable. If a turn is necessary, sweeping (45 degree) 1/8 bends or sweeping 90 degree bends are recommended. Clean-out rises are required on waste lines prior to turns. (It is preferable to corner with the tank outlet line which carries only effluent).
5. Capped clean-outs, conveniently located, are **required in all installations**. One clean-out will be required in every 50' of line length.
6. All pipe fitting joints must be glued.

B. Septic Tank.

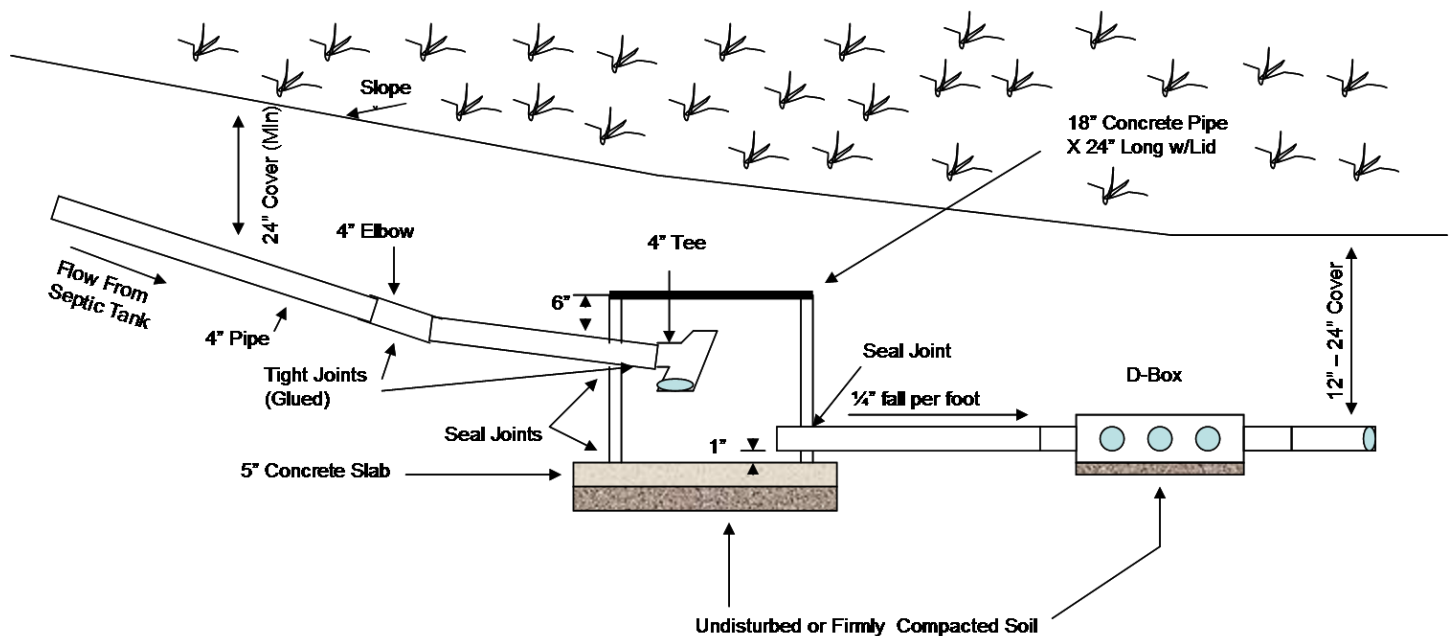
1. Only certain tanks have been approved for use.
2. All tanks must have design approval prior to use within the Health District.
3. All septic tanks to be located in high water table areas shall be adequately treated to preclude ground water intrusion.
4. Risers must be installed on all septic tanks which are deeper than 6" from finished grade, to attain a maximum of 6" of cover soil to the riser opening. Risers shall be a minimum of 24" in diameter. Any septic tank with access to surface grade shall have secured lids. Only conventional gravity flow systems may have septic tanks with 6" of cover soil.
5. All tanks must be watertight.
6. Any tank with mid-lateral seams below the liquid level will be required to be water tested to affirm its water-tightness.

For complete construction standards for septic tanks ask for separate bulletin available at either service office.

C. Septic Tank Outlet Line

1. The outlet line must be a solid 4" ABS or PVC (4000 pound crush strength, minimum) pipe separating tank and disposal area by a minimum of 5 feet and be well supported as to prevent further settlement. A minimum drop of 2" is required between the tank and header line or D-box. (The headfall is important, considering the need to dose the nearly level fields installed).
2. Distribution systems which are significantly lower in elevation than the septic tank, may be required to have a "splash box" installed to reduce excessive flows into said distribution system. All "splash boxes" must be designed by a Licensed Professional Engineer to assure necessity, and appropriate construction needs. (See Figure 4).

Figure 4
*Example "Splash Box" and
Distribution Box Detail*



D. Header Line

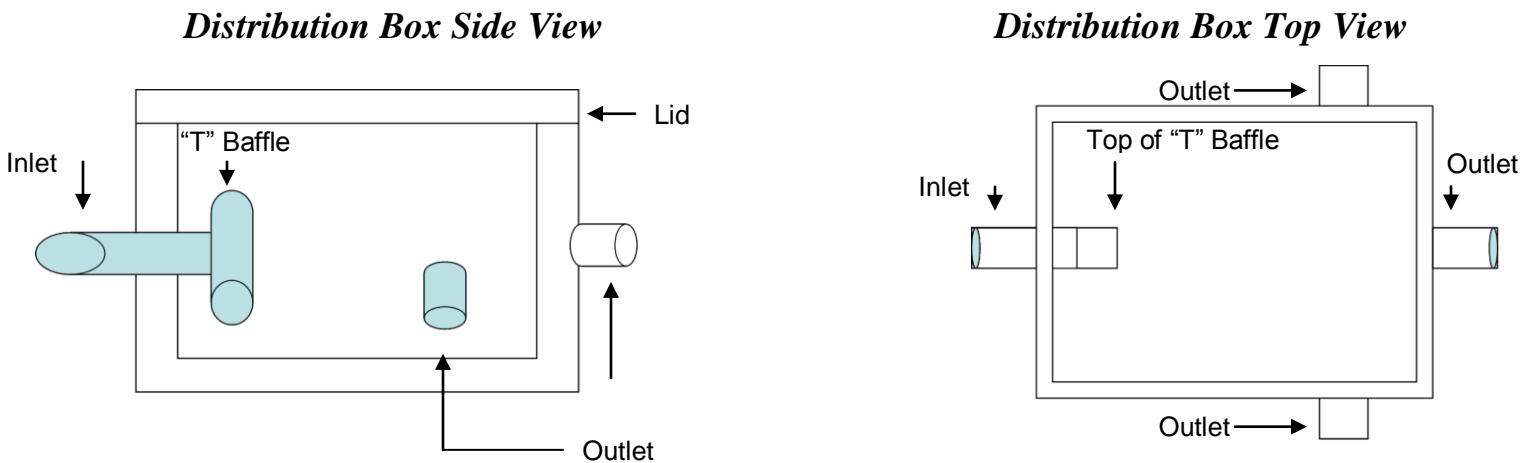
1. All header lines must be constructed of solid line, be laid level and designed to equally distribute effluent.
2. All joints of fittings must be glued.
3. Header lines must be securely bedded to prevent further settling.

4. Pipe specifications are 4" ABS or PVC, 1000 pound crush strength minimum.

E. Distribution Boxes (D-box) (See Figure 5)

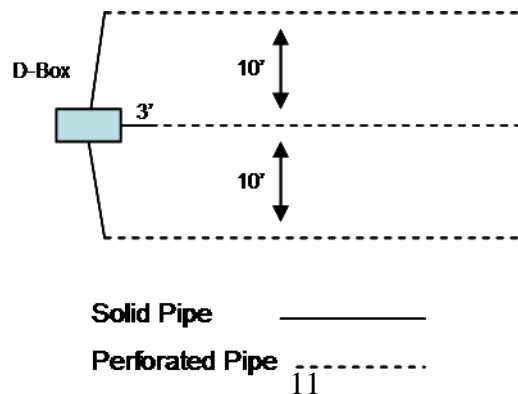
1. Distribution boxes must be water-tight and water-levelled.
2. Distribution boxes must be securely bedded to help control settling and tipping.
3. Distribution boxes must be placed so there will not be a direct flow from the distribution box inlet to a single drain line. Baffling if needed should be accomplished by any one of the following:
 - A cylindrical baffle is the preferred method.
 - Off-set the lines in the box.
 - Use a double 90 degree on the inlet line into the distribution box.
 - Use a trimmed "T" baffle in the distribution box on the inlet line.

Figure 5



4. Separate the distribution box from the graveled drainfield trench by a minimum of 3 feet of solid pipe. See Figure 5a below.

Figure 5a



5. The solid pipe used between the distribution box and the drainfield trench must be 4" PVC or ABS, 1000 pound crush strength, minimum.
6. A line from the distribution box to the drainfield may be installed level; however, sloping lines are preferred.
7. All joints and fittings must be glued and watertight unless utilizing gasketed pipe where all joints shall be watertight.

F. Drainfield Lines

1. Use 4" PVC perforated pipe, 1000 pound crush strength, minimum.
2. Level lines are preferred, however a fall of 0 to 2 inches per 50 lineal feet of drainfield is allowed.
3. All drain lines must be capped
4. The holes in the drainpipe must be directed downward (see Figure 6a).

G. Drainfield Trenches (see Figure 6b)

1. The maximum allowable depth to the bottom of the trench from the finished surface grade is 3 feet on all conventional gravity flow systems.
2. The trench bottom must be level. Trenches may be independently level on slope installations if served by an equal distribution device; i.e., distribution box.
3. Effective absorption area is a calculation of the bottom area of the trench. Any trench width from 2 to 3 feet may be used, (3 feet maximum allowed), however, lines will need to be longer to compensate for trenches narrower than 3 feet.
4. Trenches should be separated by 10' center to center (7' edge to edge).
5. Drain rock for drainfield trenches:
 - Gravel used in the construction of the drainfield shall be washed, separated, and maintained in a manner, to be observable clean and free of dust, fines and dirt.
 - Dimensions of the rock may vary from 3/4 to 2-1/2 inches, measuring the longest dimension. The recommended rock dimension for ease during construction is 3/4 to 1-1/2 inches.

6. The gravel in the trenches must be covered with a spun bound, non-woven geotextile (filter fabric 2-4 oz./yd²) of sufficient width to prevent soil infiltration into the drainfield (straw may be placed along the edges of the geotextile to cover any exposed gravel).
7. After inspection, trenches should be backfilled with a minimum of 12 inches of soil, and a maximum of 24 inches.

Figure 6a
Typical Trench Long Section

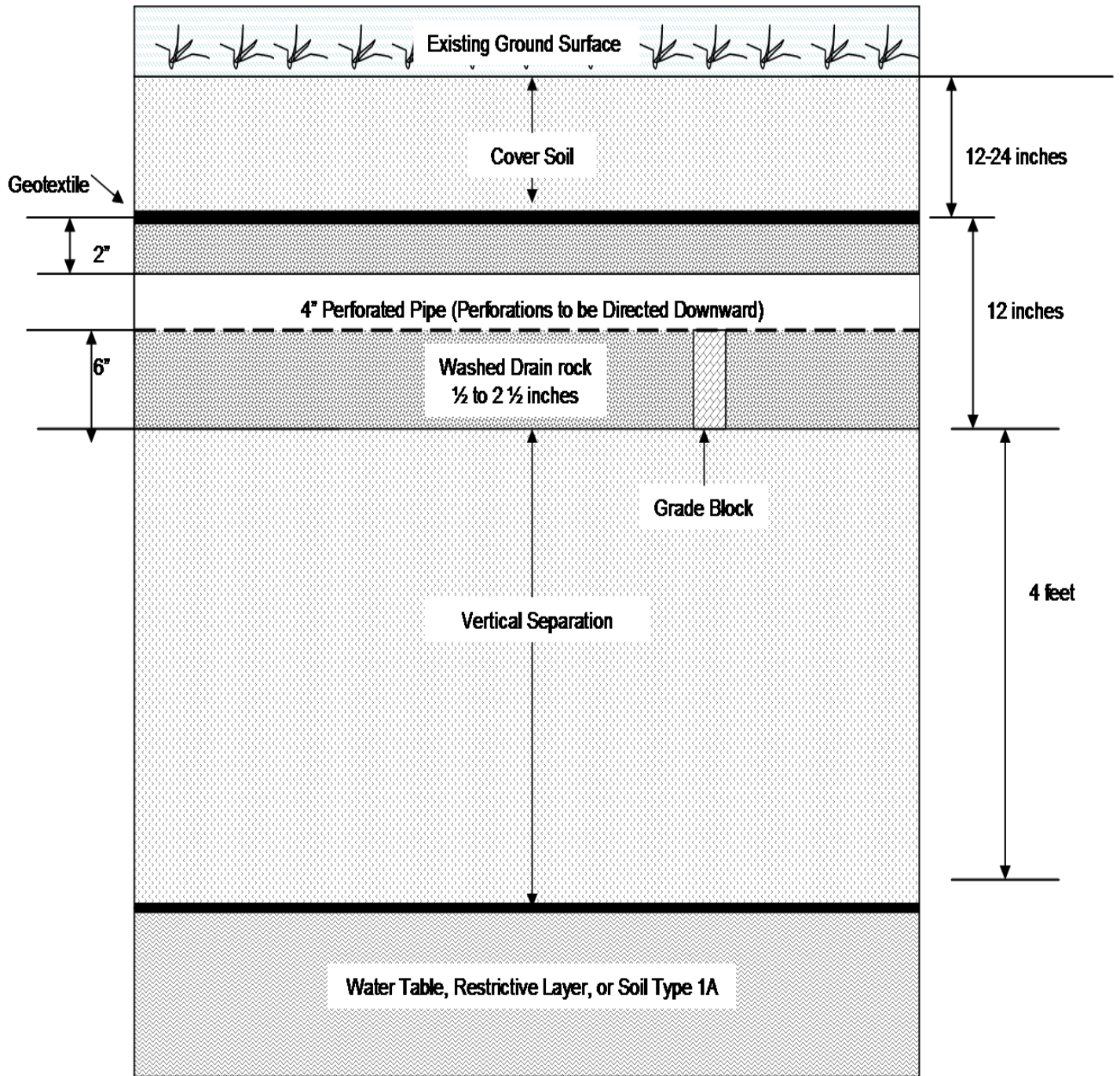
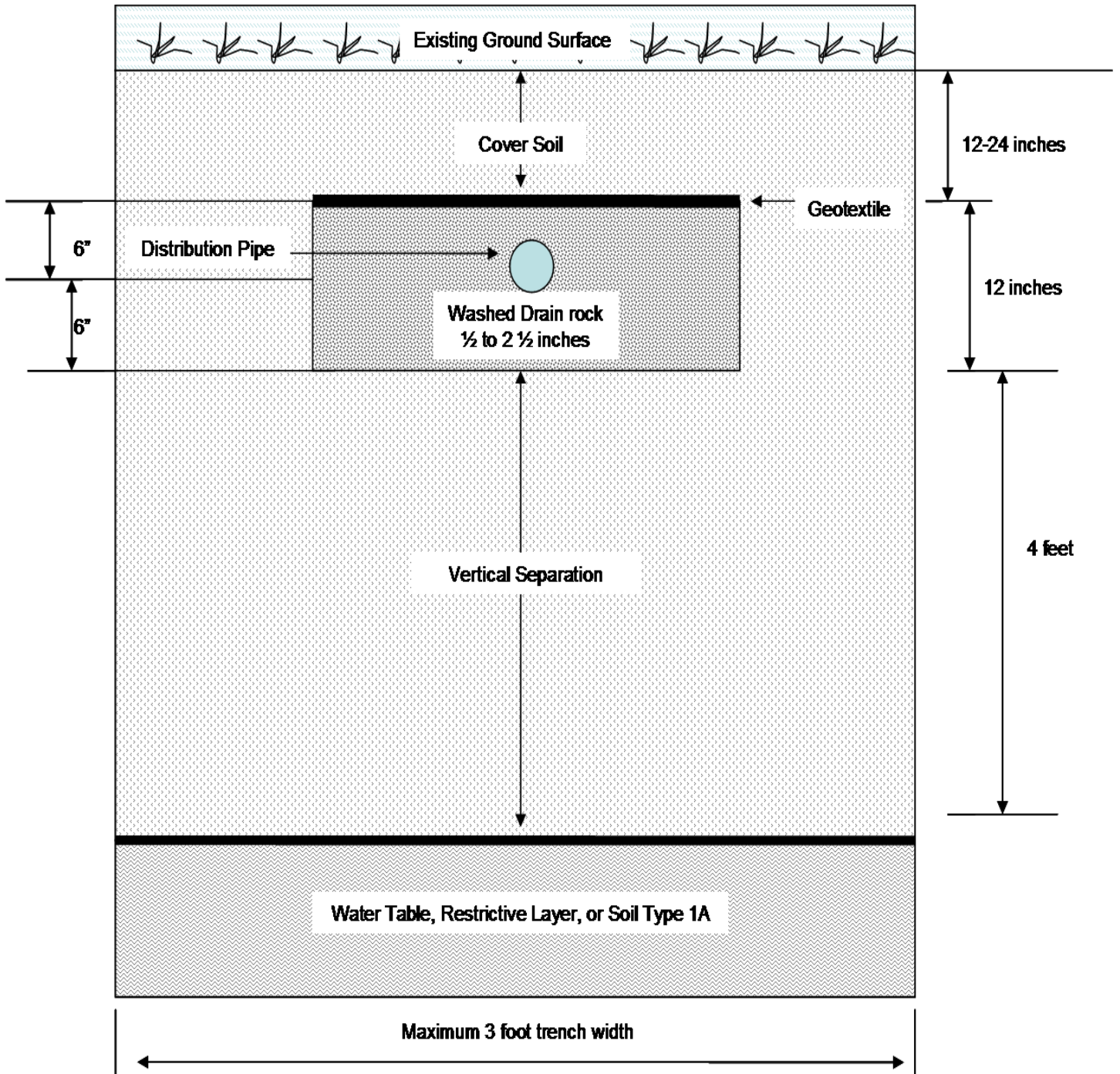


Figure 6b
Typical Trench Cross Section



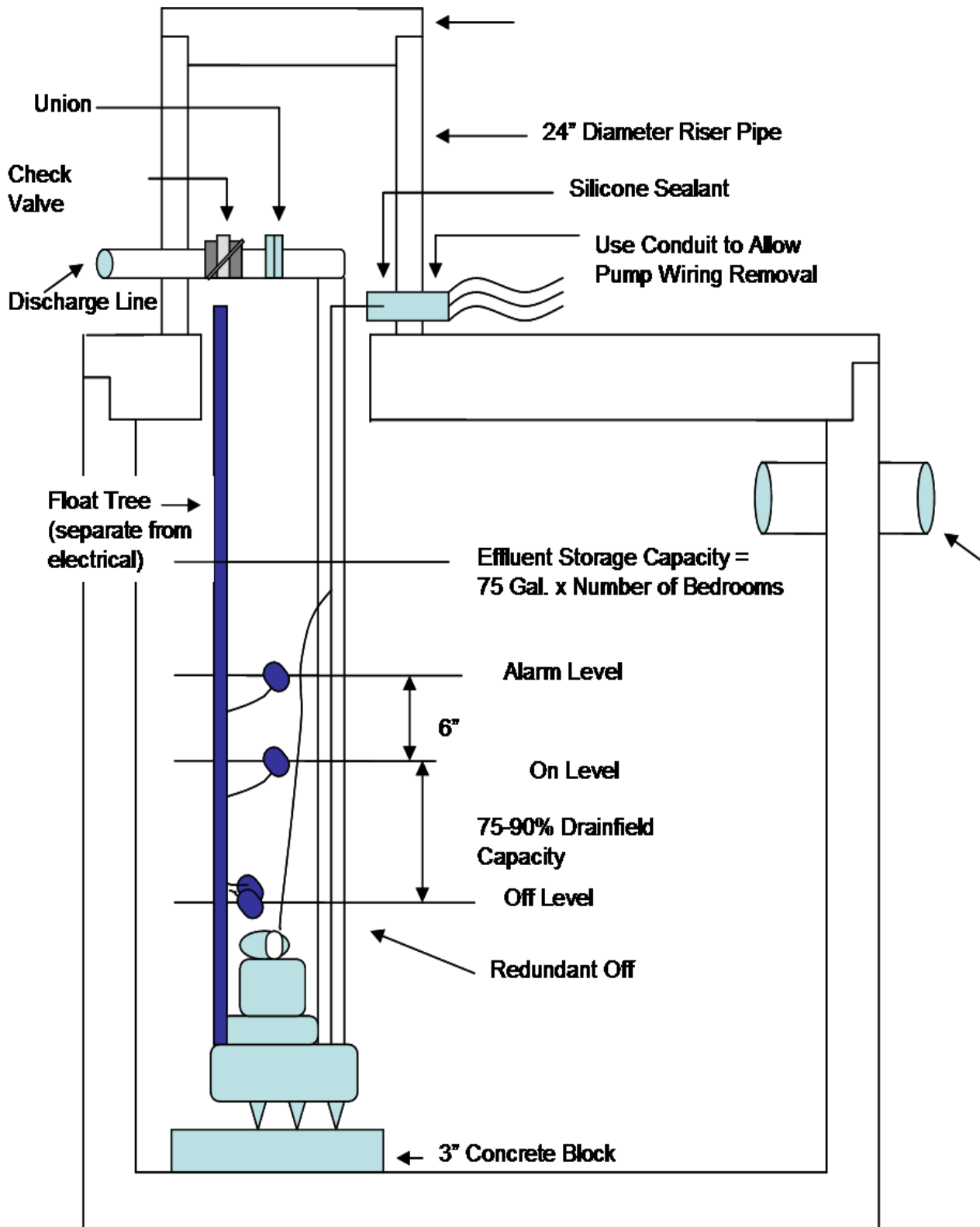
Effluent Pumps and Dosing Systems: Application and Installation Standards

8. All on-site sewage disposal systems utilizing a sewage effluent pump shall be designed and installed as dosing systems.
9. The dosing volume shall be equal to 75% to 90% of the drainline capacity (calculated by multiplying the lineal feet of drainline by 0.49 gallons to 0.59 gallons).
10. The total dosing volume shall be delivered to the drainfield within 10 minutes from the beginning of each cycle.
11. Diaphragm switches are not approved for installation or use.
12. A visual and/or audible high-level alarm shall be provided on an electrical circuit separate from that of the pump.
13. The pump chamber shall provide additional storage volume (75 gallons multiplied by the number of bedrooms) to allow a repair to be accomplished after the high level alarm has been activated, but before the household plumbing has ceased to drain into the system.
14. Effluent pump switching mechanism, excepting sealed floats, shall not be located within the effluent tank.
15. All effluent tanks shall be installed in a manner which allows access to the tank at finished grade. If the required access is accomplished by the use of a riser, the riser shall be grouted securely to the effluent tank and have a diameter of no less than 24 inches.
16. All septic tanks, pump chambers and risers of a dosing system shall be watertight and constructed or treated in a manner that precludes the intrusion of ground water.
17. The effluent pump and pressure line shall be installed in a manner which provides:
 - A minimum three inch separation between the bottom of the effluent tank and the pump intake;
 - If a pressure distribution is used, the pump or pump tank shall be screened in a manner that will preclude the passage of solid matter into the drainfield in accordance with current pressure distribution guidelines;
 - A disconnect union that is accessible when the pump chamber is flooded;
 - A check valve immediately on the discharge side of the disconnect union.
 - If a riser is used, the discharge line shall exit out the side of the riser;
 - A practical means to remove, repair and reinstall the pump, i.e., all disconnect appurtenances shall be easily accessible from the lid of the pump chamber

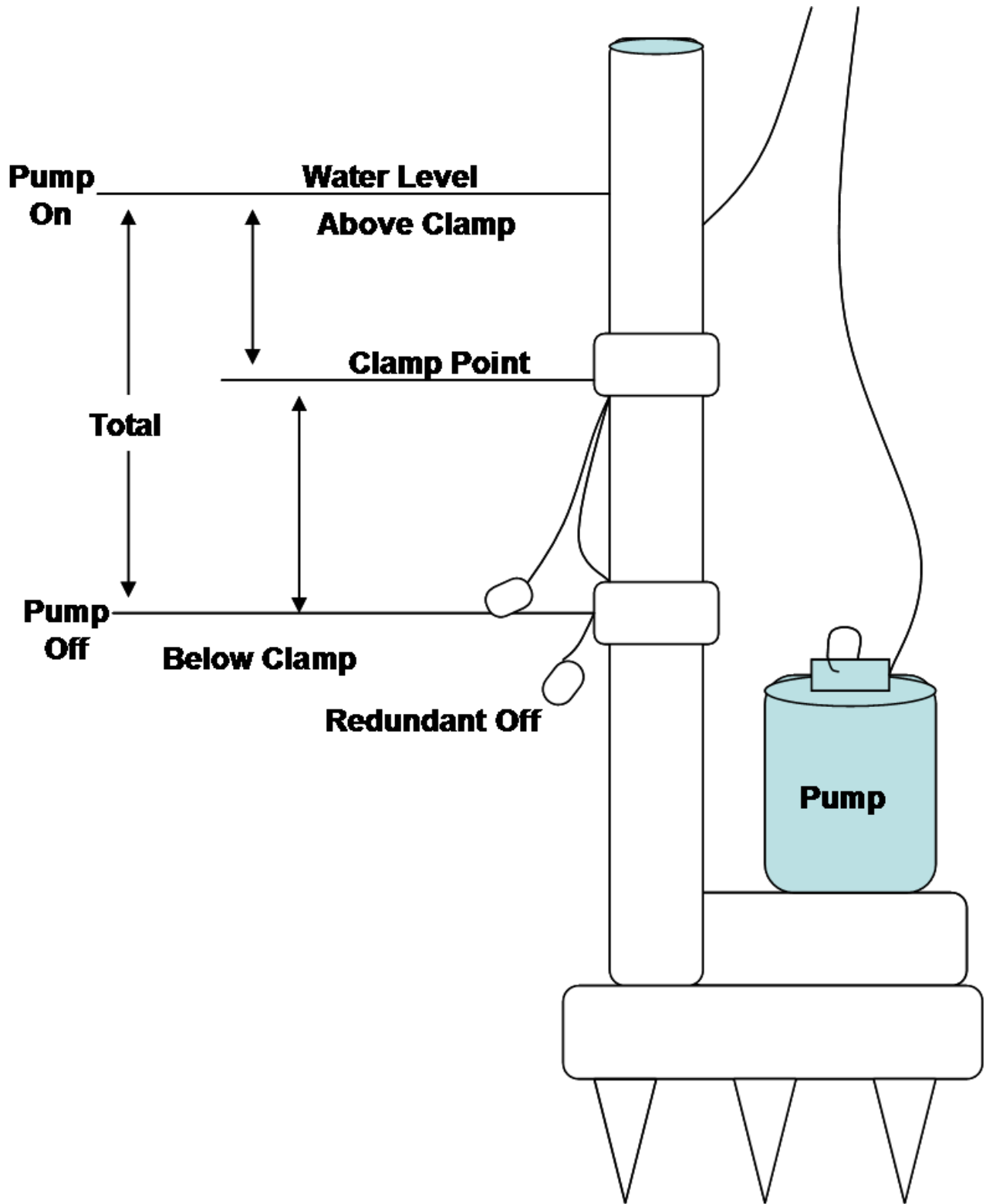
- It is recommended that the outlet baffle of the septic tank be screened on any system using a pump.

Final approval of a sewage system does not constitute approval of the electrical connection to the pump. Benton-Franklin District Health Department recommends that the applicant obtain the proper electrical permits and inspections for the pump installation.

Typical Effluent Pump Tank (Not to Scale)



Dual Action Level Control



Procedure for Final Inspection of System

A. Submit a Request for Final Inspection (Form #BFHD-EH-PC#15)

1. This request, written or e-mail, must be complete, and will be used to organize the department's inspection schedule.
2. The subsurface absorption system permit number must appear on the inspection form.
3. Indicate if the inlet line is connected to the building and the septic tank.
4. The completed inspection report will be mailed to the address indicated.

B. Final Inspection

1. Upon receipt of the completed inspection request, systems will be inspected on a "first come, first serve" basis. All systems must be inspected prior to covering, in accordance with Benton-Franklin District Board of Health rules and Regulations No., Section XV.
2. All drainfield and connecting lines, and septic tanks must remain uncovered until the inspection and approval process is complete. If particular problems arise regarding this point, the inspecting sanitarian should be contacted.
3. A tag posting system is used to indicate the results of an inspection.
 - A green tag indicates compliance with the minimum requirements and can be covered.
 - A red tag will have a "Notice of Correction" posted at the building site. This indicates that some aspect of construction or design is deficient, and must be corrected and re-inspected prior to backfilling the system.
 - A yellow tag will be used indicating a need for a grade down or additional cover soil. A reinspection will be required.
4. Systems shall not be used until approved by the Health Department.
5. Re-inspection may be requested via phone to the inspecting sanitarian.
6. For your information, an intergovernmental procedure is in effect which requires the approval of all new on-site sewage disposal systems by the Health Department prior to the issuance of a final occupancy certificate by the building department.

ADDENDUMS

Occasionally supplement information may be added to these standards. As these changes or additional information are updated, printed copies will be sent to licensed installer, and will be available in any subsequent copies of these guidelines.