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Thurston County

On-Site Wastewater System

Construction Manual

Minimum Standards and Recommendations for the Construction of On-Site Wastewater Treatment & Disposal Systems in Thurston County

Acknowledgements

Thurston County Board of Health

Cathy Wolfe, District One
Diane Oberquell, District Two
Kevin J. O'Sullivan, District Three
Patti Swanson, Clerk of the Board

*Pat Libbey***,** Director, Thurston County Public Health and Social Services Department
Diana Yu, MD, MSPH, Health Officer

Public Health and Social Services Department, Environmental Health Division appreciates the contribution of the individuals involved in the development of this manual. The quality of this document is a result of the dedication, energy, and input from these persons, including:

Representative	Company Name
Jim Dickinson	Dickinson & Associates
Allen Hall	Hall Construction
Emerson Hoel	Hoel Construction Company
Jim Henry, Dick Yunker	Jim Hunter & Associates
Randy Jackson	R J Construction
Rex Schade	Schade Contractors Incorporated
Larry Gallanger	D&D Excavation

Representative	Thurston County
Steven Davies, Alan Schmidt	Division of Environmental Health
Rachel Donnette	Environmental Educator

Thurston County Public Health and Social Services Department
Division of Environmental Health
2000 Lakeridge Dr. SW
Olympia, WA 98502-6045
Phone 360-786-5490
Fax 360-754-4462

Table of Contents

INTRODUCTION

BE SURE YOU HAVE A COPY OF THE STAMPED "APPROVED" ON-SITE SEWAGE SYSTEM DESIGN BEFORE STARTING INSTALLATION.

The best installation of an on-site wastewater system occurs when good communication exists between all parties involved – the owner or applicant, the on-site system designer, the installer, and the Health Department.

Designers and installers are responsible for communicating with each other throughout the installation phase of the wastewater system. The installer must notify the designer and Health Department when the installation is ready for final inspection. The designer and installer are both responsible for notifying the Health Department when they find site conditions different from those noted on the design, or when deviation from the approved design is necessary.

The installer is responsible for properly covering the installation. When homeowners install their own systems, they assume the responsibilities of the installer. Before beginning the installation, the homeowner needs to contact the Health Department and the sewage system designer for a preconstruction conference. This step helps clarify design requirements and helps ensure a high quality installation.

This document contains basic and minimum construction standards as well as construction recommendations. While this guide provides details of the County's construction requirements, it is not intended to limit ingenuity or innovation.

SECTION 1 – General Criteria

The construction, and therefore the design, of on-site wastewater systems must conform to:

- the Recommended Standards and Guidelines adopted by the Technical Review Committee (as modified by current Thurston County policy).
- WAC 246-272.
- Article IV of the Thurston County Sanitary Code "Rules and Regulations of the Thurston County Board of Health Governing Disposal of Sewage" (Article IV)
- industry standards and guidelines.

SECTION 2 – The Building Sewer

2.1 Connection Between the Building Drain and the Septic Tank. (Figure 1) The pipe and fittings used for construction of the building sewer from the building drain to the septic tank must be a minimum of ASTM 3034. The pipe can be either three inches or (more commonly) four inches in diameter.

Building sewer lines must be constructed with watertight joints, cleanly glued or gasketed, and be on the uniform grade of ¼ inch per foot, unless otherwise approved in writing by the health officer. The grade of the building sewer shall not be less than 1/8 inch per foot.

The building sewer line between the building drain/foundation and septic tank shall be bedded in a manner that assures it is:

- free from stones, boulders, or other objects that may cause damage;

- free from organic material (sod, wood, etc.) that may decompose and result in the pipe sagging;
- evenly supported along its entire length; and
- unlikely to settle, as much as possible.

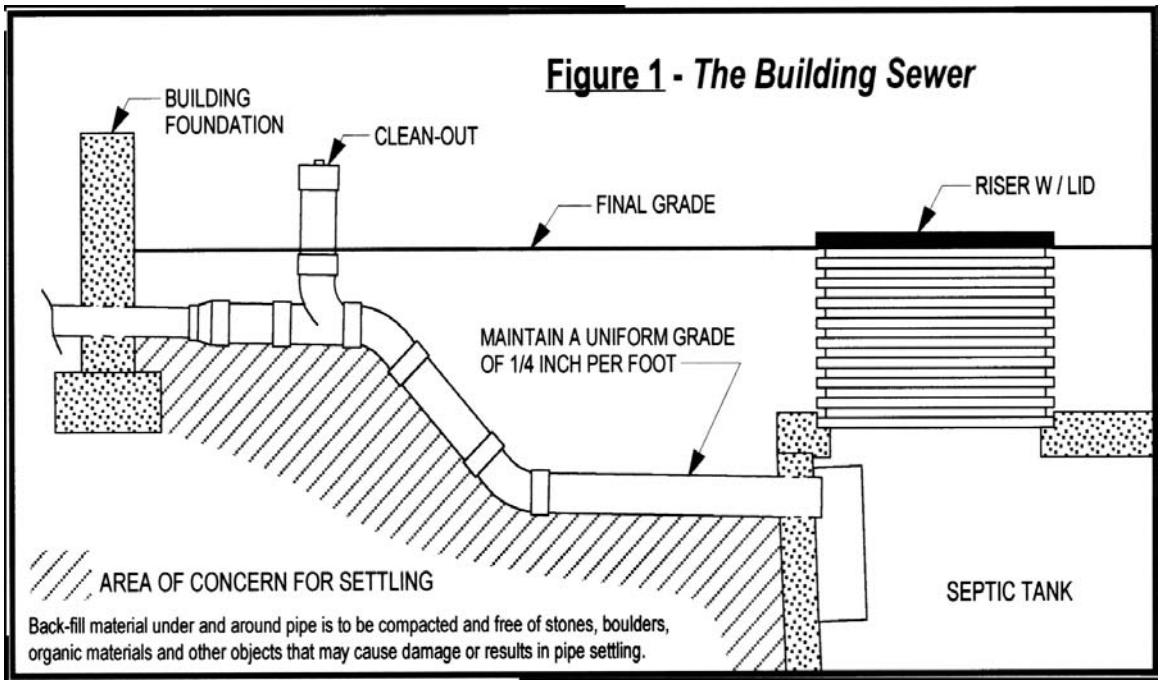
Suitable bedding and back-filling material for sewer lines may already be on the site. In other cases, it may be so rocky and stony that importing sand may be the best option. If any question arises as to the suitability of the material to be used for bedding or back filling, consult with the designer and/or Health Department.

Back fill under and around the pipe, firmly packing the bedding material so the building sewer line is evenly supported. A key step in reducing the potential for settling, sagging, and broken fittings is to dig the trench so that high and low spots are minimized, providing a smooth, undisturbed surface on which to lay the pipe. Some over-excavation, especially where the pipe enters and exits the tank, is unavoidable. Pay extra attention to ensure the pipes are evenly supported in these areas.

When a vertical drop and/or change of direction of the building sewer is necessary, medium to long sweep ninety's are acceptable. There are other methods as well. The principle is to make the turn or vertical drop as smooth as possible, reducing the potential for clogging. Medium and long sweep ninety's are preferable to multiple 45^0 bends.

Building sewer lines must have a clean out immediately adjacent to the foundation and one every 100 feet. Clean-outs are required for each aggregate change of direction in the building sewer that equals or exceeds 135^0. Clean-outs are recommended at angles of 45^0 or greater.

The maximum distance the building sewer line should extend into any septic tank baffle is one inch. The exact measurement of one inch is not the key element. The point is to extend the pipe far enough into the baffle to ensure an adequate seal and to allow for some (inevitable) settling.



SECTION 3 – Sewage Tanks - Septic tanks, Pump & Siphon Chambers

3.1 Tank Installation. (Figure 2 A &B) All sewage tanks shall be installed and bedded in a manner that assures they are:

- level.
- free from stones, rocks, boulders, or other objects that may cause damage (especially on the bottom).
- free from organic material (such as sod, wood, etc.) that may decompose and result in settling.
- evenly supported throughout the entire area beneath the tank.
- installed in accordance with the manufacturers specifications.
- unlikely to settle, as much as possible.

NOTE: It is important to minimize over excavation of the hole for the sewage tanks. It is recommended that the soil at the bottom of the excavations for the tanks be tamped to firm the soil and minimize settling

Suitable bedding and back-filling material for sewage tanks may already be on the site. In other cases, it may be so rocky and stony that importing sand may be the best option. If any question arises as to the suitability of the material to be used for bedding or back filling, consult with the designer and/or Health Department.

3.2 Flow Line Installation. (Figure 2 A &B) The flow lines of all sewage tanks must be installed above the highest known seasonal water table. Soil mottling, winter water studies, and other available resources are used to determine the highest seasonal water table. Contact the designer and Heath Department immediately (prior to installation) when conditions beyond the installers' control (such as building drain depth) preclude installation of the tanks as stated. Installations contrary to this requirement will be considered on a case-by-case basis.

Tanks installed in areas with known ground water levels that may effect the tanks must be secured from flotation. This may be accomplished by utilizing anti-flotation rings from the manufacturer or by filling the tank with water.

3.3 Tight Lines.(Figure 2 A&B) The areas under where tight lines enter and exit tanks need special attention. When back filling the connections between the building sewer and septic tank, between the septic tank and a pump/siphon chamber and between the pump/siphon chamber and treatment component, it is critical to support the tight line to prevent sagging and broken joints. Extra care to reduce settling of the tanks and proper support (packed bedding) where tight lines enter and exit tanks should result in long term, watertight connections.

3.4 Installations Under Traffic Areas. When installing sewage tanks, building sewers, and sewage transport lines under concrete, asphalt, or gravel coverings where traffic is expected, design and installation criteria shall include the following.

a) Information showing that the components used meets applicable load-bearing requirements.

b) Regardless of the depth to the top of the tank, access risers with securable lids are required to final grade over the manhole openings and baffle inspection ports.

c) Over the septic tanks and pump chambers, all risers and lids must be capable of supporting any expected vehicular traffic.

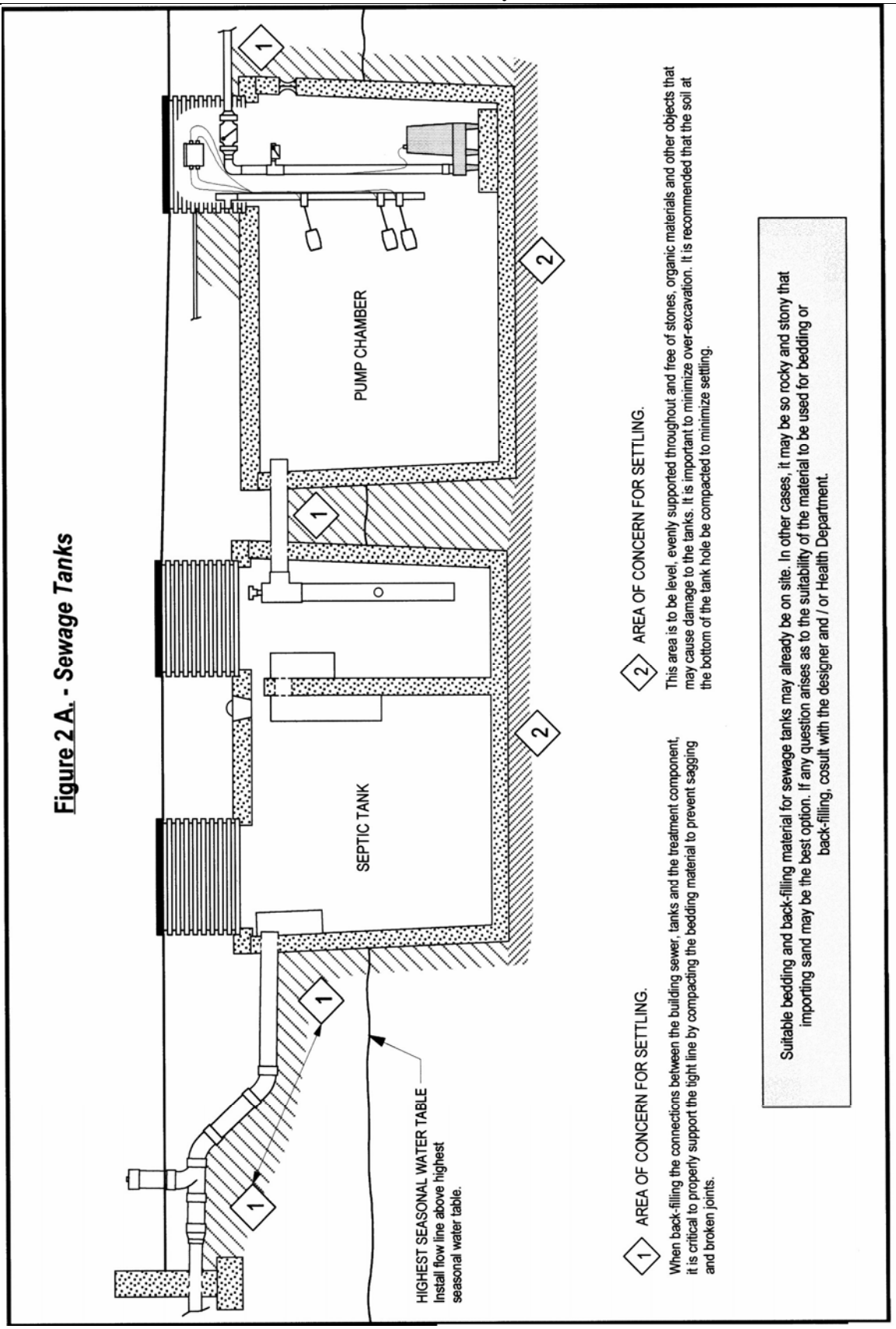
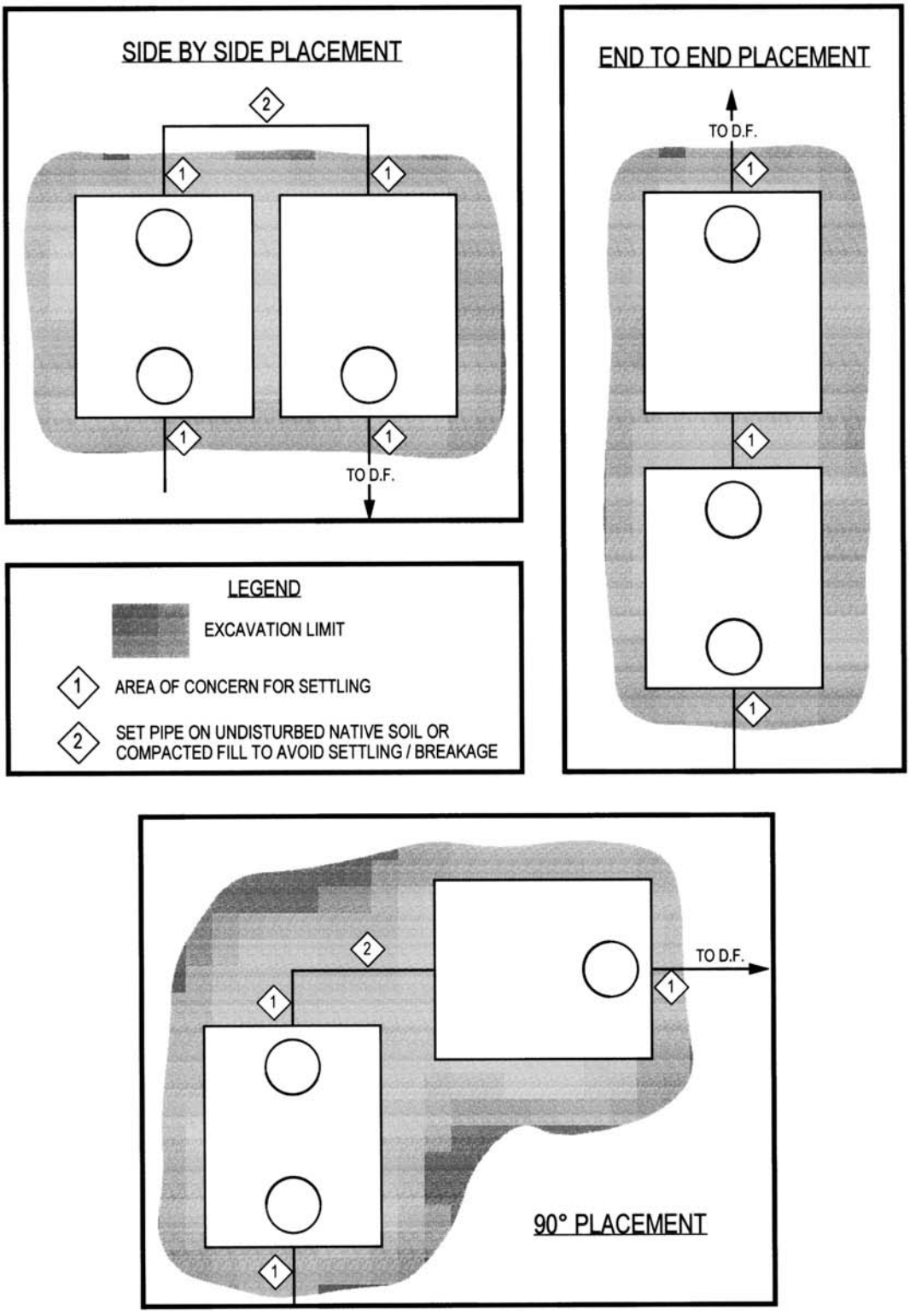


Figure 2 A. - Sewage Tanks
PUMP CHAMBER
SEPTIC TANK
HIGHEST SEASONAL WATER TABLE
Install flow line above highest
seasonal water table.
1 AREA OF CONCERN FOR SETTLING.
When back-filling the connections between the building sewer, tanks and the treatment component, it is critical to properly support the tight line by compacting the bedding material to prevent sagging and broken joints.
2 AREA OF CONCERN FOR SETTLING.
This area is to be level, evenly supported throughout and free of stones, organic materials and other objects that may cause damage to the tanks. It is important to minimize over-excavation. It is recommended that the soil at the bottom of the tank hole be compacted to minimize settling.
Suitable bedding and back-filling material for sewage tanks may already be on site. In other cases, it may be so rocky and stony that importing sand may be the best option. If any question arises as to the suitability of the material to be used for bedding or back-filling, cosult with the designer and / or Health Department.

Figure 2 B. - *Sewage Tank Placement*



3.5 Setbacks. When sewage tanks are relocated from their designed locations during installation, follow the setbacks described in Article IV. If there are any questions as to the suitability of relocating sewage tanks, the designer and Health Department must be contacted.

3.6 Risers.(Figure 2 C) Risers are required per Article IV. Risers and access covers must be constructed of durable materials and be watertight. The seal between the riser and the tank must be watertight, and the joint between the access cover and riser must be sealed to prevent escape of gases or intrusion by vermin. One way to accomplish this is with a cast in riser on the sewage tanks.

Access covers that extend to finished grade must be adequately secured to prevent unauthorized entry.

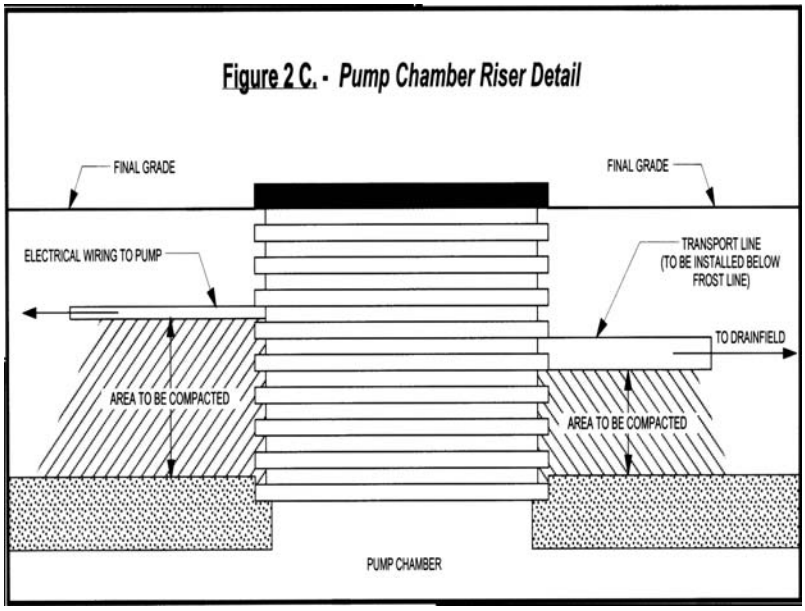


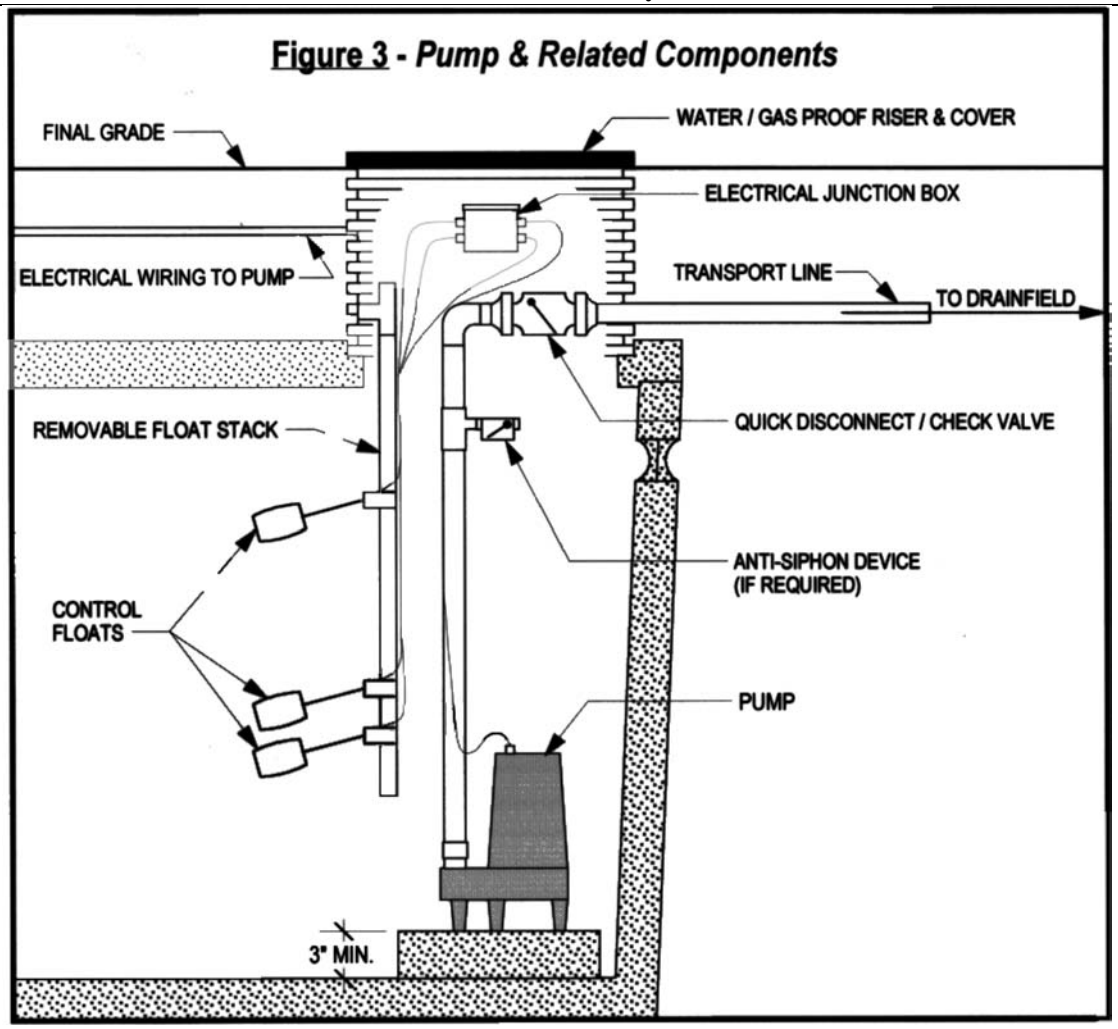
Figure 2 C.
Pump Chamber Riser Detail – Alternate Method

3.7 Cover. A minimum of six inches of cover is required over all sewage tanks.

SECTION 4 – Pumps and Siphons

4.1 Pumps.(Figure 3) Design and installation criteria for pumps include the following:

- All pumps and all mechanical components used in the pump chamber must be effluent rated.
- All electrical connections must be installed per Washington State Department of Labor and Industries requirements.
- Connect pumps to the sewage transport line with a quick disconnect coupling device so that transport lines do not have to be cut in order to remove the pump. A check valve shall be installed downstream from the quick disconnect.
- All valves and quick-disconnect couplers must be installed in a manner so they are easily accessible from the surface.
- When siphons are used in lieu of pumps, follow all manufacturers' specifications.
- Install pumps on a block above the floor of the pump chamber.



4.2 Siphoning. (Figure 3) On all systems where siphoning is a concern, an antisiphon device must be installed in the sewage transport line. Siphoning can occur when the pump inlet is at a higher elevation than the highest drainfield lateral. The potential for siphoning may be determined by examining the elevations on the design. Siphoning may only become evident during the pressure test of the completed system.

4.3 Pump Controls. (Figure 3) Requirements for pump controls include the following.

- Adjustable tether length float switches are generally utilized with a redundant "off." Switch configurations vary, so it is advisable to contact a local dealer.

- Install an audible/visible alarm switch, connected to a circuit separate from the pump circuit. This alarm is typically installed above the on/off switch. The alarm warns of problems within the pump chamber by signaling a high liquid level. (Called pump disconnects switch.)

- Install alarms and control panels so that the visual and audible alarm features are not rendered ineffective. In addition, control panels should be installed on a wall that is not immediately adjacent to the living area, as noises generated by the on/off cycles have been a source of complaints. Per Labor & Industries requirements, pump disconnect switches shall be located less than 50 feet from, and within site of, the access riser.

- Check-valves within the sewage transport line must be located within one foot of the pump chamber. Access is not required. If multiple check valves are used, they must be shown on the as built.

A major cause of septic system failure is installation of the system during periods when the soil is nearly saturated with water. Such conditions result in finer textured soils smearing and compacting during construction. Systems should only be installed when the soils are sufficiently dry. To judge soil moisture content, see the TRC Guidelines, EPA Design Manual, etc. Contact the designer or Health Department if you have any questions.

5.1 Gravity Drainfield System Requirements. (Figure 4A)

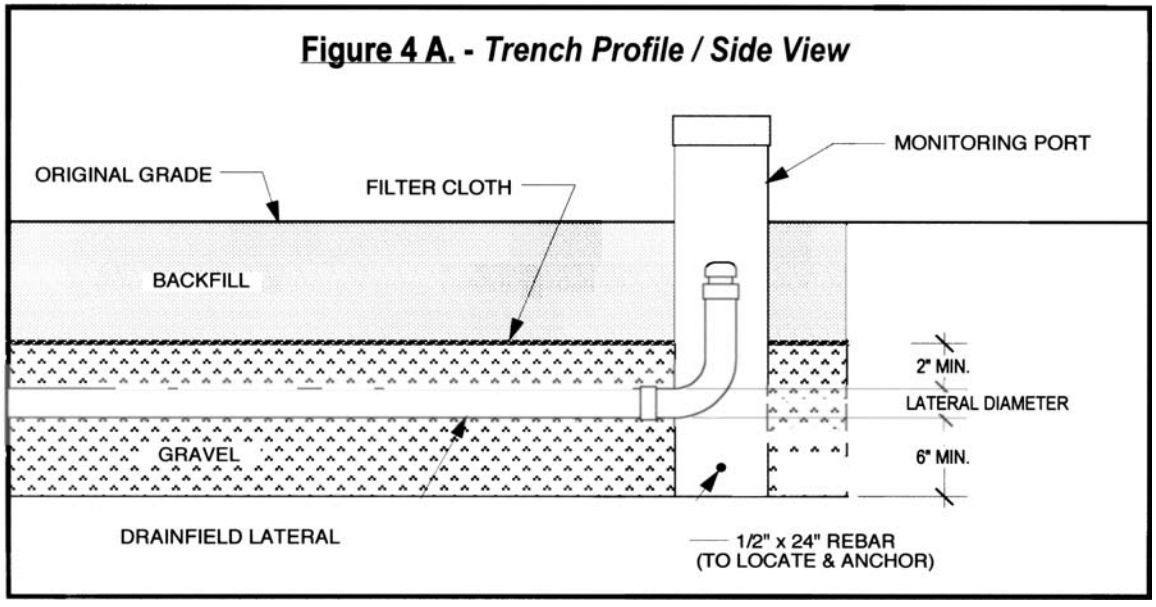
- A minimum of three feet of ASTM 3034 tight line is required between the septic tank, distribution box (D-box), and drainfield.

- Rigid, four-inch perforated pipe meeting the ASTM 2729 standard is required. Each lateral must be laid level with an end cap glued on the end. Rotate each section of pipe so the holes are at the 5:00 and 7:00 o'clock position.

- A minimum of six inches of drainrock is required under the perforated pipe, and a minimum of two inches of drainrock is required over the perforated pipe (see Figure 4). Drainrock is to be 2 to 22 inches in diameter, uniformly graded, clean, non-deteriorating gravel, with the percent by weight passing the U.S. No. 200 sieve no greater than 0.5%. Other types of drainrock may be accepted on a case-by-case basis using the WSDOT standard as a guide. The drainrock must be covered with an approved geotextile (filter fabric) prior to backfilling the system.

- When distribution boxes or inspection boxes are part of the system, the boxes must be secured in a manner to prevent shifting during back filling. This may be accomplished by pouring a concrete pad under the distribution box. The distribution box outlet pipes must be carefully leveled with respect to one another for proper operation.

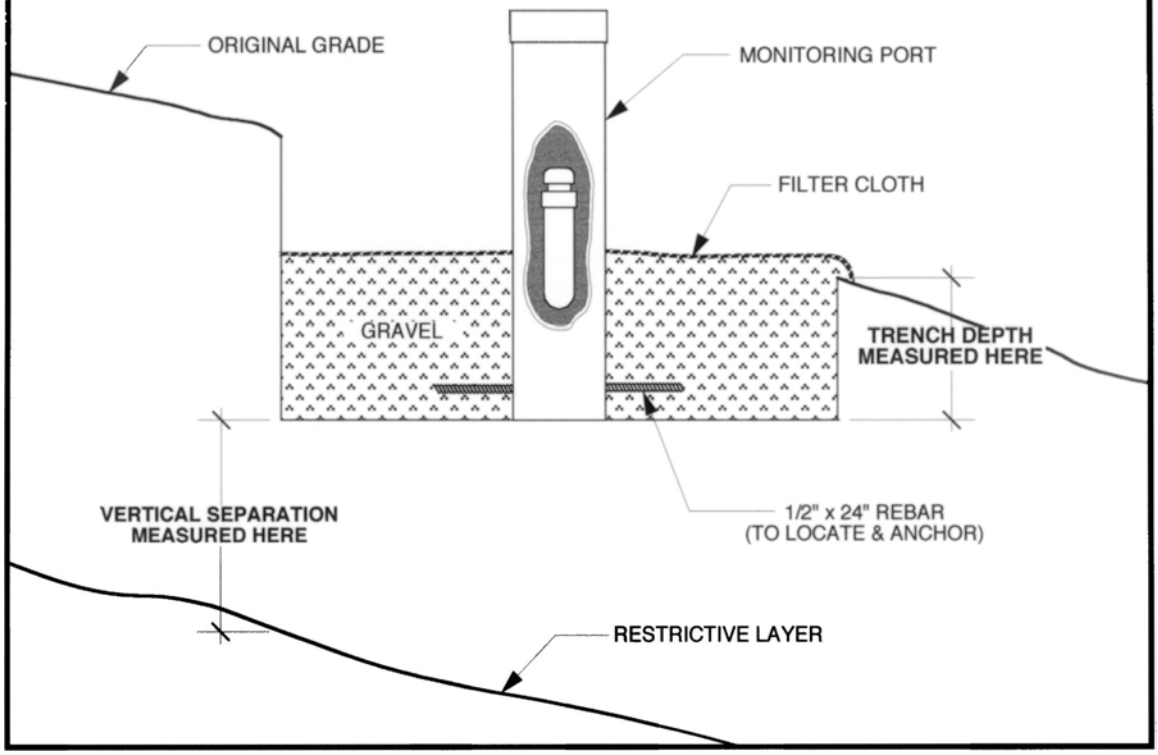
5.2 Pressure Distribution Requirements. (Figure 4A) For conventional pressure distribution systems, Class 200 or better (thicker walled) pipe is required. Schedule 40 pipe is recommended for all piping in the system. The minimum diameter pipe for sewage transport lines, manifolds, feeder pipes, and laterals is one inch. Minimum rock depth requirements are the same as for gravity drainfield systems.



5.3 Vertical Separation. (Figure 4B) Vertical separation is the depth of unsaturated, original, undisturbed soil between the trench bottom and a restrictive layer. The restrictive layer may be the highest seasonal water table, an impervious layer, or a specific soil type. On level sites, vertical separation is measured from the center of the trench. Trench depth is measured on either side of the trench. On sloping sites, trench depth is measured from the downhill side of the trench; vertical separation is measured from the uphill side of the trench.

5.4 Trench Depth. (Figure 4B) The excavated trench bottom for gravity and pressure systems should not be deeper than shown on the approved design. Contact the designer and Heath Department immediately (prior to installation) when conditions beyond the installer's control (such as building plumbing depth or inaccurate system layout) necessitate a trench deeper than designed.

Figure 4 B. - *Trench Profile / End View*



5.5 Bed Systems. Generally, bed systems are not required to be time-dosed. However, time dosing is recommended when using multiple bed configurations and for multiple family residences.

When multiple beds are installed on the same downhill plane, the minimum distance between beds is 6 feet, or equal to the width of the bed. The health officer may reduce this separation if sufficient justification exists.

Trench or bed depths installed greater than specified on the approved design: MAY NOT BE APPROVED. Installing the system too deep can and has resulted in expensive redesign and/or relocation of the subsurface soil absorption system. Make sure you understand how deep the system is to be installed before starting construction.

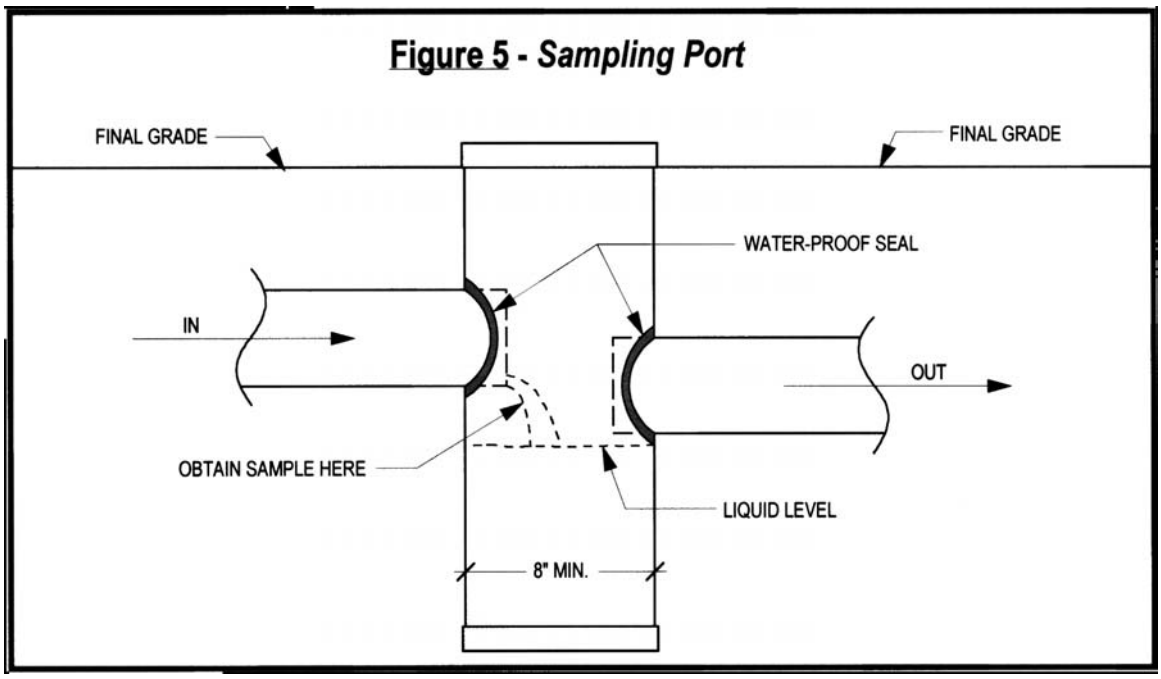
SECTION 6 – Alternative Systems

The design and construction of alternative on-site wastewater disposal systems must conform to the Recommended Standards and Guidelines adopted by the Technical Review Committee (as modified by current Thurston County policy) per WAC 246-272, Article IV, and other industry standards and guidelines.

Key requirements for alternative systems include the following.

- Install Aerobic Treatment Units (ATU) according to the manufacturer's specifications.
- Install disinfecting units according to the manufacturer's specifications.
- Show sampling point locations for obtaining effluent samples after disinfecting units on the design. Construct sampling points in a manner that allows for collecting a "free fall" sample. Sampling points are not required when an ATU is used without disinfection. *(Figure 5)*

Figure 5 - *Sampling Port*



- Install monitoring ports in a manner that meets the equivalent methods shown in the guidelines. These specifics are usually shown on the design.
- Provide access to valve boxes for operation and maintenance (this is critical!).
- The sand must be from a commercial gravel pit and meet the applicable Washington State recommended standards and guidelines.
- Commercial gravel pits should perform their own sieve analyses. The method used must conform to ASTM C-136 Method for Sieve Analysis of Fine and Coarse Aggregates and ASTM E-11 Specs for Wire Cloth Sieves for Testing Purposes, Annual Book of ASTM Standards, Volume 04.02.

Curtain Drains

NOTE: When curtain drains are utilized to lower a water table for the purpose of increasing the available vertical separation, the curtain drain must be installed and proven effective through a representative wet season typically December – March.

The following recommendations are for curtain drains used in conjunction with on-site wastewater systems.

Curtain drains in soil types 4-6 should be installed only under unsaturated conditions. Soil saturation is not a critical consideration for installation into soil types 1A-3. Contact the designer or Health Department if there are any questions.

The horizontal separation between curtain drains and drainfields is critical. Many sewage system failures result when untreated septic tank effluent enters curtain and footing drains before adequate treatment can take place. Many curtain drains are installed after final approval of a sewage system installation. Installers are encouraged to inform homeowners of the potential problems of installing curtain drains too close to on-site wastewater systems.

The curtain drain trench depth should be a minimum of six inches into the underlying restrictive layer. Trench width should be a minimum of 18 inches when the depth is 42 inches or less. Trench width should be a minimum of 24 inches when the trench depth is greater than 42 inches.

Drain discharge should be at least 30 feet downslope from any disposal component of the on-site wastewater system. The discharge point should be covered with drain rock or the equivalent to discourage animal habitation.

To drain properly, the trench bottom and pipe should slope a minimum of one percent.

The perforated pipe running the length of the intercepting drain should be a minimum of four inches in diameter. Perforated drainfield pipe and slotted pipe are typically used.

Plans. Plans for all sewage tanks used in Thurston County must be approved by the health officer or be noted on the List of Approved Systems and Products published by the Washington State Department of Health. Plans for the construction of new concrete tanks must be submitted to the health officer for approval. Plans submitted for approval should show all dimensions, reinforcing, structural calculations, and such other pertinent data as may be required.

The tanks must also be in accordance with the International Association of Plumbing & Mechanical Officials - Material & Property Standards for Prefabricated Septic Tanks.

Septic tanks must meet the following criteria.

- They must be designed to produce a clarified effluent consistent with accepted standards.
- They must provide adequate space for biosolids accumulation.
- They must be constructed of solid, durable materials, not subject to excessive corrosion or decay, and watertight, as specified by the manufacturer. Tanks constructed of wood or steel are prohibited.
- Septic tanks must have a minimum of two compartments. The inlet compartment of any septic tank must be at least 2/3 of the minimum required capacity of the tank. The secondary compartment of any septic tank must be at least 1/3 of the minimum required capacity of the tank. Minimum liquid capacities must be in accordance with Article IV.

Seals. The seals between the building sewers/tight lines and sewage tanks must be watertight. All concrete sewage tanks installed in Thurston County must be equipped with a watertight o-ring type gasket on the inlet and outlet holes. These gaskets shall be installed to allow a positive friction seal between sewage tank and the inlet or outlet pipe.

Access. Provide access to each septic tank by at least two manholes at least twenty inches in diameter. Locate one access over the first compartment and one over the second compartment. Inspection ports are required over inlet and outlet baffles and may be incorporated into the larger manholes, or the large manholes must be replaced with risers to the surface over both compartments. The intent is to provide easy access for maintenance, such as pumping, and to make it easy to inspect inlet and outlet baffles during the sale of the residence.

Baffles. Inlet and outlet baffles are required on each compartment of the septic tank. Inlet baffles must extend to a depth of twelve inches below the liquid level. The outlet baffle of each chamber must extend to 40% of the liquid depth.

Load-Bearing Requirements. Septic tanks and pump chambers shall be structurally designed to withstand all anticipated earth or other loads. All septic tank covers must be capable of supporting an earth load of not less than three hundred pounds per square foot when the maximum coverage does not exceed three feet. Septic tank manholes should not be located more than thirty-six inches below the finished grade. When the depth of the septic tank must exceed its' designed depth (three feet), you must document that the tanks used meet the additional load bearing requirements.

APPENDIX C

TABLE 5.1 Construction requirements for subsurface soil absorption systems.

	Minimum	Maximum
Number of drain lines per field	1	-
Length of each line for gravity systems	-	100 ft.
Width of trench	-	36 in.
Spacing of line, center to center	3 x width/trench	-
Depth of earth cover over laterals	12 in.	24 in.[1]
Depth of earth cover over risers and lids.	Surface. Within 12 inches of the surface when tank depth is 12 –36 inches.	-
Depth of earth cover over sewage tanks	6 in.	36 in.[2]
Depth to trench bottom	6 in.	36 in.[3]
Filter material under drain lines	6 in.	-
Filter material over drain lines	2 in.	-
Drain pipe	1 in.[4]	4 in.[4]
Distance from sewage tank to house foundation	5 ft.	-
Grade of trench bottom	Level	Level
Grade of pipe	Level	Level
Distance from sewage tank to drainfield	5 ft.	-
Distance from drainfield to interceptor drain	10 feet when upslope or level with the drainfield; 30 feet when below level of drainfield. In both cases, measure elevations from the bottom of the trenches.	

1. By approval of the health officer, the depth of earth cover may be increased to a maximum of thirty-six inches.

2. The maximum depth of cover may be increased if it is shown that the tank used is designed for the expected load.

3. Deep trench systems using ASTM C-33 sand below the drain rock/sand interface may be approved by the health officer to a maximum total depth of twenty feet when no groundwater contamination will result.

4. Drainpipes of other diameters may be used as part of designed systems, such as siphons.