

Gravelless Drainfields (August 2002)

Standards and Guidance for
Performance, Application, Design and Operation & Maintenance

**Sutter County
Department of Community Services
Environmental Health Division
1130 Civic Center Boulevard
Yuba City, CA 95993
(530) 822-7400**

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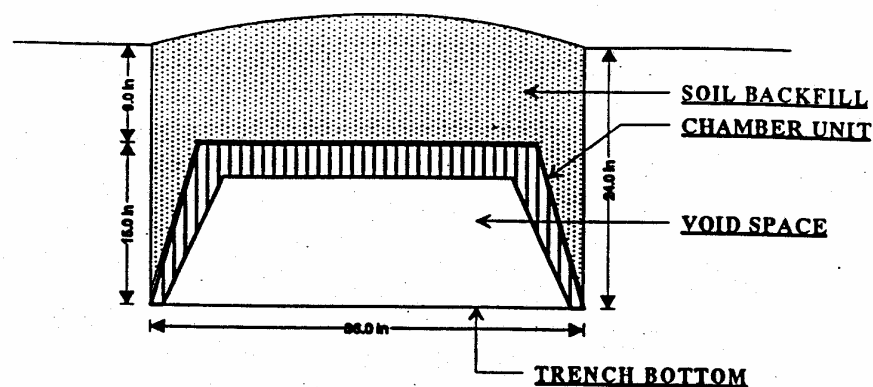
Introduction—

The gravelless drainfields addressed in these standards focus primarily on the gravelless chamber. While other types of gravel substitutes are recognized by the Technical Advisory Committee, only the gravelless chamber is currently approved for use in Sutter County.

Gravelless Chambers—(See Figure 1)

- ❑ Molded chambers, of various dimensions, are used. The chambers replace the gravel-supported void space with a chamber-supported void space. The trench bottom infiltrative surface is fully exposed, sidewalls are generally louvered, and the top is generally solid.
- ❑ The chambers are placed in the bottom of the trench, connected end-to-end, and backfilled with native material (or as otherwise directed by the manufacturer depending upon soil conditions). At both ends of each drainfield chamber line, solid end plates are installed for structural support and as a barrier to soil backfill.
- ❑ If pressure distribution is utilized, the distribution line may either be suspended at the top of the chambers or laid along the ground. Adequate support must be provided to secure the distribution pipe when utilizing either method.
- ❑ The use of a geotextile barrier between the chamber and the soil backfill varies from manufacturer-to-manufacturer and model-to-model (depending upon sidewall louver design), and depends on the type of soil in which the drainfield is installed.
- ❑ A rodent screen may also be recommended by the manufacturer if there is significant risk of rodents burrowing into the gravelless chamber drainfield.

Figure 2. Typical Gravelless Chamber Drainfield, Cross-Section



1.0 Performance Standards—

1.1 Listing

1.1.1 The Department reviews and lists proprietary gravelless drainfield products when the manufacturer or designated manufacturer representative demonstrates that the product meets or exceeds the performance criteria.

1.1.2 Before the Health Officer may issue a permit for an on-site sewage system incorporating a gravelless drainfield, the specific brand and model must be included on the current Department's *List of Approved Systems and Products*.

1.2 Performance Criteria – Gravelless drainfields must provide, at least equal to that provided by gravel in a conventional gravel-filled drainfield, the following attributes:

1.2.1 Non-decaying, Non-deteriorating. Gravelless drainfield material must not decay, deteriorate, or leach chemicals or byproducts when exposed to sewage and the subsurface soil environment.

1.2.2 Void Capacity/Storage Volume. Gravelless drainfield materials, design, and installation must provide for comparable void capacity and storage volume for the life of the drainfield.

1.2.3 Infiltrative Surface Exposure. Gravelless drainfields must provide effluent distribution to the soil interface. Drainfield sizing in Sutter County is based on trench bottom area only.

1.2.4 Trench Integrity. Gravelless drainfield material used, by its nature and its manufacturer-prescribed installation procedure, must withstand the physical forces of the soil sidewalls and soil backfill.

Drainfield Size & Long-term Performance—An element of drainfield performance (gravel-filled and gravelless) is lifespan. The length of time a drainfield functions satisfactorily depends on many factors including:

- ❑ Accuracy of initial drainfield design, matching the site and soil characteristics to the anticipated facility use and wastewater generation.
- ❑ Quality of materials and methods used in the installation of the drainfield.
- ❑ Care of use (operation) and timeliness of maintenance on the system.

While not addressed above as an element of the Performance Criteria, the selection of an appropriate wastewater-to-soil application rate is critical to the treatment performance of the drainfield and the length of time that treatment performance is achieved. Gravelless drainfield manufacturers commonly encourage the use of their products in reduced configurations when compared to conventional gravel-filled drainfields. While this approach may be satisfactory due to unique elements of the product designs, these smaller drainfields may impact the life of the drainfield. Drainfield performance over the long-term (20 – 30 years) needs to be observed and analyzed as additional field experience with these systems is gained.

2.0 Application Standards—

2.1 Permitting

2.1.1 Permitting and installation of gravelless drainfields are subject to the requirements of Sutter County Chapter 700.

2.1.2 Only proprietary gravelless drainfield products listed in the current edition of the Department's *List of Approved Systems and Products* may be permitted by the Health Officer. Only the specific models listed in the document are approved. If other models in a manufacturer's product lines do not appear on the list, they are not approved for use in Sutter County.

2.1.3 Permit Requirements – The installation permit (and operational permit, if applicable) must specify the following items:

- (a)** The design flow volume (gallons/day) for the residence or facility served;
- (b)** The soil type (textural classification) at the site;
- (c)** The soil application rate (gallons/ft.²/day) matched to the soil type and conditions;
- (d)** The drainfield size required (square feet) if a gravel-filled drainfield were to be used;
- (e)** The size of the proposed gravelless drainfield (square feet) with percent reduction, if used;
- (f)** The frequency of gravelless drainfield status observations; and
- (g)** The requirements for drainfield expansion, repair, or replacement in event of observed problems. (See Section 4.3 for possible outcomes of observed ponding conditions.)

2.2 General Conditions – Gravelless drainfields may be used:

2.2.1 In applications and locations where soil and other site conditions are suitable for a conventional on-site sewage system;

2.2.2 Where soil types and depths, setbacks, and other site evaluation and location requirements found in Sutter County Chapter 700 are satisfactorily met;

2.2.3 In conjunction with approved treatment systems, such as sand filters, that may provide effluent quality sufficient for gravelless drainfields to be used on sites not otherwise suitable for a conventional septic tank and drainfield;

2.2.4 In mounds and sand filters in lieu of gravel-filled trenches or beds; and

2.2.5 Incorporated into any combination of the following design elements:

- (a) Gravity distribution;
- (b) Pressure distribution; and/or
- (c) Drainfield dosing.

2.3 Minimum Land Area / Drainfield Area Requirements

2.3.1 The use of a gravelless drainfield does not provide for a reduction in the minimum land area requirements established in Sutter County Ordinance 700-140. Site development incorporating gravelless drainfields shall meet the minimum net land area and minimum usable sewage disposal area (MUSDA) requirements.

2.3.2 The drainfield area proposed for an on-site sewage system using gravelless drainfield products must provide for each drainfield, a 100% replacement area equal to the size of a gravel-filled drainfield as required by Sutter County Chapter 700-160-C.

2.4 Influent Wastewater Characteristics

2.4.1 Wastewater from residential sources must receive pretreatment at least equal to that provided in a two-compartment septic tank before discharge to a gravelless drainfield.

2.4.2 Wastewater from non-residential facilities with high strength wastewater must receive pretreatment sufficient to lower the waste strength to the level of that commonly found in residential septic tank effluent before discharge to a gravelless drainfield.

2.5 Installation – Gravelless drainfields must be installed according to the manufacturer's instructions and in a manner that is consistent with these standards. If the manufacturer's instructions and these standards are in conflict, the matter must be discussed with, and decided by, the Health Officer.

3.0 Design Standards—

Gravelless drainfield components are proprietary. As such, other than the performance criteria identified in Section 1.2, there are no specific design requirements for the manufactured products. There are, however, design standards relative to:

- The required vertical separation and the method of wastewater distribution;
- Effluent treatment standards;
- Drainfield trench design; and
- The sizing of gravelless drainfields.

3.1 Vertical Separation – Varies depending on effluent treatment and distribution. The vertical separation shall meet the requirements of Sutter County Chapter 700-160-D for the soil type listed.

3.2 Effluent Treatment – Wastewater pretreatment to levels meeting or exceeding Treatment Standards 1 and/or 2 shall be included in the design of on-site sewage systems using gravelless drainfields when required by Sutter County Chapter 700.

3.3 Drainfield Design – Gravelless trench design criteria must comply with Sutter County Chapter 700-160-K. Observation ports shall be installed in a representative location on each drainfield line.

3.4 Drainfield sizing – As a point of reference for a site-specific design, the amount of gravel-filled drainfield must first be determined. This is done by dividing the daily design flow (in gallons) by the soil application rate as delineated under Sutter County Chapter 700-160-C. Drainfield sizing is based on trench bottom area only. The Department’s *List of Approved Systems and Products* contains detailed information regarding the dimensions of gravelless drainfield products to assist in accurate drainfield sizing.

3.4.1 Gravelless chamber drainfields – Calculate the required length of chamber using the effective area for the particular chamber. The effective area per lineal foot of chamber is based upon the actual dimensional width of the chamber at the trench bottom, not the nominal size or product marketing description.

3.4.2 Drainfield reductions with gravelless chambers – Reduced size gravelless chamber drainfields may be designed and installed depending on soil type. For each reduced size gravelless drainfield, a replacement area shall be established and dedicated at 100% of the area required for a gravel-filled drainfield.

(a) Drainfield size reductions allowed varies according to soil types, as follows:

- Soil Type 1: No Reduction Allowed
- Soil Type 2-5: Maximum Reduction of 30% Allowed
- Soil Type 6: No Reduction Allowed

- (b) System design, layout, and installation must be done in a manner easily facilitating the installation of additional gravelless drainfield if future conditions necessitate such action.

- 3.5 **Other Design Elements** – Other design features, such as trench separation, maximum lateral lengths, vertical separation, maximum width and depth of trench, minimum depth of soil backfill, suitable backfill, required pretreatment, and setbacks shall be the same as for gravel drainfields.
- 3.6 **Combining Drainfield Size Reductions** – Gravelless chambers may not be used to reduce the size of mounds or sand-lined trenches treating septic tank effluent or be used to achieve additional reductions in drainfields receiving effluent meeting Treatment Standard 1 or 2.

4.0 Operation and Maintenance—

4.1 General

- 4.1.1** The owner of the residence or facility served by the gravelless drainfield is responsible for assuring proper operation and providing timely maintenance for all components of the on-site sewage system.
- 4.1.2** The on-site sewage system designer must instruct, or assure that instruction is provided to the owner of the residence or facility regarding proper operation of the system.

4.2 Operation and Maintenance – For gravelless drainfield systems, the owner shall:

- 4.2.1** Assure that no surface water collects on the drainfield site;
- 4.2.2** Prohibit any type of vehicular or livestock traffic over the drainfield area;
- 4.2.3** Maintain a suitable, non-invasive shallow-rooted vegetative cover over the drainfield site;
- 4.2.4** Observe the entire on-site sewage system at a frequency appropriate for the site conditions and the on-site sewage system. This may be done by the homeowner or other qualified persons, as required;
- 4.2.5** Service all system components as required or as recommended by the manufacturer; and
- 4.2.6** Maintain a written chronological record of drainfield ponding level observations, and operation and maintenance activities.

4.3 Observed Conditions / Actions

- 4.3.1** When observation reveals either of the following listed conditions, the owner of the system must take appropriate action to alleviate the situation according to the direction and satisfaction of the Health Officer.
 - (a)** Drainfield failure; or
 - (b)** A history of long-term, continuous and increasing ponding of wastewater within the gravelless drainfield of such magnitude that if left unresolved, will probably result in drainfield failure.
- 4.3.2** Appropriate action may include:
 - (a)** Repair or modification of the drainfield;
 - (b)** Expansion of the drainfield; and/or
 - (c)** Modifications or changes within the structure relative to wastewater strength or hydraulic flow.