Ohio Department of Health
Special Device Approval per OAC 3701-29-20(C)
Alternative Leaching Trenches

In accordance with Am. Sub. HB 119 (127th General Assembly), effective July 2, 2007, the Ohio Department of Health (ODH) adopted Statewide Interim Sewage Rules that reflect the language in the 1977 version of Ohio Administrative Code (OAC) Chapter 3701-29. Due to this action and the rescinding of the 2007 sewage treatment system rules, the rule provisions for shallow leaching trenches were eliminated. Provisions in OAC Rule 3701-29-20(C) do provide the means for securing continued use of alternative trench design, dosing and distribution methods, as well as other advanced treatment systems. The rule reads as follows:

Household sewage disposal system components or household sewage disposal systems differing in design or principle of operation from those set for the in rules 3701-29-01 to 3701-29-21, may qualify for approval as a special device or system; provided, comprehensive tests and investigations show any such component or system produces results equivalent to those obtained by sewage disposal components or systems complying with such regulations. Such approval shall be obtained in writing from the director of health.

Am. Sub. HB 119 amendments to Ohio Revised Code Chapter 3718 still include the Technical Advisory Committee (TAC) process of reviewing systems and components that differ in design and function from those in rule. With consideration of TAC recommendations, ODH grants special device approval for alternative leaching trenches that may include shallow trench designs, distribution options, and trench lengths exceeding 150 feet in accordance with the conditions, specifications, and other provisions set forth in this document. **This special device approval is intended as a supplement to OAC Rule 3701-29-11 and grants local boards of health the authority to use alternative leaching trench options.**

DEFINITIONS

1. Parallel Distribution: pressure or gravity distribution of effluent that proportionally and simultaneously loads multiple sections of a final treatment and dispersal component.
2. Sequential Distribution: distribution method in which effluent is loaded into one trench and fills it to a predetermined level before passing through a relief line or device to the succeeding trench; the effluent does not pass through the distribution media before it enters succeeding trenches.
3. Serial Distribution: distribution method in which effluent is loaded into one trench and fills it to a predetermined level before passing through a relief line or device to the succeeding trench; effluent passes through the distribution media before entering succeeding trenches which may be connected to provide a single uninterrupted flow path**.**

CONDITIONS

The following conditions, as applicable, shall be met to comply with this approval:

1. The vertical separation distance (VSD) from the infiltrative surface of the leach trench to limiting condition, when applying septic tank effluent, may be 3 feet to rock strata and shall comply with VSD established locally for water tables and other limiting conditions.
2. Maintain at least one foot of in situ soil above any limiting condition except where permitted locally to be less than one foot to a perched seasonal high water table.
3. Soil depth credits may be used as specified for approved pretreatment components and other special device approvals posted on the ODH web site.
4. A sizing reduction of the soil absorption area is permitted when utilizing approved pretreatment components listed on the ODH web site for reduced BOD_5/TSS. The reduced absorption area should not exceed a 1/3 reduction of the area required for application of septic tank effluent and may be based on the infiltration loading rates from the Tyler Table referenced herein.

SPECIFICATIONS

1. **Site Limitations and Modifications -** Siting limitations and site modification include but are not limited to the following:
    a. Trenches shall be oriented parallel to natural surface contours and shall be sited to avoid natural drainage features and depressions that may hold surface water. A variation of plus or minus 3 inches along the surface contour may be permissible to accommodate trench installation along the contour.
    b. Plans shall address surface water diversion as needed. An interceptor drain may be used upslope of the leaching trench soil absorption component to intercept the horizontal flow of subsurface water to reduce its impact on the down gradient leaching trenches.
    c. Special safety considerations and installation criteria as needed are required for installing trenches on a slope greater than 15%. Manufacturer prohibitions and instructions shall be followed where applicable. When the depth to a limiting condition requires the approved product to be installed to within six inches of or above natural grade, and fill material is placed between and/ or over trenches for the purpose of creating trench sidewall, soil cover installation on slopes greater than 15% may not be feasible due to the risk of material slippage and maintenance of appropriate trench depths.
    d. Site modification involving fill material shall follow manufacturer's specifications where applicable and comply with the following:
        i. When the specified trench depth results in the distribution product extending above natural grade of the in situ soil, fill material between the trenches shall be of sand, loamy sand or sandy loam texture. Fill material shall be applied in a manner that protects and creates an interface with the underlying in situ soil and prevents compaction of material between trenches.
        ii. Fill material applied to the natural ground surface prior to the excavation of leaching trenches shall be sand, loamy sand, or sandy loam texture soil capable of maintaining trench sidewall stability

during installation and shall be applied in a manner that both protects and creates an interface with the underlying in situ soil.

iii. Unless evaluated as suitable, no fill material shall be present in the vertical separation distance below the infiltrative surface of the leaching trenches. Careful consideration shall be given prior to siting leach trenches in settled non-compacted fill material to determine its suitability for soil absorption. Over time, fill material *may* develop the characteristics of soil; however, it shall be thoroughly evaluated for such characteristics, in addition to treatment and dispersal capacities.

2. **Site and Soil Information -** A site and soil evaluation is required to identify depth to limiting conditions including but not limited to seasonal saturation and the average depth to the water table and rock strata, a description of soils including texture, consistence, structure (both shape and grade) and identification of replacement area.

3. **Design Criteria**

   a. **Sizing and configuration –** The soil absorption component **area** shall be of adequate size and configuration to disperse the effluent and prevent surface seepage. For the purpose of sizing, soil loading rates and linear loading rates shall be considered. Resources for estimating loading rates may include the Tyler Table (table available in papers referenced herein) or other resources.

   Systems shall be sized based on at least 120 GPD per bedroom or as otherwise justified for daily peak flow variations or for SFOSTS flows per OAC Rule 3701-29-21.

   The daily design flow and linear loading rate will establish the minimum **length** of the trenches along each contour. **Partial trenches, that do not provide the required length along contour, are not permitted.** Leach trench lengths exceeding 150 feet, as a result of loading rate calculations, are permissible. Placing the manifold in center of longer trenches or use of low pressure distribution systems may be considered.

   The trench shall have a maximum **width** of 2 feet. The minimum length and the specified trench width shall be used to determine the number of leaching trenches needed to accommodate the daily design flow.

   Additional **area**, for the purposes of resting portions of the leach field, shall be added to the calculated soil absorption component area in all leaching systems. This additional area shall be equivalent to 25% of the calculated area.

   Trench **depth** shall be determined by the limiting condition and have a minimum depth of two inches into the in situ soil. A leaching trench bottom shall be as level as practical along its length, shall follow the natural surface contour maintaining the specified trench depth from the natural surface of the ground along the entire trench length, and shall be installed in accordance with the guidelines set forth in the Installation Section herein.

   b. **Trench materials** –Trenches shall have a minimum height of 8 inches of coarse aggregate or alternative aggregate. Gravelless and chamber products

shall provide a minimum 8-inch height. Gravel or stone shall be washed with not more than 5% passing the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing" **and** shall be durable with a hardness of 3 or greater on the Moh's Scale of Hardness. Gravelless and chamber products shall be used in accordance with manufacturer specifications for installation.

c. **Cover –** The soil cover shall have a depth of at least six inches after settling or as specified for a proprietary product and shall be of a quality to allow for oxygen transfer and growth of vegetation.

d. **Distribution options** – This special device approval allows for alternative dosing and distribution methods when gravity flow is not possible or preferred. Serial distribution as defined herein is expressly prohibited under this Special Device Approval. Plans shall specify the means of distribution and management requirements including but not limited to the following:
    i. Specification of either parallel or sequential distribution with components to be used having access to grade and a mechanism for flow diversion and the sequential resting of each trench in the leaching system.
    ii. Distribution component connections between the tank or another distribution component, and to a leaching trench, shall be watertight and shall include properly supported rigid solid wall pipe to prevent settling and damage under normal loads and operating conditions.
    iii. A means for determining the liquid level or capacity of each leaching trench shall be provided. If an inspection port is used or required by the board of health, the port shall be anchored and accessible with at least a four inch opening and a removable watertight cap.
    iv. References or specifications for dosing or distribution methods such as lift tanks, flood dosing, surge capacity for timed dosing, or low pressure pipe (LPP) distribution.

INSTALLATION

If any disturbance or damage has occurred to the soil absorption area, installation shall not proceed and the registered installer shall contact the owner and the board of health. Soil moisture conditions shall be evaluated and trench excavation postponed when there is risk of compaction or smearing sidewalls. Leaching trench material shall be placed in a manner that prevents compaction of the infiltrative surface. Open trenches shall be avoided for any length of time to prevent impacts from sediments in runoff and windblown silt. Suitable backfill and cover material as required in this document or proprietary component specifications shall be used. Such material shall not be compacted and shall allow for settling unless otherwise specified by the proprietary product installation instructions. The area over the leaching trenches shall be protected

from erosion with provision of suitable vegetative cover, mulching, or other specified means of protection.

OPERATION & MAINTENANCE (O&M)

An alternative leaching trench system shall be operated, maintained, and monitored as required by the operation permit issued by the Board of Health. In sewage treatment systems where a pretreatment component precedes an Alternative Leaching Trench, any service agreement for the pretreatment component shall include the maintenance and monitoring of all system components. In conjunction with any operation permit conditions or O&M provisions required by the board of health, the O&M of a shallow trench soil absorption system may include but is not limited to:

1. Monitoring the liquid level or capacity of the leaching trench soil absorption component.
2. Management of flow diversion mechanisms for the purpose of resting portions of the soil absorption area.
3. Checking for surface water infiltration or clear water flows from the dwelling or structures into the system or onto the soil absorption area.
4. Monitoring for proper operation of mechanical components and/or distribution methods as applicable.
5. Any other O&M requirements specified by the manufacturer of the system as applicable.

REFERENCES / RESOURCES

The Tyler Table is provided in the following published papers available through the Small Scale Waste Management Project (SSWMP) at University of Wisconsin, Madison. The papers provide a detailed explanation of the development and use of this loading rate table in Ohio.

Hydraulic Wastewater Loading Rates to Soil. E. J. Tyler. 2001. Proceedings of the 9th International Symposium on Individual and Small Community Sewage Systems. ASAE. Saint Joseph, MI. P.80-86.
http://www.soils.wisc.edu/sswmp/SSWMP_4.43.pdf

Designing with Soil: Development and Use of a Wastewater Hydraulic Linear and Infiltration Loading rate Table. E. Jerry Tyler and Laura Kramer Kuns. 2000. Conference Proceedings. NOWRA. Grand Rapids, MI.
http://www.soils.wisc.edu/sswmp/SSWMP_4.42.pdf

Appendix A

Example Calculation of the Trench Bottom Area and Trench Length Required for an Alternative Leaching Trenches

Design Parameters:

Home: Four Bedrooms
Soil Type: A fine sandy loam (FSL) with moderate (2) blocky (BK) structure
Slope: 3%
Infiltration Distance: 18 inches - distance from trench bottom to soil limitation or restrictive layer

Step 1: Calculate the Daily Design Flow

4 bedroom System at 120 gallon per day per bedroom: (120 gpd x 4) = 480 gal/day (gpd)

Step 2: Determine Infiltration (Soil) Loading Rate from the Tyler Table

Go to the Tyler Table. Referencing the septic tank effluent with BOD_5/TSS > 30 mg/L column, the soil type listed has a design infiltration rate of 0.4 gallons/day/square foot (gpd/ft^2)

Step 3: Calculate the Trench Bottom Area

The absorption area for a gravel system (leach trench bottom area) is calculated by dividing the daily design flow (gpd) by the infiltration loading rate. Therefore:

Required minimum leaching trench bottom area: $\frac{480 \text{ gpd}}{0.4 \text{ gpd/ ft2}}$ = **1200** ft^2

Step 4: Determine the Hydraulic Linear Loading Rate (HLLR)

Return to the Tyler Table. Referencing the soil loading rate of 0.4 gpd/ft^2 (0-4%) and the infiltration distance of 18 inches (12-24), the HLLR is **3.8 gpd/linear foot** (lf).

Step 5: Calculate the Minimum Required Length of the Trenches Along the Contour

To calculate the minimum required system length, divide the daily design flow by the HLLR:

$$\frac{480 \text{ gpd}}{3.8 \text{ gpd/lf}} = \textbf{126 lf}$$

Step 6: Calculate the Resting Leaching Trench Bottom Area

The resting area must be equal to 25% of the required minimum leaching trench bottom area or the area utilized by one leaching trench, whichever is greater.

- Calculate 25% of the required minimum leaching trench bottom area 1200 ft^2 x 0.25 = **300 ft^2**

Step 7: Calculate the Total Leach Trench Bottom Area

- Determine the total leaching trench bottom area by adding the required minimum leaching trench bottom area and the resting leaching trench bottom area

1200 ft^2 + 300 ft^2 = ***1500 ft^2***

Step 8: Calculate the component width

Determine infiltration component width (sum of trench widths) by dividing total leaching trench bottom area by HLLR trench length:

1500 ft^2 / 126 ft = ***11.90 feet wide***

Step 9: Calculate the number of trenches

Determine the number of trenches by dividing the component width by the trench width. ***Note***: Three examples are provided in the chart below utilizing 12", 18", and 24" wide trenches

Utilizing a	**Calculate the number of trenches**	**Round up* to nearest number of whole trenches**
12" wide trench:	11.90 feet divided by 1.0 foot = 11.90 trenches	Round up to: ***12 trenches***
18" wide trench:	11.90 feet divided by 1.5 feet = 7.90 trenches	Round up to: ***8 trenches***
24" wide trench:	11.90 feet divided by 2.0 feet = 5.95 trenches	Round up to: ***6 trenches*** ***(Note: This design requires that 2 trenches be available for resting)***

* The number of trenches calculated in Step 9 is the minimum number of trenches to be installed for the trench length given in this example. **Partial trenches, that do not provide the required length along contour, are not permitted**. If rounding the number of trenches up requires the installation of more square footage of leaching trench than is desirable, the designer may wish to consider changing the trench width or length to determine a more desirable configuration. **However, under no circumstances can the trench length be less than the minimum required length based on the Hydraulic Linear Loading Rate (HLLR)**.

NOTES:

1. Leaching trenches for new sewage treatment system installations shall have a maximum width of two feet. A leaching trench width of up to three feet may be permissible for system alterations or replacements when the two- foot trench width requirement will cause an unusual hardship as described in the SDA.
2. Design options shown above are possible options. Other options that meet the required minimum leaching trench bottom area are acceptable.
3. The system design must include operation instructions and designate the number of trenches to be rested at one time. It is recommended that flow be diverted from 25% of the leaching trenches at one time.

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DIRECTOR'S JOURNAL ENTRY

MODIFICATION OF THE ALTERNATIVE TRENCH SPECIAL DEVICE APPROVAL

Under the authority of rule 3701-29-20(C) of the Administrative Code, the Director of Health may approve special devices or systems that differ in design or principle of operation from those set forth in the rules. A special device approval for alternative leaching trenches was authorized by journal entry on August 28, 2007. These standards and criteria for alternative leaching trenches have been reviewed and recommended for modification by the Sewage Treatment Systems Technical Advisory Committee at their meeting on April 14, 2009, with concurrence by this Department, for use as a sewage treatment system in Ohio. Therefore, the use of alternative leaching trenches as described in the attachment, and designed, installed and maintained in accordance with the conditions as now specified, are approved as a sewage treatment system special device for use in Ohio.

August 7, 2009
Date

Alvin D. Jackson /ms
Alvin D. Jackson, M.D.
Director of Health

I hereby certify this to be a true and correct copy of the Order to journal entry for the Ohio Director of Health.

8-7-2009
Date

Brenda M. Adams
Custodian of the Director's Journals
Ohio Department of Health