Ohio Department of Health
Special Device Approval per OAC 3701-29-20(C)
Sand Mounds with Pressure Distribution

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 mound systems were eliminated. Provisions in OAC Rule 3701-29-20(C) do provide the means for securing continued use of mound systems 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 the statewide use of sand mounds with pressure distribution in accordance with the conditions, specifications, and other provisions set forth in this document.

CONDITIONS

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

1. Maintain at least one foot of in situ soil below the sand fill and above any limiting condition except for perched seasonal high water tables. If permitted locally to be less than one foot to a perched seasonal high water table, consideration should be given to timed dosing with smaller dose volumes.
2. Vertical separation distance (VSD) from the top of the sand fill to the limiting condition(s):
    a. When applying septic tank effluent, VSD shall not be less than 3 feet to rock strata or soils with greater than 50% fragments, and not less than 2 feet to all other limiting conditions
    b. When applying pretreated effluent for pathogen reduction, can use soil depth credits as specified for approved pretreatment components on the ODH web site.

SPECIFICATIONS

1. **Site Limitations and Modifications -** Siting limitations and site modification include but are not limited to the following:

a. Mounds 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 design plan for a mound shall address surface water diversion as needed.
b. An interceptor drain may be used upslope of a mound soil absorption component to intercept the horizontal flow of subsurface water to reduce its impact on the down gradient mound component.
c. A mound soil absorption component shall not be sited on a slope greater than fifteen percent unless the design plan includes special installation criteria.
d. Sites with boulders or numerous trees are less desirable for a mound soil absorption component. Such conditions shall be avoided or the design plan shall increase the basal area to compensate for losses due to boulders or flush cut trees and shall include special instructions for the basal area preparation under such conditions.

2. **Site and Soil Information**
   a. Site information shall include a description of landscape position, slope, vegetation, drainage features, rock outcrops, erosion and other natural features; and documentation of any relevant surface hydrology, geologic and hydrogeologic risk factors for the specific site or in the surrounding area that may indicate vulnerability for surface water and ground water contamination.
   b. Soil Information shall include identification of depth to limiting conditions including but not limited to water table and rock strata, and a description of soil texture, consistence, and structure, including shape and grade.

3. **Design Criteria**
   a. **Sizing -** For the purpose of sizing, the soil loading rate and linear loading rate shall be determined from site and soil evaluation information. The most limiting in situ soil layer within the VSD shall be used to determine the soil loading rate. Resources for estimating loading rates may include the Tyler Table (table available in papers referenced herein) or other referenced resources. A basal area sizing reduction (i.e. higher soil loading rate) shall be based on the Tyler Table or other referenced resource when using at least one foot of sand fill or when using ODH approved pretreatment components meeting BOD_5 of less than 30 mg/L.

      Systems shall be sized based on 120 GPD per bedroom or as otherwise justified for daily peak flow variations or for SFOSTS flows per OAC Rule 3701-29-21. When the daily average flow from a dwelling is expected to exceed sixty percent of a peak daily design flow of 120 GPD per bedroom, the peak daily design flow shall be increased accordingly. Time dosing may be used to avoid exceeding the daily design flow. The peak daily design flow and the linear loading rate shall establish the minimum continuous length of the mound soil absorption area parallel to the natural surface contour.

b. **Sand Fill -** The mound sand fill depth shall be determined based on the depth to the limiting conditions. The sand fill depth shall not exceed two feet and shall not be less than four inches. The loading rate for the sand fill material shall not exceed 1.0 gpd/ft^2. For the purpose of this document, **natural sand** is defined as naturally deposited silica based sand not manufactured by mechanical processing such as the crushing of rock or coarse aggregates. The mound sand fill shall be a natural sand meeting **one** the following:

   i. Referenced specifications in Wisconsin Mound Soil Absorption System: siting, design and construction manual (Converse & Tyler, 2000) recognizing it is best to stay on the coarse side with effective size (D_{10}) close to 0.30 mm and uniformity coefficient (D_{60}/D_{10}) of 4.0 (as stated in the referenced resource on page 13).
   ii. Concrete sand meeting the gradation requirements of ASTM C33 provided not more than 5% passes 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". In order to allow for greater void space and water movement, and to help deter premature clogging, **it is best to err on the coarse side of the ASTM C33 standard** with a recommended effective size close to 0.30 mm and a uniformity coefficient close to 4.0.
   iii. Having an effective size between 0.20 to 0.35 mm, a uniformity coefficient of 5.0 or less 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 not less than 80% passing the No. 8 (2.36mm) sieve.

c. **Distribution Area over Sand Fill -** The design plan shall specify the depth of the distribution area. If using coarse aggregate, it 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. Plans may specify the use of other distribution area products or material such as gravelless and chamber products.

d. **Pressure distribution network** – Distribution network connections shall be watertight and shall include properly supported rigid solid wall pipe to prevent settling and damage under normal loads and operating conditions. The design plan shall include the entire network configuration including pipe lengths and sizes for the force main, any force main branches, manifolds, and laterals with orifice size, spacing and shielding and also the calculations used to determine dose volume and pump selection within the following specification:
   i. There shall be no more than a ten percent difference in flow rate between the proximal and distal orifices on each distribution lateral.

ii. Each dose shall deliver to the distribution area no greater than one fourth of the daily design flow and at least five times the void volume of the laterals.
iii. The orifice number and spacing shall provide distribution of no more than six square feet per orifice with an orifice size of not less than one-eighth inch. The direction of orifices and the method of orifice shielding shall be specified in the plan.
iv. The selected distal pressure head to be maintained at the end of each lateral shall be between two to five feet using a higher pressure head when selecting smaller orifice sizes.

The dosing tank size and the pump, **exterior** control panel, and alarm information shall be included with the design plan and the plan shall indicate the settings or means used to accommodate the dose volume including any drainback to the dosing tank.

e. **O&M and monitoring components -** At least three inspection ports shall be spaced at intervals adequate for observation of distribution and any ponding at the sand fill surface. The ports shall be anchored and be accessible with at least a four inch opening and a removable watertight cap. Accessible turn-ups shall be provided at the end of each lateral for the purpose of flushing the laterals and testing distal operating head.

f. **Mound cover -** A geotextile fabric or straw covering of the aggregate in the distribution area or other barrier as specified for proprietary components shall be used to prevent introduction of soil fines and allow for free movement of air and water. The soil cover shall be applied to allow for an approximate depth of six inches after settling, and the mound shall be crowned to promote runoff. Soil cover shall be of a quality to allow for oxygen transfer and growth of vegetation.

INSTALLATION

1. **Pre-Installation -** The full soil absorption area shall be free of any site disturbances. If any disturbance or damage has occurred, installation shall not proceed and the registered installer shall contact the owner and the board of health. Prior to installation the registered installer shall check all elevations in the design plan relative to the established benchmark including the surface contour and the flow line elevation of other components to assure proper flow through the system and freeze protection as applicable. Soil moisture conditions shall be evaluated and basal area preparation shall not proceed when there is risk of smearing or compaction.

2. **Site Preparation and Installation -** The mound shall be installed according to the design plan and any referenced resource and shall comply with the following:
    a. All vegetation shall be cut close to the ground and removed from the site. Stumps, roots, sod, topsoil, and boulders shall not be removed.
    b. The force main should be installed from the upslope side. All vehicle traffic on the basal area and downslope area of the mound should be avoided with

installation work being conducted from the upslope side or end of the mound basal area.

c. The basal area of the mound shall be prepared to provide a sand/soil interface and to improve infiltration if needed. The basal area preparation shall not reduce the infiltrative capacity of the soil surface. The degree of basal area preparation shall be determined on a site by site basis depending on soil conditions. Any basal scarification or other basal area preparation shall be conducted working along the contour. Sand may be incorporated into the basal area during the preparation process. Following basal preparation, a layer of sand fill shall be placed on the entire basal area to prevent damage from precipitation and foot traffic.
d. The specified depth and sufficient amount of sand fill shall be placed to cover the basal area, form the absorption area, and shall not be steeper than 3:1 side slopes. The distribution area shall be formed to the specified dimensions and the sand surface of the distribution area shall be level.
e. Construct and install all components of the distribution network and observation ports.
f. Cover the distribution area with straw, geotextile fabric, or other product as applicable and place the required soil cover over the mound.

3. **Completion**
    a. The area around the mound system shall be protected from erosion through upslope surface water diversion and provision of suitable vegetative cover, mulching, or other specified means of protection.
    b. Installer documentation shall include the measured height of the distal operating head, the system flow rate, and dose volume settings as baseline measures for future O&M and monitoring. Documentation shall be provided to the local health district to be included in the permit record.

OPERATION & MAINTENANCE (O&M)

The mound system shall be operated, maintained, and monitored as required by the operation permit issued by the board of health. A service agreement for a mound system with a pretreatment component shall also 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 mound soil absorption system shall include but is not limited to:

1. Checking the mound vegetative cover for erosion or settling and any evidence of seepage on the sides or toes of the mound.
2. Flushing of distribution laterals.
3. Checking for ponding in the distribution area.
4. Monitoring the dose volume and operating pressure head of the distribution system.
5. Checking for any surface water infiltration or clear water flows from the dwelling or structures into the system components or around the mound soil absorption area.

REFERENCES / RESOURCES

The following referenced resources may supplement the provisions of this approval for statewide use of sand mounds with pressure distribution. Any more stringent siting limitations or other provisions specified in a referenced resource shall be considered. Provisions in the referenced resources that are less stringent than those set forth in this document are not acceptable for use under this special device approval.

Tyler Table Resources – The Tyler Table is provided in the following published documents 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

Mound Resources – Attention should be paid to the siting limitations specified in the following manuals.

Wisconsin Mound Soil Absorption System: siting, design and construction manual (Converse & Tyler, 2000)
http://www.soils.wisc.edu/sswmp/SSWMP_15.24.pdf
Pressure Distribution Network Design (Converse, 2000)
http://www.soils.wisc.edu/sswmp/SSWMP_9.14.pdf

Bulletin 813: Mound Systems for Onsite Wastewater Treatment - Siting, Design, and Construction in Ohio (Chen, C. and Mancl, K.; 2004)
http://ohioline.osu.edu/b813/index.html
Bulletin 829: Mound System - Pressure Distribution of Wastewater (Kang, Y.W., Mancl, K., and Gustafson, R.; 2005)
http://ohioline.osu.edu/b829/index.html