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DIRECTOR'S JOURNAL ENTRY

APPROVAL OF SAND MOUNDS WITH TIMED DOSED PRESSURE DISTRIBUTION AS A SPECIAL DEVICE FOR SEWAGE TREATMENT SYSTEMS FOR AREAS WITH SIX (6) TO TWELVE (12) INCHES OF IN-SITU SOILS ABOVE BEDROCK

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. The standards and criteria for sand mounds with timed dosed pressure distribution in areas with six to twelve inches of in-situ soils above bedrock is attached to this entry and have been reviewed and recommended for approval by the Sewage Treatment Systems Technical Advisory Committee for use as a sewage treatment system in Ohio at their meeting on September 9, 2014. Therefore, sand mounds using timed dosed pressure distribution in areas with six to twelve of in-situ soils as described in the attachment, and designed, installed and maintained in accordance with the conditions as specified are now approved as a sewage treatment system special device for use in Ohio.

9/23/14
Date

Richard Hodges MPA
Director of Health

I hereby certify this to be a true and correct copy of the Journal Entry of the Director of the Ohio Department of Health.

9-23-14
Date

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

Ohio Department of Health
Special Device Approval per OAC 3701-29-20(C)
Sand Mounds with Time Dosed Pressure Distribution
for areas with six (6) to twelve (12) inches of In-Situ Soil Above Bedrock

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) does 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 shall be met to comply with this approval:

1. To be used only for replacement systems or for lots created prior to January 1, 2007.

2. Can only be used where site conditions have a soil thickness range of between six (6) and twelve (12) inches over bedrock

3. Only pretreatment unit(s) that treat effluent to less than or equal to one thousand (1,000) cfu/100 mL or two-hundred (200) cfu/100 mL shall be used in accordance with this SDA.

4. The combined thickness of suitable in-situ soil and sand media shall be at least eighteen (18) inches. For purposes of this SDA, highly permeable materials within the in-situ soil are not considered suitable for the minimum thickness, therefore there will be a minimum of eighteen (18) inches of suitable soils and sand media when highly permeable soils are present

5. When highly permeable soils are present in the in-situ soils, a pretreatment unit that pretreats effluent to 200 fecal coliforms per 100 milliliters shall be used.

6. Highly permeable soils means a layer through which effluent is expected to pass too quickly to provide adequate treatment, such as:

(i) Soils with greater than fifteen per cent rock fragment size particles and a soil texture of: loamy sand, loamy coarse sand, coarse sand, sand, fine sand or very fine sand;

(ii) Soils with greater than sixty per cent rock fragment size particles and the spaces between the rock fragments are filled with air, or soils other than fine textured soil; or

(iii) Any other layer deemed by the site and soil evaluator as highly permeable material.

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.

Sand Fill - The mound sand fill depth shall be determined based on the depth to the limiting conditions. The sand fill depth shall depend on the amount of suitable in-situ soil present. The loading rate for the sand fill material shall not exceed one gallon per day per square-foot. For the purpose of this rule, 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:

(1) Sand specifications in the Ohio State University Mound Bulletin (2004).

(2) Sand meeting the gradation requirements of ASTM C33, provided not more than five per cent 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".

(3) Having an effective size between 0.15 to 0.3 millimeters, a uniformity coefficient of 5 or less, with not more than five per cent 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 eighty per cent passing the No. 8 (2.36mm) sieve.

b. **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. .

Pressure distribution network – The pressure distribution design shall include the entire network configuration including, but not limited to, pipe lengths and size, exterior control panel and alarm information, and calculations used to determine dose volume, orifice flow rates, dosing tank sizing and pump selection within the following specifications:

(1) Distribution Network

(a) Supply network piping including the main, sub-mains, and manifold shall be watertight, rigid solid wall pipe, and shall be properly supported to prevent sagging and damage under normal loads and operating conditions. All network piping and low pressure distribution piping and fittings shall be polyvinyl chloride meeting ASTM Standard D 1785 Schedule 40, 80, or 120 or ASTM D 2241, SDR 13.5, 17, or 21 or equivalent. All fittings shall be pressure rated meeting or exceeding ASTM D 2466.

(b) Manifold designs shall address freeze protection while assuring uniform distribution. The manifold shall be designed to minimize drain down of laterals into other laterals at a lower elevation between dosing events.

(c) Lateral pipes shall be three-quarter to two inches in diameter.

(d) There shall be no more than a ten per cent difference in flow rate between the proximal and distal orifices on each distribution lateral. The system design shall ensure a minimum fluid velocity of two feet per second is maintained in the main and manifold piping during dosing.

(e) There shall be no more than a fifteen per cent difference in the flow rate between two orifices in different distribution laterals that are to be dosed simultaneously during a single dosing event.

(f) Laterals shall include valves to allow adjustment of the operating distal pressure at startup to meet design specifications in compliance with this standard. The distal operating pressure of each lateral shall be adjusted at startup to ensure compliance with this rule. Baseline measurements including reconciling the gallons per minute with the design, distal pressures/heights, and dose rates for future O&M and monitoring must be measured and recorded before STS approval by the board of health.

(g) Pressure distribution networks shall have an accessible means of measuring design pressure or operating head for both initial baseline measurement and future monitoring of orifice clogging and other network operations and shall include a means of scouring or flushing distribution laterals.

(2) Dose Frequency and Volume

When there is between six (6) and (12) inches of in-situ soil time dosing will be required and each dose shall deliver no greater than one-eighth of

the daily design flow and at least three times the void volume of the laterals. Theselected dose volume and frequency shall ensure that dosing events are spaced uniformly throughout a twenty-four hour period to maximize resting between dosing events. Time dosed controls should prevent premature dosing when less than the daily dose volume is present in the dosing tank.

3 Orifices and Orifice Shielding

(a) Orifices shall be uniform, clean, and free of all drill cuttings. Lateral pipes must be stabilized when drilling orifices to prevent the pipes from moving and to ensure orifices are drilled perpendicular to the pipe.

(b) Orifices must be sized no less than one-eighth inch and spaced a maximum of six feet apart along the lateral.

(c) 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. Orifices must be spaced a minimum of six inches from the end of the lateral.

(d) The direction of orifices and the method of orifice shielding shall be specified in the design and shall allow for uniform pressurization and depressurization of the laterals, and drain-back to prevent freezing.

(e) The design must specify how the effluent stream from the orifices will be dispersed for uniform distribution. When orifices are positioned up in the twelve o'clock position, the effluent stream must be sprayed against an orifice shield, gravel-less chambers, or similar device. When orifices are positioned down in the six o'clock position to facilitate draining after each dosing cycle, a mechanism to disperse the effluent stream such as an orifice shield, a pad of gravel, or a splash plate shall be provided.

(f) When orifice shields are used, they must be strong enough to withstand the weight of the backfill and large enough to protect the orifice from being plugged by gravel.

(g) If effluent is to be sprayed upward against the top of gravel-less chambers, the design shall include and follow manufacturer recommendations.

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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.

c. **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.

d. **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 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