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Tony Evers, Governor
Dawn B. Crim, Secretary

HYBRID (IN-PERSON/VIRTUAL)
PRIVATE ONSITE WASTEWATER TREATMENT SYSTEMS (POWTS)
TECHNICAL CODE ADVISORY COMMITTEE
Room N208, 4822 Madison Yards Way, 2nd floor, Madison, WI
Contact: Bradley Johnson (608) 266-2112
February 9, 2024

The following agenda describes the issues that the Committee plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the meeting minutes for a record of the actions of the Committee. Be advised that board committee members may attend meetings designated as "Hybrid" in-person or virtually.

AGENDA

9:00 A.M.

OPEN SESSION – CALL TO ORDER – ROLL CALL

A. Adoption of Agenda (1-2)

B. Approval of Minutes for October 7, 2020 (3)

C. Administrative Matters – Discussion and Consideration
1. Committee, Department, and Staff Updates
2. Committee Member Introductions
   a. Jeffrey Hammes
   b. Frederick Hegeman
   c. Daniel Keymer
   d. Robert Schmidt
   e. Todd Stair
   f. Daniel Vander Leest
   g. Eric Wellauer

D. Technical Advisory Matters - Discussion and Consideration
1. AeroFin System Wisconsin In-Ground Component Manual **(4-26)**
2. AeroFin System Wisconsin Mound Component Manual **(27-61)**
3. Hydrograph Procedure SPS 385.60(4)(f) "The governmental unit or the department may reject or suspend use of the hydrograph procedure when erratic groundwater tables are present due to recent, significant recharge events." **(62-68)**

E. Public Comments

ADJOURNMENT

****

MEETINGS AND HEARINGS ARE OPEN TO THE PUBLIC, AND MAY BE CANCELLED WITHOUT NOTICE.

Times listed for meeting items are approximate and depend on the length of discussion and voting. All meetings are held at 4822 Madison Yards Way, Madison, Wisconsin, unless otherwise noted. In order to confirm a meeting or to request a complete copy of the board's agenda, please call the listed contact person. The board may also consider materials or items filed after the transmission of this notice. Times listed for the commencement of disciplinary hearings may be changed by the examiner for the convenience of the parties. Requests for interpreters for the deaf or hard of hearing, or other accommodations, are considered upon request by contacting the Affirmative Action Officer, 608-266-2112, or the Meeting Staff at 608-266-5439.

VIRTUAL/TELECONFERENCE
POWTS TECHNICAL ADVISORY COMMITTEE
MEETING MINUTES
OCTOBER 7, 2020

PRESENT: Jeffrey Hammes (*arrived at 9:28 a.m.)*, Frederick Hegeman, Robert Schmidt, Todd Stair, Daniel Vander Leest, Eric Wellauer

EXCUSED: Daniel Keymer

STAFF: Christine Poleski, Executive Director; Bradley Johnson, Section Chief; Tim Vander Leest, Plan Reviewer; Matthew Janzen, Wastewater Specialist; Mark Finger, Wastewater Specialist; Kimberly Wood, Program Assistant Supervisor-Adv; and other Department staff

Christine Poleski, Executive Director, called the meeting to order at 9:03 a.m. A quorum was confirmed with five (5) members present.

ADOPTION OF AGENDA

MOTION: Robert Schmidt moved, seconded by Todd Stair, to adopt the Agenda as published. Motion carried unanimously.

APPROVAL OF MINUTES

MOTION: Robert Schmidt moved, seconded by Daniel Vander Leest, to approve the Minutes of April 26, 2019 as published. Motion carried unanimously.

TECHNICAL ADVISORY MATTERS

Proposal for Permitting of Experimental Use of a Septic Tank Retrofit Unit

MOTION: Todd Stair moved, seconded by Daniel Vander Leest, to recommend approval of the proposal for permitting of experimental use of the Synergy septic tank retrofit as presented in materials for, and reviewed at the 10/7/2020 meeting. A final disposition report shall be provided upon conclusion of the experiment. Motion carried unanimously.

(Jeffrey Hammes arrived at 9:28 a.m.)

ADJOURNMENT

MOTION: Robert Schmidt moved, seconded by Todd Stair, to adjourn the meeting. Motion carried unanimously.

The meeting was adjourned at 10:11 a.m.

AeroFin SYSTEM WISCONSIN IN-GROUND

COMPONENT MANUAL

January 2024

TABLE OF CONTENTS

Published by:
Infiltrator Water Technologies
4 Business Park Road
P.O. Box 768
Old Saybrook, CT 06475

This component manual was produced exclusively for use with AeroFin products. This manual is originally based upon the “In-Ground Soil Absorption Component Manual for Private Onsite Wastewater Treatment Systems” Ver. 2.1, May 2022, by the State of Wisconsin, Department of Safety and Professional Services, with periodic updates applied.

Infiltrator Water Technologies (Infiltrator) reserves the right to revise this component manual according to changes in regulations or AeroFin system installation instructions.

AEROFIN SYSTEM APPLICATIONS INFORMATION

AeroFin System Type[1]	Infiltrator AeroFin System Design Document	System Sand Depth (inches)	Effluent Distribution Method
Subsurface bed	AeroFin System In-Ground Component Manual	6 – with ≥ 30 inches unsaturated soil 12 – with 24 inches unsaturated soil	Gravity
Mound	AeroFin System Mound Component Manual	12 – with minimum 24 inches unsaturated soil	Gravity

[1] If any part of the AeroFin distribution cell is above grade then the AeroFin System Mound Component Manual shall be used.

I. INTRODUCTION AND SPECIFICATIONS

This Private Onsite Wastewater Treatment System (POWTS) component manual provides design, construction, inspection, operation, and maintenance specifications for an AeroFin System in-ground soil absorption component. However, these items shall accompany a properly prepared and reviewed plan acceptable to the governing unit to help provide a system that can be installed and function properly. Violations of this manual constitute a violation of chs. SPS 383 and 384, Wis. Adm. Code. The AeroFin System in-ground soil absorption component shall receive influent flows and loads less than or equal to those specified in Table 1. When designed, installed, and maintained in accordance with this manual, the AeroFin System in-ground soil absorption component provides treatment and dispersal of domestic wastewater in conformance with ch. SPS 383 of the Wis. Adm. Code. Final effluent characteristics will comply with s. SPS 383.41, Wis. Adm. Code when inputs are within the range specified in Tables 1 to 3.

Note: Detailed plans and specifications shall be developed and submitted to be reviewed and approved by the governing unit having authority over the plan for the installation. Also, a Sanitary Permit shall be obtained from the department or governmental unit having jurisdiction. See Section XII for more details.

Table 1
INFLUENT FLOWS AND LOADS

Design wastewater flow (DWF)	≤ 5,000 gal/day
Dosing of Effluent required when DWF	> 1,500 gal/day
Monthly average value of Fats, Oil and Grease (FOG)	≤ 30 mg/L
Monthly average value of five-day Biochemical Oxygen Demand (BOD_5)	≤ 220 mg/L
Monthly average value of Total Suspended Solids (TSS)	≤ 150 mg/L
Wastewater particle size	≤ 1/8 inch
Design loading rate of the basal area	= soil application rate of effluent with maximum monthly average values of BOD_5 and TSS of ≤ 30 mg/L as per s. SPS Table 383.44-2
Design wastewater flow (DWF) from one- or two-family dwellings	Based on s. SPS 383.43 (3), (4), or (5), Wis. Adm. Code
Design wastewater flow (DWF) from public facilities	≥ 150% of estimated daily wastewater flow in accordance with Table 4 of this manual or s. SPS 383.43 (6), Wis. Adm. Code
Volume of a single dose to soil absorption component when effluent is delivered to a non-pressure distribution system	≤ 20% of the design wastewater flow

Table 2a SIZE AND ORIENTATION	
Minimum area of distribution cell	≥ Design wastewater flow ÷ design soil application rate for the in situ soil at the infiltrative surface or a lower horizon if the lower horizon adversely affects the dispersal of wastewater in accordance with s. SPS 383.44 (4) (a) and (c), Wis. Adm. Code
Distribution cell width (A)[a]	≤ 10 feet
Distribution cell depth	Product height of 12.75 inches + system sand of - 6 inches = 18.75 inches -12 inches = 24.75 inches
Depth of cover over top of distribution cell	≥ 12 inches and ≤ 4 feet

Number of Fin Rows	Table 2b MINIMUM DISTRIBUTION CELL WIDTH											
	2	3	4	5	6	7	8	9	10	11	12	Each Add'l
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

Table 2c MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	Minimum Conduit Length Required (ft)
2	160
3	240
4	320
5	400
Each Add'l	80

NOTES:

a. The conduit rows must be extended to within 6 to 12 inches of each end of the bed. The dimensions in Table 2b include 6 inches of system sand in between each of the conduit rows and 6 inches of system sand on each outside edge.
b. The conduits are manufactured in 8-foot lengths. Individual row lengths can be rounded up to the nearest 8-foot increment to eliminate cutting. Cutting is allowed at any point along the conduit length as needed.
c. Where site conditions or other considerations require multiple beds or multiple distribution cells, the row-specific length dimensions in Table 2c may be equally distributed between all distribution cells.

Table 3 OTHER SPECIFICATIONS	
Slope of in situ soil	≤ 25% in area of component
Vertical separation between the bottom of the AeroFin conduit and seasonal saturation defined by redoximorphic features	≥ Depth required by s. SPS 383 Table 383.44-3, Wis. Adm. Code (36 inches from bottom of conduit) - 6 inches sand + 30 inch minimum unsaturated soil - 12 inches sand + 24 inches minimum unsaturated soil
Horizontal separation between AeroFin conduits	≥ 6 inches
Piping material for observation pipes	Meets requirements of s. SPS 384.30 Table 384.30-1, Wis. Adm. Code
Slope of gravity flow AeroFin conduits	≤ 4 inches per 100 feet of conduit
Location of gravity flow AeroFin distribution conduit in distribution cell	On level sites: Centered in the distribution cell On site slopes > 5%: 6 in from upslope side of bed
Length of distribution pipe for components using gravity flow distribution	= length of AeroFin conduit per Table 2c
Distance between AeroFin rows and end of distribution cell	6 inch minimum, 12 inch maximum
Length of AeroFin	80 ft per bedroom per Table 2c
Number of observation pipes per distribution cell	≥ 2
Location of observation pipes	At opposite ends of the distribution cell.
Design and installation of observation pipes	1. Have an open bottom. 2. Have a nominal pipe size of 4 inches. 3. The lower 6 inches slotted and wrapped in geotextile. 4. Slots are ≥ ¼ inch and ≤ ½ inch in width and located on opposite sides. 5. Anchored in a manner that will prevent the pipe from being pulled out. 6. Extend from the infiltrative surface up to or above finish grade. 7. Terminate with removable watertight cap. 8. Terminate with a vent cap if ≥ 12 in. above finish grade.
Effluent application to the AeroFin system	Effluent may be applied by gravity flow; or dose to gravity to the AeroFin Manifold;
Septic tank effluent pump system	Meets requirements of s. SPS 384.10, Wis. Adm. Code and this manual
Dose tank or compartment volume employing one pump	≥ Volume of a single dose + reserve capacity[a] + drain back volume[b] + (6 inches x average gal/inch of tank)[c] Notes: a: Reserve capacity ≥ the estimated daily flow b: Drain back volume ≥ volume of wastewater that will drain into the dose tank from the distribution cell. c: Four inches of the dimension ≥ vertical distance from pump intake to bottom of tank. Two inches of the dimension ≥ vertical distance between pump on elevation and high water alarm activation elevation.

Table 3 OTHER SPECIFICATIONS (continued)	
Dose tank or compartment volume employing duplex pumps	≥ Volume of a single dose + drain back volume[a] + (6 inches x average gal/inch of tank)[b] Notes: a: Drain back volume ≥ volume of wastewater that will drain into the dose tank from the force main b: Four inches of the dimension ≥ vertical distance from pump intake to the bottom of tank. Two inches of this dimension ≥ vertical distance between pump on elevation and high water alarm activation elevation.
Siphon tank or compartment volume	≥ What is required to accommodate volumes necessary to provide dosing as specified in this manual.
Cover material over the AeroFin System	Soil that will provide frost protection, prevent erosion and excess precipitation or runoff infiltration and allow air to enter the distribution cell
Installation inspection	In accordance with ch. SPS 383, Wis. Adm. Code
Management	In accordance with ch. SPS 383, Wis. Adm. Code and this manual

II. DEFINITIONS

Definitions not found in this section, are in ch. SPS 381 of the Wisconsin Administrative Code or the terms use the standard dictionary definition.

A. “Basal Area” means the effective in-situ soil surface area available for infiltration of partially treated effluent from the fill material.

B. “Conduit” means Infiltrator AeroFin System component made up 12.75-inch-tall by 2.25-inch-wide pipe, geonet mesh and geotextile fabric.

C. “Fill Material” means soil that is free of organic material and stones over 3 inches and is used along the sides of the distribution cell and above system sand extensions.

D. “Limiting Factor” means high groundwater elevation or bedrock.

E. “Product” means one AeroFin conduit manufactured by Infiltrator.

F. “Sand Extension” means additional system sand 6 inches in depth that is added to the system sand footprint to meet the minimum basal area requirement.

G. “System Sand” means the sand material that is used along the sides of an under the AeroFin System Conduits to provide treatment of effluent. Acceptable system sand shall meet ATSM Specification C33.

H. “Vertical Separation” means the total depth of unsaturated soil that exists between the infiltrative surface of a distribution cell and limiting factor (as indicated by redoximorphic features, groundwater, or bedrock).

III. DESCRIPTION AND PRINCIPLE OF OPERATION

The AeroFin System in-ground soil absorption component operation is a two-stage process involving both wastewater treatment and dispersal. Treatment is accomplished within the AeroFin System by physical and biochemical processes within the product, the fill material, and the in-situ soil. The fill material and in-situ soil also provide dispersal and separation distance to limiting conditions.

Cover material consisting of material that provides erosion protection, a barrier to excess precipitation infiltration, and allows gas exchange is added. See Figure 1 for a typical in-ground system.

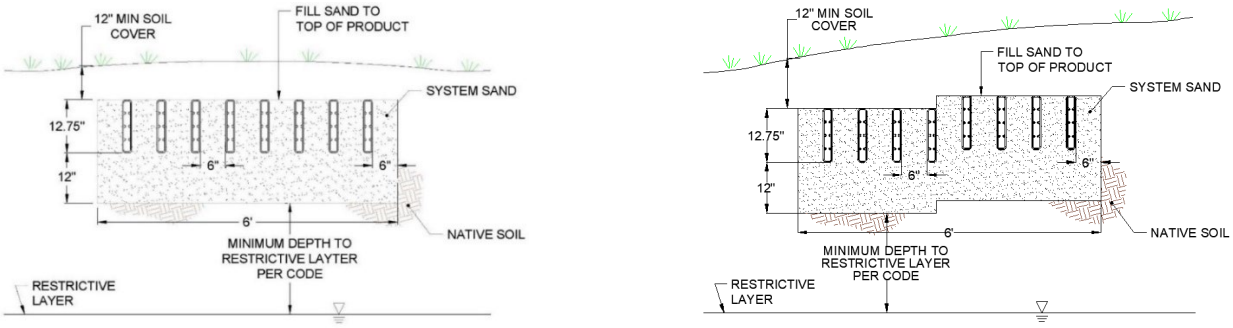


Figure 1. Example cross-sections of AeroFin System in-ground soil absorption component for POWTS (level and stepped)

IV. SOIL AND SITE REQUIREMENTS

The AeroFin System in-ground soil absorption component design shall be matched to the given soil and site.

The design approach presented in this manual is based on criteria that all applied wastewater is successfully transported away from the system, that it will not affect subsequent wastewater additions, and that the effluent is ultimately treated.

A. Minimum Soil Depth Requirements

The minimum soil factors required for successful AeroFin System in-ground soil absorption component performance are listed in the introduction and specification section of this manual.

Soil evaluations must be in accordance with ch. SPS 385 of the Wis. Adm. Code. In addition, soil application rates must be in accordance with ch. SPS 383 of the Wis. Adm. Code.

B. Other Site Considerations -

1. AeroFin System in-ground soil absorption component location - In open areas, exposure to sun and wind increases the assistance of evaporation and transpiration in the dispersal of the wastewater.
2. Sites with trees and large boulders Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for installing an in-ground soil absorption component because of difficulty in preparing the distribution cell area. As with rock fragments, tree roots, stumps and boulders occupy area, thus reducing the amount of soil available for proper treatment. If no other site is available, trees in the distribution cell area must be removed.

3. Setback distances - The setbacks specified in ch. SPS 383, Wis. Adm. Code for soil subsurface treatment/dispersal component apply to AeroFin System in-ground soil absorption components. The distances are measured from the edge of the AeroFin System in-ground soil absorption component (distribution cell).

V. COVER MATERIAL

The cover material is a soil that will allow air exchange while promoting plant growth. The gas exchange will increase the treatment performance of the system by providing oxygen to the wastewater to help ensure aerobic conditions in the AeroFin System in-ground soil absorption component. The plant growth will protect the surface from soil erosion. Clays may not be used for cover material, as they will restrict oxygen transfer. Often, excavated soil from the site can be used. Seeding or other means must be done to prevent erosion of the AeroFin System soil cover material.

VI. DESIGN

A. Location, Size and Shape - Placement, sizing and shaping of the AeroFin System in-ground soil absorption component and the distribution cell within the AeroFin System in-ground soil absorption component must be in accordance with this manual.

B. Component Design - Design of the AeroFin System in-ground soil absorption component is based upon the design wastewater flow and the soil characteristics. It must be sized such that it can accept the design wastewater flow without causing surface seepage or groundwater pollution. Consequently, the basal area, which is the in-situ soil area beneath the fill, shall be sufficiently large enough to absorb the effluent into the underlying soil. The system shall also be designed to avoid encroachment of the water table into the required minimum unsaturated zone.

Design of the AeroFin System in-ground soil absorption component includes the following three steps: (A) calculating design wastewater flow, (B) design of the AeroFin System distribution cell within the fill, (C) design of the entire AeroFin System in-ground soil absorption component. This includes calculating total width, total length, system height, distribution lateral location and observation pipes. Each step is discussed. A design example is provided in Section XI of this manual.

Step A. Design Wastewater Flow Calculations

One and two-family dwellings. Distribution cell size for one and two-family dwelling application is determined by calculating the design wastewater flow (DWF). To calculate DWF, use Formulas 1, 2 or 3. Formula 1 is for combined wastewater flows, which consist of blackwater, clearwater and graywater. Formula 2 is for only clearwater and graywater. Formula 3 is blackwater only.

Formula 1	Formula 2	Formula 3
Combined wastewater	Clearwater & Graywater	Blackwater
DWF = 150 gal/day/bedroom	DWF = 90 gal/day/bedroom	DWF = 60 gal/day/bedroom

Public Facilities. Distribution cell size for public facilities application is determined by calculating the DWF using Formula 4. Only facilities identified in Table 4 are included in this manual. Estimated daily wastewater flows are determined in accordance with Table 4

or s. SPS 383.43(6), Wis. Adm. Code. Facilities not listed in s. SPS 383.43(6), Wis. Adm. Code can be discussed with the plan reviewer to establish an acceptable daily flow rate volume. A detailed project description must be submitted with all commercial plans. Many commercial facilities have high BOD_5, TSS and FOG (fats, oils and grease), which shall be pretreated in order to bring their values down to an acceptable range before entering into the AeroFin System in-ground soil absorption component described in this manual.

Formula 4

DWF = Sum of each estimated wastewater flow per source per day x 1.5

Where 1.5 = Conversion factor to convert estimated wastewater flow to design wastewater flow

Step B. Design of the AeroFin System Distribution Cell - This section determines the required infiltrative surface area of the distribution cell/fill interface, as well as the dimensions of the distribution network within the fill.

Design of the AeroFin System distribution cell is a four-step process:

1. Determine the minimum total conduit length
2. Design the system sand configuration
3. Calculate the minimum basal area required
4. Make basal area adjustments as necessary

Step 1: Determine the minimum total conduit length
The minimum length of conduit per bedroom is 80 feet. Determine the minimum total length of conduit from Table 5 below, based on the number of bedrooms.

Table 4
MINIMUM TOTAL LENGTH OF CONDUIT

Number of Bedrooms	Minimum Conduit Length Required (ft)
2	160
3	240
4	320
5	400
Each Add'l	80

Step 2: Design the system sand configuration
Use Table 5 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 4 above) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Number of Fin Rows	Table 5 MINIMUM DISTRIBUTION CELL WIDTH											
	2	3	4	5	6	7	8	9	10	11	12	Each Add'l
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

NOTES:

1. The conduit rows must be extended to within 6 to 12 inches of each end of the bed. The dimensions in Table 2b include 6 inches of system sand in between each of the conduit rows and 6 inches of system sand on each outside edge.
2. The conduits are manufactured in 8-foot lengths row lengths can be rounded up to the nearest 8-foot increment to eliminate cutting. Cutting is allowed at any point along the conduit length as needed.
3. Where site conditions or other considerations require multiple beds or multiple distribution cells, the row-specific length dimensions in Table 2c may be equally distributed between all distribution cells.

Step 3: Calculate the minimum basal area required
Investigate the site in accordance with the Wisconsin Administrative Code to determine the design loading rate (DLR) of the basal area. Calculate the minimum basal area required by dividing the daily design flow (DWF) by this DLR.

Step 4: Make basal area adjustments as necessary

The minimum basal area required in Step 3 cannot be reduced. This area must be maintained to ensure adequate infiltration of treated effluent into the native soil.

Sand extensions are necessary as follows:

- If the minimum basal area determined in Step 3 is smaller than the area of the system sand footprint determined in Step 2, no sand extensions are necessary.
- If the minimum basal area determined in Step 3 is larger than the area of the system sand footprint determined in Step 2, sand extensions must be added to meet the minimum basal area footprint requirements.
    - When adding sand extensions in level system applications, additional width shall be evenly divided on each side of the Aerofin System.
    - When adding sand extension on sloping sites, additional width shall be placed on the downslope side of the bed.

The length of the bed area may be altered by extending the AeroFin rows. This method may be preferred over increasing the width of the system under certain site and system design considerations.

	Table 6					
	Maximum Soil Application Rates Based Upon Morphological Soil Evaluation (gpd/ft^2)					
Soil Characteristics			Soil Application Rates (to determine LLR requirements		BOD_5 ≤30 mg/L TSS ≤30 mg/L Design Loading Rate (gpd/ft^2)	
Texture[c]	Structure[d]					
	Shape	Grade				
COS, S LCOS, LS	---	0	0.7[a]	0.5[b,c]	1.6[a]	0.5[b]
FS, LFS	---	0	0.5		1.0	
VFS, LVFS	---	0	0.4		0.6	
COSL, SL	---	0M	**0.2**		0.6	
	PL	1	0.4		0.6	
		2, 3	**0.0**		0.2	
	PR, BK, GR	1	0.4		0.7	
		2, 3	0.6		1.0	
FSL, VFSL	---	0M	**0.2**		0.5	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	**0.0**		0.6	
	PR, BK, GR	2, 3	0.4		0.8	
L	---	0M	**0.2**		0.5	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	0.4		0.6	
	PR, BK, GR	2, 3	0.6		0.8	
SIL	---	0M	**0.0**		0.2	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	0.4		0.6	
	PR, BK, GR	2, 3	0.6		0.8	
SI	---	---	**0.0**		0.0	
SCL, CL, SICL	---	0M	**0.0**		0.0	
	PL	1, 2, 3	**0.0**		0.2	
	PR, BK, GR	1	**0.0**		0.3	
		2, 3	0.4		0.6	
SC, C, SIC	---	0M	**0.0**		0.0	
	PL	1, 2, 3	**0.0**		0.0	
	PR, BK, GR	1	**0.0**		0.0	
		2, 3	**0.2**		0.3	

Note a: With ≤60% rock fragments

Note b: With >60 to

Note c: COS − Coarse Sand
S−Sand
Loamy Coarse Sand
LS − Loamy Sand
FS − Fine Sand
LFS − Loamy Fine Sand
VFS − Very Fine Sand
LVFS − Loamy Very Fine Sand
COSL − Coarse Sandy Loam
SL − Sandy Loam
FSL − Fine Sandy Loam
VFSL − Very Fine Sandy Loam
L − Loam
SIL − Silt Loam
SI − Silt
SCL − Sandy Clay Loam LCOS −
CL − Clay Loam
SICL − Silty Clay Loam
SC − Sandy Clay
C − Clay
SIC − Silty Clay

Note d: PL − Platy
PR − Prismatic
BK − Blocky
GR − Granular
M − Massive
0 − Structureless
1 − Weak
2 − Moderate
3 − Strong

VII. SITE PREPARATION AND CONSTRUCTION

Procedures used in the construction of an AeroFin System in-ground soil absorption component are just as critical as the design of the component. A good design with poor construction results in system failure. It is emphasized that the soil only be worked when it is not frozen and the moisture content is low to avoid compaction and smearing. Consequently, installations are to be made only when the soil is dry enough to prevent compaction and smearing of the infiltrative surface. The construction plan to be followed includes:

A. Equipment – Proper equipment is essential. Tracked type equipment that will not compact the infiltrative surface. Minimize foot traffic and avoid equipment traffic over the infiltrative surface.

B. Sanitary Permit – Prior to the construction of the system, a sanitary permit, obtained for the installation must be posted in a clearly visible location on the site. Arrangements for inspection(ss) shall also be made with the department or governmental unit issuing the sanitary permit.

C. Construction Procedures

1. Check the moisture content and conditions of the soil. If the soil at the infiltrative surface can be rolled into a ¼ inch wire, the site is too wet, smearing and compaction will result, thus reducing the infiltrative capacity of the soil. If the site is too wet, do not proceed until it dries out. If the soil at or below the infiltrative surface is frozen, do not proceed.

2. Set up a construction level or similar device and determine all relative elevations in relationship to the bench mark. It is necessary to determine the bottom elevation of the distribution cell, land surface contour lines, and approximate component elevations critical to the installation.

3. Lay out the absorption and/or basal area. Where possible lay out the absorption and/or basal area(s) on the site so that the distribution cell runs parallel with the land surface contours. Reference stakes offset from the corner stakes are recommended in case corner stakes are disturbed during construction.

4. Excavate the distribution cell(s) to the correct bottom elevation(s) making sure not to smear the infiltrative surface. If the infiltrative surface is smeared, loosen it with the use of a rake or similar device. The infiltration surface can be left rough and should not be raked smooth.

5. Install the system sand over the entire system area as per design. System sand should be leveled and stabilized prior to introduction of the conduits.

6. Assemble the required manifold units and place at the inlet end of the treatment cell. Connect the AeroFin to the manifold then end-to-end to create rows of the required length using the integrated snap-lock feature on both products. Place components on the surface of the system sand arranged in the configuration shown on the system design. Use of temporary construction bracing, available from Infiltrator, may assist with conduit layout and spacing. Cap the end of the rows using the AeroFin endcaps.

7. Install the observation pipe with the bottom 6 inches of the observation pipe slotted. It is recommended to wrap geotextile around the slots. Installation of the observation pipe includes a suitable means of anchoring (Figures 2 and 3).

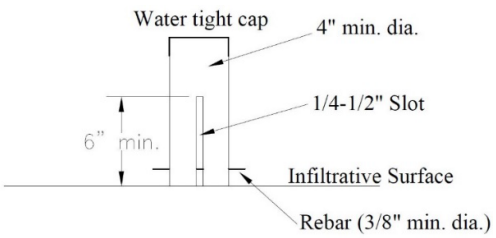


Figure 2

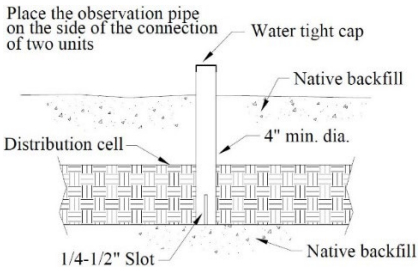


Figure 3

8. Once the AeroFin conduit is in place on the surface of the system sand and distribution piping is connected to the manifold per design, additional system sand shall be ladled beside and between, and to the top of each of the conduit rows. System sand shall also be installed on each side and at each end of the backfilled conduit rows, per the design.
9. Backfill the system with the required 12-inch minimum cover.
10. Complete final grading to divert surface water drainage away from the AeroFin System. Sod or seed and mulch all disturbed areas.

VIII. OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

A. The AeroFin system in-ground soil absorption component owner is responsible for the operation and maintenance of the component. The county, department or POWTS service contractor may make periodic inspections of the components, checking for surface discharge, treated effluent levels, etc.

   The owner or owner's agent is required to submit necessary maintenance reports to the appropriate jurisdiction and/or the department.

B. Design approval and site inspections before, during, and after the construction are accomplished by the county or other appropriate jurisdictions in accordance with ch. SPS 383 of the Wis. Adm. Code.

C. Routine and preventative maintenance aspects:

   1. Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
   2. Inspections of the AeroFin System in-ground soil absorption component performance are required at least once every three years. These inspections include checking the liquid levels in the observation pipe and examination for any seepage around the AeroFin System in-ground soil absorption component.
   3. Winter traffic on the AeroFin System in-ground soil absorption component is not permitted to avoid frost penetration and to minimize compaction.
   4. A good water conservation plan within the house or establishment as well as proper system care and maintenance will help assure that the AeroFin System in-ground soil absorption component will not be overloaded.

D. User's Manual: A user's manual is to accompany the component. The manual is to contain the following as a minimum:

1. Diagrams of all components and their location. This should include the location of the reserve area, if one is provided.
2. Names and phone numbers of local health authority, component manufacturer or POWTS service contractor to be contacted in the event of component failure or malfunction.
3. Information on periodic maintenance of the component, including electrical/mechanical components.
4. Information on limited activities on reserve area if provided.
5. Supply a copy of the Infiltrator Users guide: *A Guide to the Proper Care and Maintenance of Your Onsite Wastewater Treatment System*.

E. Performance monitoring must be performed on AeroFin System in-ground soil absorption components installed under this manual.

1. The frequency of monitoring must be:
   a. At least once every three years following installation and,
   b. At time of problem, complaint, or failure.
2. The minimum criteria addressed in performance monitoring of AeroFin System in-ground soil absorption components are:
   a. Type of use.
   b. Age of system.
   c. Nuisance factors, such as odors or user complaints.
   d. Mechanical malfunction within the system including problems with valves or other mechanical or plumbing components.
   e. Material fatigue or failure, including durability or corrosion as related to construction or structural design.
   f. Neglect or improper use, such as exceeding the design rate, poor maintenance of vegetative cover, inappropriate cover over the AeroFin in-ground soil absorption component, or inappropriate activity over the AeroFin in-ground soil absorption component.
   g. Installation problems such as compaction or displacement of soil, improper orientation or location.
   h. Pretreatment component maintenance, including dosing frequency, structural integrity, groundwater intrusion or improper sizing.
   i. Dose chamber maintenance, including improper maintenance, infiltration, structural problems, or improper sizing.
   j. Distribution piping network, including improper maintenance or improper sizing.
   k. Ponding in distribution cell, prior to the pump cycle, is evidence of development of a clogging mat or reduced infiltration rates.
   l. Siphon or pump malfunction including dosing volume problems, breakdown, burnout, or cycling problems.

m. Overflow/seepage problems, as shown by evident or confirmed sewage effluent, including backup if due to clogging.

3. Reports are to be submitted in accordance with ch. SPS 383, Wis. Adm. Code.

IX. REFERENCES

R.J. Otis, G.D. Plews and D.H. Patterson. “Design of Conventional Soil Absorption Trenches and Beds.” In: Home Sewage Treatment, Proceeding of the Second National Home Sewage Treatment Symposium, ASAE Publication 5-77.

United States EPA, EPA 625/1-80-012, October 1980. “Design Manual – Onsite Wastewater Treatment and Disposal Systems.”

X. AEROFIN SYSTEM IN-GROUND SOIL ABSORPTION COMPONENT WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

1. Surface water movement.
2. Measure elevations and distances on the site so that slope, contours, and available areas can be determined.
3. Description of several soil profiles where the component will be located.
4. Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - ____%
Occupancy – One or Two-Family Dwelling - ____(# of bedrooms)
Public Facility - _____ gal/day (Estimated wastewater flow)
Depth to limiting factor - _____inches
Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code -___ inches
System sand depth below AeroFin conduit: ☐ 6 inches ☐ 12 inches
In-situ soil application rate used - _____ gpd/ft^2
FOG value of effluent applied to component - _____ mg/L
BOD_5 value of effluent applied to component - __mg/L
TSS value of effluent applied to component - ___mg/L
Fecal Coliform monthly geometric mean value of effluent applied to component > 10^4 CFU/100ml ___Yes __No

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling		
Combined wastewater flow: DWF = 150 gal/day/bedroom x # of bedrooms = 150 gal/day/bedroom x ____# of bedrooms = _____ gal/day	Clearwater and graywater only: DWF = 90 gal/day/bedroom x # of bedrooms = 90 gal/day/bedroom x___# of bedrooms = _____ gal/day	Blackwater only: DWF = 60 gal/day/bedroom x # of bedrooms = 60 gal/day/bedroom x___# of bedrooms = _____ gal/day
Public Facilities		
DWF = Estimated wastewater flow x 1.5 = _____ gal/day x 1.5 = _____ gal/day		

C. DESIGN OF THE AEROFIN SYSTEM DISTRIBUTION CELL

a. Determine the minimum total AeroFin length

The minimum length of AeroFin per bedroom is 80 feet. Determine the minimum total length of conduit from Table 4, based on the number of bedrooms.

Table 4 MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	**Minimum Conduit Length Required (ft)**
2	160
3	240
4	320
5	400
Each Add'l	80

b. Design the system sand configuration

Use Table 5 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 4) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Number of Fin Rows	**Table 5 MINIMUM DISTRIBUTION CELL WIDTH**											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Each Add'l**
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

D. CALCULATE THE MINIMUM BASAL AREA REQUIRED

Calculate the basal area by dividing the daily design wastewater flow (DWF) by the design loading rate (DLR).

Basal area = DWF ÷ DLR

Basal area = _____ gpd ÷ _____ gpd/ft^2

Basal area = _____ ft^2

E. MAKE AREA AND WIDTH ADJUSTMENTS AS NECESSARY

First, verify the minimum AeroFin conduit length (160 ft) has been met.

The minimum areas required in Step C (system sand configuration) and Step D (basal area) cannot be reduced. These areas must be maintained to ensure adequate area for placement of the conduits and infiltration of treated effluent into the native soil.

Sand extensions are necessary as follows:

- If the minimum basal area determined in Step 3 is smaller than the area of the system sand footprint determined in Step 2, no sand extensions are necessary.
- If the minimum basal area determined in Step 3 is larger than the area of the system sand footprint determined in Step 2, sand extensions must be added to meet the minimum basal area footprint requirements. When adding sand extensions in level system applications, additional width shall be evenly divided on each side of the AeroFin System; and

- In sloped applications, additional width shall be placed entirely on the downslope side of the AeroFin system. For elevated or mound systems, this manual does not apply. See the Infiltrator AeroFin System Mound Component Manual.

Note: *The length of the bed area may be altered, but only by extending the conduit rows. This method may be preferred over increasing the width of the system under certain site and system design considerations.*

XI. EXAMPLE IN-GROUND SOIL ABSORPTION COMPONENT WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

1. Surface water movement.
2. Measure elevations and distances on the site so that slope, contours and available areas can be determined.
3. Description of several soil profiles where the component will be located.
4. Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - 0 %
Occupancy – One or Two-Family Dwelling - 4 (# of bedrooms)
Public Facility - _____ gal/day (Estimated wastewater flow)
Depth to limiting factor - 60 inches
Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code - 36 inches.
System sand depth below AeroFin conduit: ☐ 6 inches ☐ 12 inches
In-situ soil application rate used - 1.6 gpd/ft^2
FOG value of effluent applied to component - < 30 mg/L

Treated Effluent from Component
BOD_5 value of effluent applied to component - ≤ 30 mg/L
TSS value of effluent applied to component - ≤ 30 mg/L
Fecal Coliform monthly geometric mean value of effluent applied to component
> 10^4 CFU/100ml __Yes X No

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling		
Combined wastewater flow: DWF = 150 gal/day/bedroom x # of bedrooms = 150 gal/day/bedroom x 4 # of bedrooms = 600 gal/day	Clearwater and graywater only: DWF = 90 gal/day/bedroom x # of bedrooms = 90 gal/day/bedroom x _____# of bedrooms = _____ gal/day	Blackwater only: DWF = 60 gal/day/bedroom x # of bedrooms = 60 gal/day/bedroom x _____# of bedrooms = _____ gal/day
Public Facilities		
DWF = Estimated wastewater flow x 1.5 = _____ gal/day x 1.5 = _____ gal/day		

C. DESIGN OF THE AEROFIN SYSTEM DISTRIBUTION CELL

a. Determine the minimum total conduit length

The minimum length of conduit per bedroom is 80 feet. The minimum total length of conduit from Table 4, based on 4 bedrooms is 320 linear feet.

Table 4 MINIMUM TOTAL LENGTH OF AeroFin Conduit	
Number of Bedrooms	**Minimum Fin Length Required (ft)**
2	160
3	240
4	**320**
5	400
Each Add'l	80

b. Design the system sand configuration

Using 4 rows of 80 ft long requires a treatment cell area of 266.5 ft^2 (3.25 ft wide by 82 ft long).

Number of Fin Rows	Table 5 MINIMUM DISTRIBUTION CELL WIDTH											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Each Add'l**
Minimum Width (ft)	1.88	2.57	**3.25**	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

D. CALCULATE THE MINIMUM BASAL AREA REQUIRED

Basal area = DWF ÷ DLR

Basal area = 600 gpd ÷ 1.6 gpd/ft^2

Basal area = 375 ft^2

E. MAKE AREA AND WIDTH ADJUSTMENTS AS NECESSARY

The minimum AeroFin conduit length required (160 ft) is met by the 320 lf of AeroFin conduit in this system design (Step C a).

As determined in Step C b, the minimum length of the system is 82 feet and the minimum width of the system is 3.25 feet, creating a system sand footprint of 266.5 ft^2 (3.25 ft x 82 ft) Since the 375 ft^2 minimum basal area (Step D) is larger than the 266.5 ft^2 system sand footprint (Step C b), sand extensions must be added.

- *Divide the minimum basal area required by the length of the system sand footprint as designed.* *375 ft^2 ÷ 82 ft = 4.57 ft*

- *Subtract the design system sand footprint width from the above adjusted system sand footprint width to determine the width of the sand extension required.*

  4.57 ft - 3.25 ft = 1.32 ft

- *Divide the total width of the sand extension required as calculated above by 2 to determine the minimum width of the sand extension required on each side of the system.*

  ***NOTE:** Round up and convert to feet/inches for ease of installation.*

  1.32 ft ÷ 2 = .66 ft (Round up to 0.75 ft.)

- *The system sand width must be widened by 1.5 ft. On a level site, this is accomplished by adding a 9-in-wide sand extension to the entire length of each side of the system. This results in a total basal area footprint width of 4.75 ft.*

  4.75 ft x 82 ft = 389.5 ft²

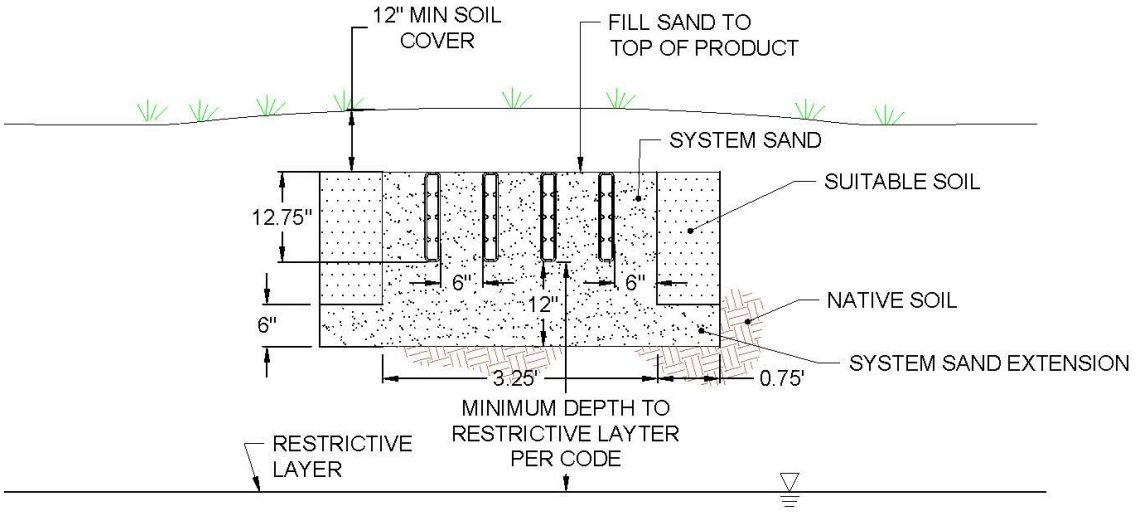


Figure 4. Detailed cross-section of an example in-ground AeroFin System

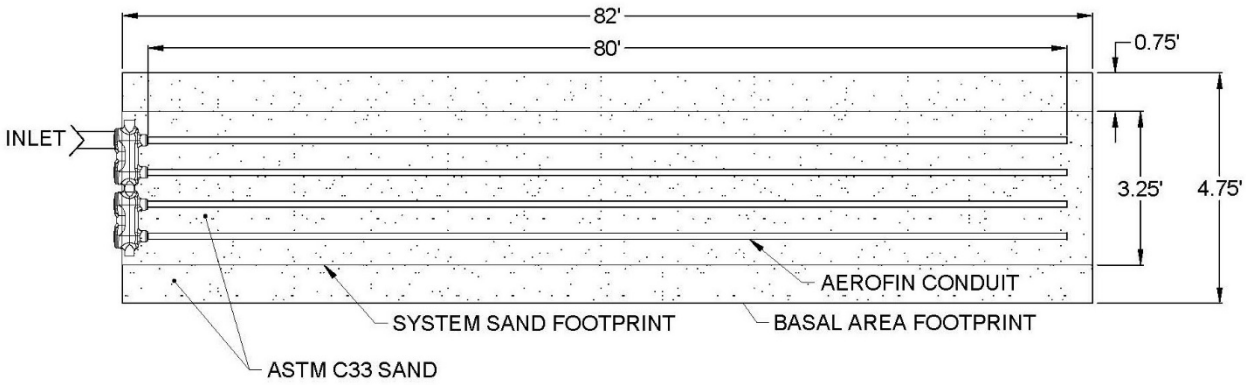


Figure 5. Detailed plan-view of an example in-ground AeroFin System

XII. PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

To install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a **general guide**. Not all needed information may be included in this list. Some of the information may not be required to be submitted due to the design of the system. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

General Submittal Information

1. Photocopies of soil report forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
2. Submittal of additional information requested during plan review or questions concerning a specific plan must be referenced to the Plan Identification indicator assigned to that plan by the reviewing agency.
3. Plans or documents must be permanent copies or originals.

Forms and Fees

1. Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.

Soils Information

1. Complete Soils and Site Evaluation Report (form # SBD-8330) for each soil boring described; signed and dated by a certified soil tester, with license number.
2. Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

Documentation

1. Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
2. Master Plumbers must sign, date and include their license number on each page of the submittal or provide an index page, which is signed, sealed and dated.
3. A detailed project description must be submitted with all commercial plans. Any facility creating non-domestic wastewater may require concurrence approved from the WI DNR. Please check with a state plan reviewer if there are any questions.
4. Three completed sets of plans and specifications (clear, permanent and legible); submittals must be on paper measuring at least 8-1/2 by 11 inches.
5. Designs that are based on department approved component manual(s) must include reference to the manual by name, publication number and published date.

Plot Plan

1. Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
2. Slope directions and percent in system area.
3. Bench mark and north arrow.

4. Setbacks indicated as per appropriate code.
5. Two-foot contours or other appropriate contour interval within the system area.
6. Location information; legal description of parcel must be noted.
7. Location of any nearby existing system or well.

Plan View

1. Dimensions for distribution cell(s).
2. Location of observation pipes.
3. Dimensions of AeroFin System in-ground soil absorption component.
4. Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length.
5. Manifold and force main locations, with materials, length and diameter of each.

Cross Section of System

1. Include tilling requirement, distribution cell details, percent slope, side slope, and cover material.
2. Lateral elevation, position of observation pipes, dimensions of distribution cell, and type of cover material such as geotextile fabric, if applicable.

System Sizing

1. For one and two-family dwellings, the number of bedrooms must be included.
2. For public buildings, the sizing calculations must be included.

Tank and Pump or Siphon Information

1. All construction details for site-constructed tanks.
2. Size and manufacturer information for prefabricated tanks.
3. Notation of pump or siphon model, pump performance curve.
4. Notation of high water alarm manufacturer and model number.
5. Cross section of dose tank / chamber to include storage volumes; connections for piping, and power; pump “off” setting; dosing cycle and volume, high water alarm setting, and storage volume above the highwater alarm; and location of manhole.
6. Cross section of two compartments tanks or tanks installed in a series must include information listed above.

B. Inspections

Inspection shall be made in accordance with s. 145.20, Wis. Stats. and s. SPS 383.26, Wis. Adm. Code. The inspection form found on the DSPS POWTS website may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

AeroFin SYSTEM

WISCONSIN MOUND COMPONENT MANUAL

January 2024

TABLE OF CONTENTS

Published by:
Infiltrator Water Technologies
4 Business Park Road
P.O. Box 768
Old Saybrook, CT 06475

This component manual was produced exclusively for use with AeroFin products. This manual is originally based upon the "Mound Component Manual for Private Onsite Wastewater Treatment Systems" Ver. 2.1, May 2022, by the State of Wisconsin, Department of Safety and Professional Services, with periodic updates applied.

Infiltrator Water Technologies (Infiltrator) reserves the right to revise this component manual according to changes in regulations or AeroFin system installation instructions.

AeroFin System Application Information

AeroFin System Type[1]	Infiltrator AeroFin System Design Document	System Sand Depth (inches)	Effluent Distribution Method
Subsurface bed	AeroFin System In-Ground Component Manual	6 – with ≥ 30 inches unsaturated soil 12– with 24 inches unsaturated soil	Gravity
Mound	AeroFin System Mound Component Manual	12 – with min. 24 inches unsaturated soil	Gravity

[1] If any part of the AeroFin distribution cell is above grade then the AeroFin System Mound Component Manual shall be used.

I. INTRODUCTION AND SPECIFICATIONS

This Private Onsite Wastewater Treatment System (POWTS) component manual provides design, construction, inspection, operation, and maintenance specifications for an AeroFin System mound component. However, these items must accompany a properly prepared and reviewed plan acceptable to the governing unit to help provide a system that can be installed and function properly. Violations of this manual constitute a violation of chs. SPS 383 and 384, Wis. Adm. Code. The AeroFin System mound component must receive influent flows and loads less than or equal to those specified in Table 1. When designed, installed, and maintained in accordance with this manual, the AeroFin System mound component provides treatment and dispersal of domestic wastewater in conformance with ch. SPS 383 of the Wis. Adm. Code. Final effluent characteristics will comply with s. SPS 383.41, Wis. Adm. Code when inputs are within the range specified in Tables 1 to 3. Design variations to this manual will constitute an "Individual Site Design" which requires exclusive plan review conducted by state staff.

Note: Detailed plans and specifications must be developed and submitted for review and approved by the governing unit having authority over the plan for the installation. Also, a Sanitary Permit must be obtained from the department or governmental unit having jurisdiction. See Section XII for more details.

Table 1
INFLUENT FLOWS AND LOADS

Design wastewater flow (DWF)	≤ 5,000 gal/day
Monthly average value of Fats, Oil and Grease (FOG)	≤ 30 mg/L
Monthly average value of five-day Biochemical Oxygen Demand (BOD_5)	≤ 220 mg/L
Monthly average value of Total Suspended Solids (TSS)	≤ 150 mg/L
Design loading rate of fill	Determined by conduit requirement and system layout.
Design loading rate of the basal area	= soil application rate of effluent with maximum monthly average values of BOD_5 and TSS of ≤ 30 mg/L per Table 383.44-2.
Volume of a single dose to absorption component when pumps or siphons are used in the design	≥ 5 times void volume of the distribution lateral (s) and ≤ 20% of the design wastewater flow.
Design wastewater flow (DWF) from one- or two-family dwellings	Based on s. SPS 383.43 (3), (4), or (5), Wis. Adm. Code
Design wastewater flow (DWF) from public facilities	≥ 150% of estimated daily wastewater flow in accordance with s. SPS 383.43 (6), Wis. Adm. Code
Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day (as shown in the untreated wastewater column of Table 383.44-2) within 12 inches of fill material	≤ 4.5 gal/ft/day
Wastewater particle size	≤ 1/8 inch

Table 2a SIZE AND ORIENTATION	
Distribution cell width (A)[a]	≤ 10 ft Distribution cell width is based on the number of rows. Product widths are shown in Table 2b.
Distribution cell length (B)[a]	Distribution cell length is conduit length ÷ number of rows + 1 ft to 2 ft for sand on ends of rows.
Total distribution cell area (A x B)[a]	A x B
Required product amount	Minimum product length required is shown in Table 2c.
Orientation	Longest dimension parallel to surface grade contours on sloping sites.
Deflection of distribution cell on concave slopes	≤ 10%
Fill material depth at up slope edge of distribution cell (D)[a]	The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-3 WI Adm. Code (36 inches). Under the 12 inches of system sand required with any additional fill that is required is on an inch-by-inch basis. If 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches. In step down systems, D remains constant.
Fill material depth at downslope edge of distribution cell (E)[a]	For level distribution cells, D = E. For stepped distribution cells, E is greater than D and the difference is a function of the site slope and distance from D.
Distribution cell depth (F)[a]	Product height of 12.75 inches + system sand of 12 inches = 24.75 inches.
Depth of cover material at top center of distribution cell area (H)[a]	≥ 12 inches
Depth of cover material at top outer edge of distribution cell area (G)[a]	≥ 6 inches
Basal area [b]	≥ Design wastewater flow rate ÷ Design loading rate of basal area as specified in Table 7.
Soil Application Rate [b]	The designer may use treated effluent values in accordance with SPS Table 383.44-2, WI Adm. Code. See Table 7.

[a] Letter corresponds to letters referenced in figures, formulas and on worksheets

[b] *Linear loading rate requirement must be met if applicable..*

Number of Conduit Rows	Table 2b MINIMUM DISTRIBUTION CELL WIDTH											
	2	3	4	5	6	7	8	9	10	11	12	Each Add'l
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

Table 2c MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	Minimum Conduit Length Required (ft)
2	160
3	240
4	320
5	400
Each Add'l	80

Table 3 OTHER SPECIFICATIONS	
Bottom of the distribution cell	Level or stepped
Slope of original grade	≤ 25% in area of basal area of the mound
Depth of in-situ soil to high groundwater elevation and bedrock under basal area	≥ 6 inches
Vertical separation between distribution cell infiltrative surface and seasonal saturation defined by redoximorphic features, groundwater, or bedrock	≥ 2 ft measured to the bottom of the AEROFIN distribution cell ≥ 36 inches measured from the bottom of the AeroFin conduit.
Horizontal separation between distribution cells	≥ 3 ft
Fill material below and beside distribution cell	Meets ASTM Specification C33 for fine aggregate
Size for basal area (for level sites) (B x W) [a]	Cell length x [Total mound width]
Size for basal area (for sloping sites) (B x {A +I})[a]	Cell length x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width]
Observation pipe material	Shall conform with requirements in SPS 383 Table 384.30-1, Wis. Adm. Code
Effluent application	The use of pressure distribution is prohibited. Pumps or siphons may distribute effluent to the AeroFin manifold.
Piping Material	Meets requirements of s. SPS 384.30 (2), Wis. Adm. Code for its intended use.
Distribution cell aggregate material	AeroFin conduits and C33 sand
Number of observation pipes per distribution cell	≥ 2

Table 3 OTHER SPECIFICATIONS (continued)	
Location of observation pipes	Observation pipes must be located on opposite ends of the distribution cell. Observation pipes will be installed in each distribution cell so as to be representative of a cell's hydraulic performance and: • be located such that there are a minimum of two • installed in each dispersal cell at opposite ends from one another • be located near the dispersal cell ends • be at least 6 inches from the end wall and sidewall • be installed at an elevation to view the horizontal or level infiltrative surface within the dispersal cell
Maximum final slope of mound surface	$\leq$ 3:1
Cover material	Soil that will provide frost protection, prevent erosion and excess precipitation or runoff infiltration and allow air to enter the distribution cell.
Grading of surrounding area	Graded to divert surface water around mound system.
Limited activities	Unless otherwise specifically allowed in this manual, vehicular traffic, excavation, and soil compaction are prohibited in the basal area and 15 feet down slope of basal area for sloped sites and 10 feet on both sides for level sites, if there is a restrictive horizon that negatively affects treatment or dispersal .
Installation inspection	In accordance with ch. SPS 383, Wis. Adm. Code.
Management	In accordance with ch. SPS 383, Wis. Adm. Code and this manual.

II. DEFINITIONS

Definitions not found in this section, are in ch. SPS 381 of the Wisconsin Administrative Code or the terms use the standard dictionary definition.

A. "Basal Area" means the effective in-situ soil surface area available for infiltration of partially treated effluent from the fill material.

B. "Conduit" means the Infiltrator AeroFin System component made up of 2.25 in. wide by 12.75 in. tall rectangular conduit, geonet mesh and geotextile fabric.

C. "Deflection of distribution cell" means the ratio between the maximum distance between the down slope edge of a concave distribution cell to the length of a perpendicular line that intersects the furthest points of the contour line along the down slope edge of the distribution cell.

D. “Distribution cell area” means the area within the AeroFin System mound where the effluent is distributed into the system sand and then into the fill material or in-situ soil.

E. “Fill Material” means sand that meets specifications of ASTM Specification C33 for fine aggregate and is used along the sides of and could be under the distribution cell to provide treatment of effluent. A minimum of 6 in of fill material is required over the required absorption area.

F. “Individual Site Design” means a system that does not fully comply with the design standards of this component manual (ISD)

G. “Limiting Factor” means high groundwater elevation or bedrock.

H. “Mound” means an on-site wastewater treatment and dispersal component. The structure contains a distribution cell area surrounded by suitable fill material. The fill material provides a measurable degree of wastewater treatment and allows effluent dispersal into the natural environment under various soil permeability.

I. “Original Grade” means that land elevation immediately prior to the construction of the mound system.

J. “Parallel to surface grade contours on sloping sites” means the mound is on the contour except that a 1% cross slope is allowed along the length of the mound. See ch. SPS 383 Appendix A-383.44 ORIENTATION (6).

K. “Permeable Soil” means soil with textural classifications according to the U.S. Department of Agriculture, Natural Resource Conservation Service, classification system of silt loam to gravelly medium sand.

L. “Product” means one AeroFin conduit manufactured by Infiltrator.

M. “Slowly Permeable Soil” means soil with textural classifications according to the U.S. Department of Agriculture, Natural Resource Conservation Service, classification system of clay loams and silty clay loams that exhibit a moderate grade of structure; and loams, silt loams, and silts with weak grades of structure; or soils with weak to moderate grades of platy structure.

N. “System Sand” means the sand material that is used along the sides of and under the AeroFin System Conduits to provide treatment of effluent. Acceptable system sand shall meet ASTM C33 Specification.

O. “Unsaturated flow” means liquid flow through a soil media under a negative pressure potential. Liquids containing pathogens and pollutants come in direct contact with soil/fill material microsites, which enhances wastewater treatment by physical, biological, and chemical means.

P. “Vertical Flow” means the effluent flow path downward through soil or fill material, which involves travel along soil surfaces, or through soil pores.

Q. “Vertical Separation” means the total depth of unsaturated soil that exists between the infiltrative surface of a distribution cell and limiting factor (as indicated by redoximorphic features, groundwater, or bedrock).

III. DESCRIPTION AND PRINCIPLE OF OPERATION

The AeroFin System mound component operation is a two-stage process involving both wastewater treatment and dispersal. Treatment is accomplished within the AeroFin System mound by physical and biochemical processes within the product, the fill material, and the in-situ soil. The physical characteristics of the influent wastewater, influent loading rate, temperature, and the nature of the receiving fill material and in situ soil affect these processes.

Physical entrapment, increased retention time, and conversion of pollutants in the wastewater are important treatment objectives accomplished under unsaturated conditions. Pathogens contained in the wastewater are eventually deactivated through filtering, retention, and adsorption by the fill material. In addition, many pollutants are converted to other chemical forms by oxidation processes.

Dispersal is primarily affected by the depth of the unsaturated receiving soils, their hydraulic conductivity, land slope, and the area available for dispersal.

The mound consists of fill material, a distribution cell, and cover material. Effluent is dispersed into the distribution cell where it flows through the fill material and undergoes biological, chemical, and physical treatment and then passes into the underlying soil for further treatment and dispersal to the environment.

Cover material consisting of material that provides erosion protection, a barrier to excess precipitation infiltration, and allows gas exchange is added. See Figure 1 for a typical AeroFin mound system.

The in situ soil serves in combination with the fill, as treatment media, and it disperses the treated effluent.

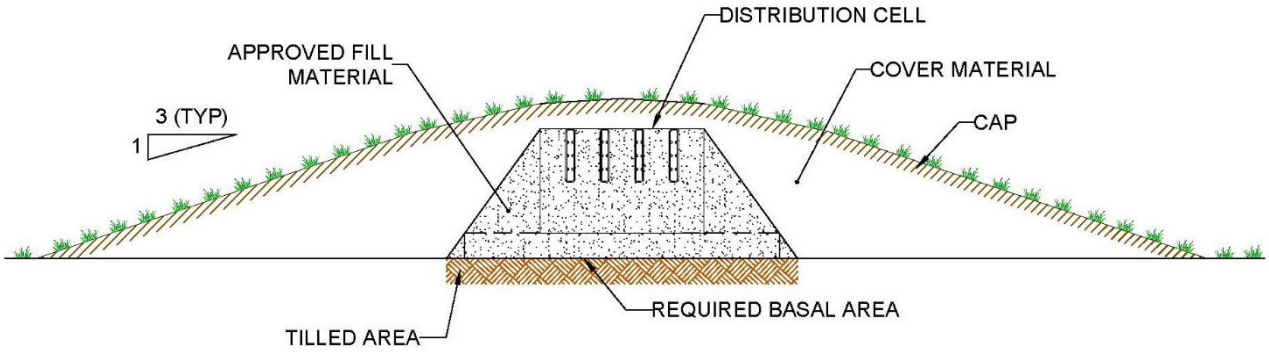


Figure 1. A cross-section of a level AeroFin system mound for POWTS

IV. SOIL AND SITE REQUIREMENTS

The AeroFin System mound design shall be matched to the given soil and site.

The design approach presented in this manual is based on criteria that all applied wastewater is successfully transported away from the system, that it will not affect subsequent wastewater additions, and that the effluent is ultimately treated.

A. Minimum Soil Depth Requirements - The minimum soil factors required for successful AeroFin System mound performance are listed in the introduction and specification section of this manual.

Soil evaluations must be in accordance with ch. SPS 385 of the Wis. Adm. Code. In addition, soil application rates must be in accordance with ch. SPS 383 of the Wis. Adm. Code.

B. Other Site Considerations -

1. Slopes - The slope on which an AeroFin System mound is to be installed may not indicate the direction of groundwater movement. If there is documentation that the direction of groundwater movement is different than the slope of the land, the direction of groundwater movement must be considered during AeroFin System mound design.

On a crested site the fill can be situated such that the effluent can move laterally down both slopes. A level site allows lateral flow in all directions but may present problems as the water

table could rise higher beneath the fill in slowly permeable soils. The sloping site allows the liquid to move in one direction away from the fill. Figure 5 shows a cross-section of an AeroFin System mound and the effluent movement in a slowly permeable soil on a sloping site. Systems that are installed on a concave slope may have a deflection that does not exceed that allowed in Table 2a.

AeroFin System mound components rely on lateral effluent movement through the upper soil horizons. Lateral movement becomes more important as soil permeability decreases.

2. AeroFin System mound location - In open areas, exposure to sun and wind increases the assistance of evaporation and transpiration in the dispersal of the wastewater.

3. Sites with trees and large boulders - Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for installing an AeroFin System mound because of difficulty in preparing the surface and the reduced infiltration area beneath the AeroFin System mound. Areas that are occupied with rock fragments, tree roots, stumps and boulders reduce the amount of soil available for proper treatment. If no other site is available, trees in the basal area of the AeroFin System mound must be cut off at ground level. A larger fill area is necessary when any of the above conditions are encountered, to provide sufficient infiltrative area.

4. Setback distances - The setbacks specified in ch. SPS 383, Wis. Adm. Code for soil subsurface treatment/dispersal component apply to AeroFin System mounds. The distances are measured from the outside edge of the required basal area.

V. FILL AND COVER MATERIAL

A. Fill Material - The fill material and its placement are one of the most important components of the AeroFin System mound. Quality control of the fill material is critical to system performance, each truckload of material must meet specifications for the fill. Fill material is placed below and beside the distribution cell, covering the entire required basal area with a minimum of 6 inches of fill.

Determining whether a proposed fill material is suitable or not requires that a textural analysis be performed. The standard method to be used for performing this analysis conforms to ASTM C-136, Method for Sieve Analysis of Fine and Coarse Aggregates, and ASTM E-11, Specifications for Wire-Cloth Sieves for Testing Purposes, Annual Book of ASTM Standards, Volume 04.02. Information concerning these methods can also be obtained from Methods of Soils Analysis Part 1, C. A. Black, ed., ASA, Monograph #9, American Society of Agronomy, Inc., 1975.

B. Cover material - The cover material is a soil that will allow air exchange while promoting plant growth. The gas exchange will increase the treatment performance of the system by providing oxygen to the wastewater to help ensure aerobic conditions in the AeroFin System mound. The plant growth will provide frost protection in the winter season. Clays may not be used for cover material, as they will restrict oxygen transfer. Often, excavated soil from the site can be used. Seeding or other means must be done to prevent erosion of the AeroFin System mound. Cover material is used to provide the required side slope tapering of 3:1.

VI. DESIGN

A. Location, Size and Shape - Placement, sizing and shaping of the AeroFin System mound and the distribution cell within the AeroFin System mound must be in accordance with this manual.

B. Component Design - Design of the AeroFin System mound is based upon the design wastewater flow and the soil characteristics. It must be sized such that it can accept the design wastewater flow without causing surface seepage or groundwater pollution. Consequently, the basal area, which is the in-situ soil area beneath the fill, must be sufficiently large enough to absorb the effluent into the underlying soil. The system must also be designed to avoid encroachment of the water table into the required minimum unsaturated zone.

Design of the AeroFin System mound includes the following three steps: (A) calculating design wastewater flow, (B) design of the distribution cell within the fill, (C) design of the entire AeroFin mound. This includes calculating total width, total length, system height, distribution lateral location and observation pipes. Each step is discussed. A design example is provided in Section XI, of this manual. The letters for the various dimensions are shown in Figures 2 through 5.

Step A. Design Wastewater Flow Calculations

One and two-family dwellings. Distribution cell size and basal area required for one and two-family dwelling application is determined by calculating the design wastewater flow (DWF). To calculate DWF use, Formulas 1, 2 or 3. Formula 1 is for combined wastewater flows, which consist of blackwater, clearwater and graywater. Formula 2 is for only clearwater and graywater. Formula 3 is blackwater only.

Formula 1	Formula 2	Formula 3
Combined wastewater	Clearwater & Graywater	Blackwater
DWF = 150 gal/day/bedroom	DWF = 90 gal/day/bedroom	DWF = 60 gal/day/bedroom

Public Facilities. Distribution cell size and basal area required for public facilities application is determined by calculating the DWF using Formula 4. Public facility estimated daily wastewater flows can be found in s. SPS 383.43(6), Wis. Adm. Code. Facilities not listed in s. SPS 383.43(6), Wis. Adm. Code can be discussed with the plan reviewer to establish an acceptable daily flow rate volume. Many commercial facilities have high BOD_5, TSS and FOG (fats, oils and grease), which must be pretreated in order to bring their values down to an acceptable range before entering into the AeroFin System mound component described in this manual. Infiltrator shall be contacted for design assistance.

Formula 4

DWF = Sum of each estimated wastewater flow per source per day x 1.5

Where 1.5 = Conversion factor to convert estimated wastewater flow to design wastewater flow

Step B. Design of the AeroFin System Distribution Cell - This section determines the required infiltrative surface area of the distribution cell/fill interface, as well as the dimensions of the distribution network within the fill.

1. Sizing the Distribution Cell – The minimum bottom area of the distribution cell is determined by the dimensions of the distribution network within the fill.

   Design of the AeroFin System distribution network is a three-step process:

   1. Determine the minimum total conduit length
   2. Design the system sand configuration

3. Calculate the minimum distribution cell area required

Step 1: Determine the minimum total conduit length

The minimum length of conduit per bedroom is 80 feet. Determine the minimum total length of conduit from Table 4 below, based on the number of bedrooms. Commercial applications calculate conduit length as DWF divided by 1.88 gpd/lf.

Table 4
MINIMUM TOTAL LENGTH OF CONDUIT

Number of Bedrooms	Minimum Conduit Length Required (ft)
2	160
3	240
4	320
5	400
Each Add'l	80

Step 2: Design the system sand configuration

Use Table 5 below to determine the distribution cell footprint using the minimum length of conduit (determined using Table 4 above) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow. The maximum width of the distribution cell is 10 feet. The maximum length of the distribution cell is dependent on setback requirements and soil evaluation.

Number of Conduit Rows	**Table 5 MINIMUM DISTRIBUTION CELL WIDTH**											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Each Add'l**
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

NOTES:

1. The conduit rows must be extended to within 6 to 12 inches of each end of the bed. The dimensions in Table 4 include 6 inches of system sand in between each of the conduit rows and 6 inches of sand on each outside edge.
2. The conduits are manufactured in 8-foot lengths row lengths can be rounded up to the nearest 8-foot increment to eliminate cutting.
3. Where site conditions or other considerations require multiple beds or multiple distribution cells, the row-specific length dimensions must be equally distributed between all distribution cells.

Step 3: Calculate the minimum distribution cell area required

The minimum distribution cell area required is determined by multiplying the minimum distribution cell width (A) from Table 5 by the selected row length (B) from Step 2 plus system sand on the ends of the rows (6 to 12 in on each end).

2. Distribution Cell Configuration - The AeroFin System mound distribution cell must be longer than it is wide. The maximum width of the distribution cell is 10 feet. The maximum length of the distribution cell is dependent on setback requirements and soil evaluation.

   The distribution cell is aligned with its longest dimension parallel to surface grade contours on sloping sites as required by the specifications of this package so as not to concentrate the effluent into a small area as it moves laterally down slope.

   The bottom of the distribution cell is level or stepped, so no area of the distribution cell is overloaded.

   When the in-situ soil within 12 inches of the fill material has a soil application rate of ≤ 0.3 gal/ft^2/day the linear loading rate may not exceed 4.5 gal/ft/day. To calculate the linear loading rate, use Formula 5.

Formula 5

Linear Loading Rate = DWF ÷ B

Where DWF = Design wastewater flow

B = Distribution cell length

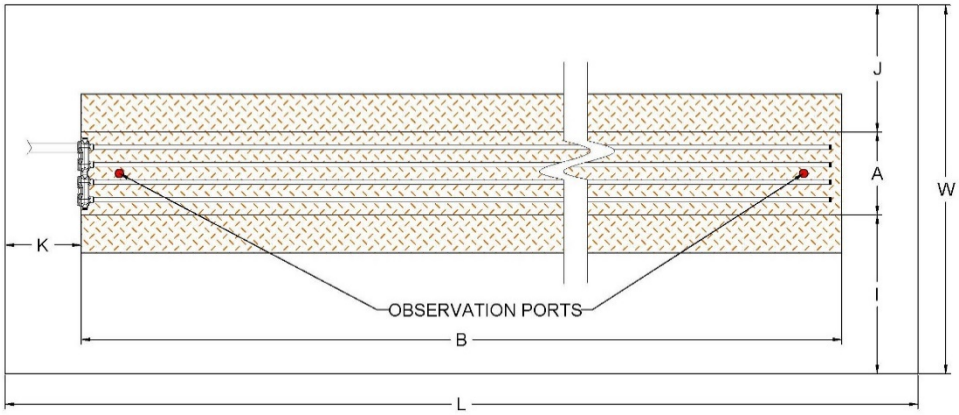


Figure 2. Detailed plan view of a level AeroFin System mound

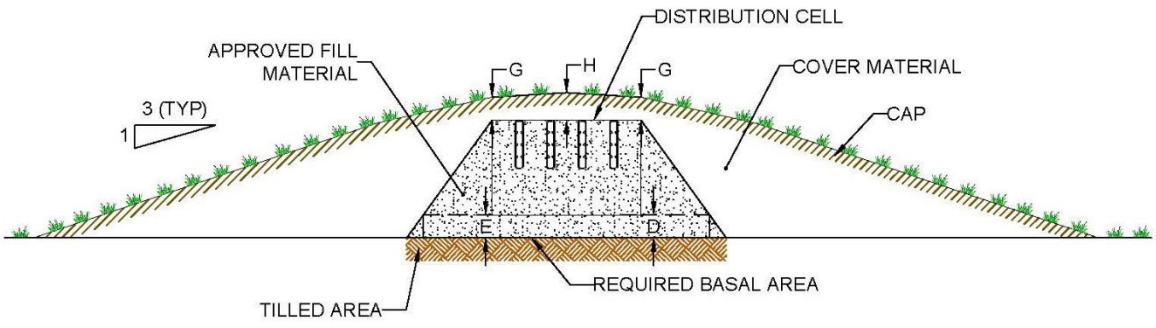


Figure 3. Detailed cross-section of a level AeroFin System mound

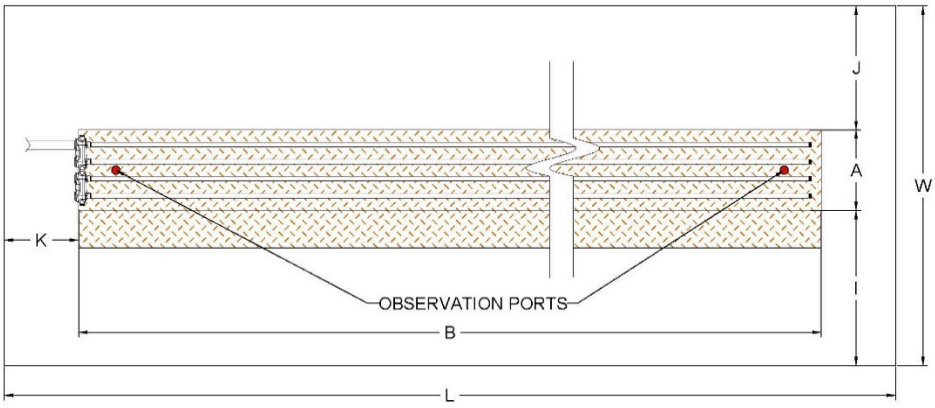


Figure 4. Detailed plan view of a sloping AeroFin System mound

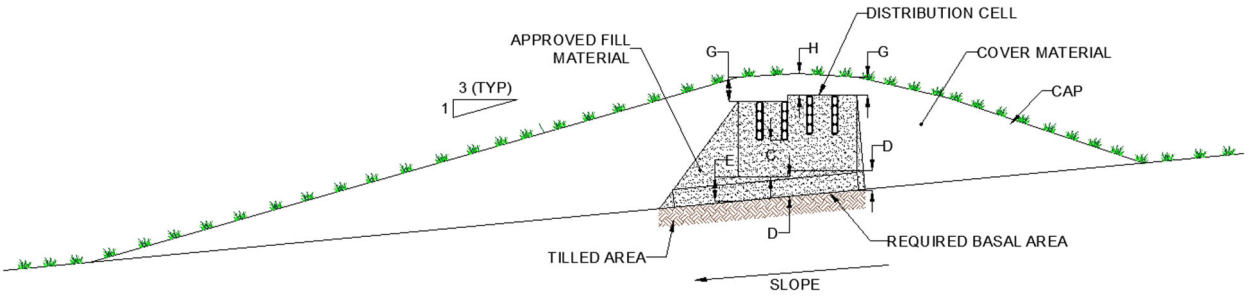


Figure 5. Detailed cross-section of a sloping AeroFin System mound

Step C. Sizing the AeroFin System Mound

1. Mound Height - The AeroFin System mound height on sloping sites is calculated using Formula 6.

   Formula 6

   AeroFin System Mound Height = (D + E) ÷ 2 + F + H

   Where: D = Sand fill depth
   E = Down slope fill depth
   F = Distribution cell depth
   H = Cover material depth

2. Fill Depth - The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-3 WI Adm. Code. Beneath the 12 inches (1 ft depth credit) of sand required for the AeroFin System, any additional sand fill that is required is on an inch-by-inch basis. For example if 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.

   For sloping sites, the fill depth below the down slope edge of distribution cell (E) ≥ D + [% slope of original grade as a decimal x width of distribution cell (A)]

3. Distribution Cell Depth - The distribution cell depth (F) provides wastewater storage within the distribution cell. For an AeroFin System mound, the distribution cell depth (F) shall be defined as the height of the product and system sand.

   Formula 7

   Distribution cell depth (F)= 24.75 inches)

4. Cover Material - The cover material (G & H) provides frost protection and a suitable growth medium for vegetation. For design purposes, use a depth of 12 inches above the center of the distribution cell (H) and 6 inches above the outer edge of the distribution cell (G).

   Cover material depth at product distribution cell center (H) $\geq$ 12 inches

   Cover material depth at product distribution cell edges (G) $\geq$ 6 inches

   Cover material may also be used above and beside the fill used over the required absorption area as well as for side slopes of the mound. Side slopes may not be steeper than 3:1 over the basal area, (i.e. 3 feet of run for every 1 foot of rise).

5. Fill Length and Width - The length and width of the fill are dependent upon the length and width of the required absorption area, fill depth and side slopes of the fill.

   The fill length of the cover material consists of the end slopes (K) and the distribution cell length (B). The fill width consists of the up-slope width (J), the distribution cell width (A), and the down slope width (I). On sloping sites, the up-slope width (J) is less while the down slope width (I) is greater than on a level site to maintain the 3:1 side slope (see Fig. 2). To calculate the up slope and down slope widths when a 3:1 side slope is maintained, multiply the calculated width by the correction factor found by using the following equations or the correction factor listed in Table 6.

   Up slope correction factor = 100 ÷ [100 + (3 x % of slope)]
   Down slope correction factor = 100 ÷ [100 - (3 x % of slope)]

   The most critical dimensions of the fill are: fill depths (D) & (E), distribution cell length (B), distribution cell width (A), and the down slope width (I).

   End slope width (K) = Total fill at center of distribution cell {[(D + E) ÷2] + F + H} x horizontal gradient of selected side slope (3 if 3:1 side-slope)

   Fill Length (L) = Distribution cell length (B) + 2 x end slope width (K)

   Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x horizontal gradient of side slope (3 if 3:1) x slope correction factor {100 ÷ [100 + (3 x % of slope)] if 3:1}

   Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x horizontal gradient of side slope (3 if 3:1) x slope correction factor {100 ÷ [100 - (3 x % of slope)] if 3:1}

   Fill Width (W) = Up slope width (J) + down slope width (I) + width of distribution cell (A)

Table 6 Down slope and up slope width correction factors		
Slope %	Down slope correction factor	Up Slope correction factor
0	1.00	1.00
1	1.03	0.97
2	1.06	0.94
3	1.10	0.915
4	1.14	0.89
5	1.18	0.875
6	1.22	0.85
7	1.27	0.83
8	1.32	0.81
9	1.37	0.79
10	1.43	0.77
11	1.49	0.75
12	1.56	0.735
13	1.64	0.72
14	1.72	0.705
15	1.82	0.69
16	1.92	0.675
17	2.04	0.66
18	2.17	0.65
19	2.33	0.64
20	2.50	0.625
21	2.70	0.61
22	2.94	0.60
23	3.23	0.59
24	3.57	0.58
25	4.00	0.57

6. Basal Area - The basal area is the in-situ soil/fill interface between the soil and the fill material. Its function is to accept the effluent from the fill, assist the fill in treating the effluent, and transfer the effluent to the subsoil beneath the fill or laterally to the subsoil outside of the fill.

   The soil infiltration rate of the in-situ soil determines how much basal area is required. When the wastewater applied to fill material or in-situ soil has gone through the AeroFin distribution cell it has values for BOD_5 and TSS of $\leq$ 30 mg/L so the soil application rates for the basal area may be those specified in Table 383.44-2 for maximum monthly average BOD_5 and TSS of $\leq$ 30 mg/L. These rates are provided in Table 7 below and are labeled as "Design Loading Rates". Linear loading rates for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill must be less than ≤ 4.5 gal/ft/day. Distribution cell adjustments may be necessary to ensure linear loading requirements are met.

   For level sites, the total basal area, excluding end slope area [(B) x (W)] beneath the fill and soil cover is available for effluent absorption into the soil (see Figure 6a.). For sloping sites, the available basal area is the area down slope of the upslope edge of the distribution cell to the down slope edge of the fill and soil cover or (A + I) x (B) (see Figure 6b.). The upslope width and end slopes are not included as part of the total basal area.

Table 7						
Maximum Soil Application Rates Based Upon Morphological Soil Evaluation (gpd/ft²)						
Soil Characteristics			Soil Application Rates (to determine LLR requirements)		Design Loading Rate (gpd/ft²)	
Texture[c]	Structure[d]					
	Shape	Grade				
COS, S LCOS, LS	---	0	0.7[a]	0.5[b,c]	1.6[a]	0.5[b]
FS, LFS	---	0	0.5		1.0	
VFS, LVFS	---	0	0.4		0.6	
COSL, SL	---	0M	**0.2**		0.6	
	PL	1	0.4		0.6	
		2, 3	**0.0**		0.2	
	PR, BK, GR	1	0.4		0.7	
		2, 3	0.6		1.0	
FSL, VFSL	---	0M	**0.2**		0.5	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	**0.0**		0.6	
	PR, BK, GR	2, 3	0.4		0.8	
L	---	0M	**0.2**		0.5	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	0.4		0.6	
	PR, BK, GR	2, 3	0.6		0.8	
SIL	---	0M	**0.0**		0.2	
	PL	2, 3	**0.0**		0.2	
	PL, PR, BK, GR	1	0.4		0.6	
	PR, BK, GR	2, 3	0.6		0.8	
SI	---	---	**0.0**		0.0	
SCL, CL, SICL	---	0M	**0.0**		0.0	
	PL	1, 2, 3	**0.0**		0.2	
	PR, BK, GR	1	**0.0**		0.3	
		2, 3	0.4		0.6	
SC, C, SIC	---	0M	**0.0**		0.0	
	PL	1, 2, 3	**0.0**		0.0	
	PR, BK, GR	1	**0.0**		0.0	
		2, 3	**0.2**		0.3	

Note a: With ≤60% rock fragments

Note b: With >60 to

Note c:
- COS – Coarse Sand
- S–Sand
- Coarse Sand
- LS – Loamy Sand
- FS – Fine Sand
- LFS – Loamy Fine Sand
- VFS – Very Fine Sand
- LVFS – Loamy Very Fine Sand
- COSL – Coarse Sandy Loam
- SL – Sandy Loam
- FSL – Fine Sandy Loam
- VFSL – Very Fine Sandy Loam
- L – Loam
- SIL – Silt Loam
- SI – Silt
- SCL – Sandy Clay Loam LCOS – Loamy
- CL – Clay Loam
- SICL – Silty Clay Loam
- SC – Sandy Clay
- C – Clay
- SIC – Silty Clay

Note d:
- PL – Platy
- PR – Prismatic
- BK – Blocky
- GR – Granular
- M – Massive
- 0 – Structureless
- 1 – Weak
- 2 – Moderate
- 3 – Strong

It is important to compare the required basal area to the available basal area. The available basal area must equal or exceed the required basal area.

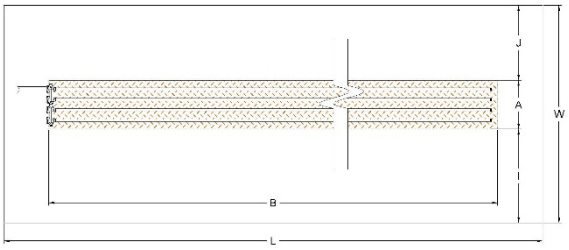


Figure 6a. Level site

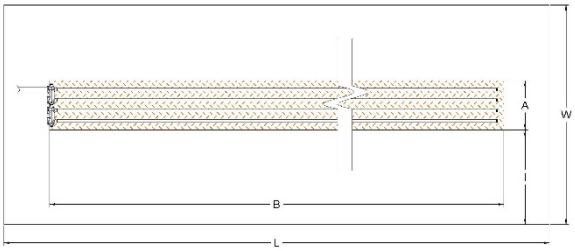


Figure 6b. One direction slope

Basal area required = DWF ÷ Infiltration rate or design loading rate of in-situ soil

Basal area available = B x W on a level site or = B x (A+I) on a sloping site.

If sufficient area is not available for the given design and site conditions, corrective action is required to increase (J) and (I) on level sites or (I) on sloping sites.

7. Location of the observation pipes - Each product distribution cell shall have two observation pipes, located at opposite ends of the distribution cell near the dispersal cell ends.

   Observation pipes will be installed in each distribution cell so as to be representative of a cell's hydraulic performance.

   - Be located such that there a minimum of two installed in each dispersal cell at opposite ends from one another
   - Be located near the dispersal cell ends
   - Be at least 6 inches from the end wall and sidewall
   - Be installed at an elevation to view the horizontal level infiltrative surface within the dispersal cell

   Observation pipes may be located less than 6 inches from end walls or side walls if specified in state—approved manufacturers' installation instructions.

Step D. Distribution Network and Dosing System - The use of pressure distribution is prohibited with AeroFin. Effluent shall be delivered to the AeroFin System mound by pumping to a distribution box followed by gravity flow into the distribution manifold.

VII. SITE PREPARATION AND CONSTRUCTION

Procedures used in the construction of an AeroFin System mound are just as critical as the design of the system. A good design with poor construction results in system failure. It is emphasized that the soil only be tilled when it is not frozen, and the moisture content is low to avoid compaction and puddling. The construction plan to be followed includes:

A. Equipment - Proper equipment is essential. Tracked type equipment that will not compact the AeroFin System mound area or the down slope area is required.

B. Sanitary Permit - Prior to the construction of the system, a sanitary permit, obtained for the installation must be posted in a clearly visible location on the site. Arrangements for inspection(s) must also be made with the department or governmental unit issuing the sanitary permit.

C. Construction Procedures

1. Check the moisture content of the soil to a depth of 8 inches. Smearing and compacting of wet soil will result in reducing the infiltration capacity of the soil. Proper soil moisture content can be determined by rolling a soil sample between the hands. If it rolls into a 1/4-inch wire, the site is too wet to prepare. If it crumbles, site preparation can proceed. If the site is too wet to prepare, do not proceed until it dries.

2. Lay out the fill area on the site so that the distribution cell runs perpendicular to the direction of the slope.

3. Establish the original grade elevation(s) (surface contour) along the upslope edge of the distribution cell area(s) D. See Figure 5. This elevation is used throughout the AeroFin System mound construction as a reference to determine the bottom of the distribution cell, lateral elevations, etc., and is referenced to the permanent benchmark for the project. A maximum of 4 inches of sand fill may be tilled into the surface.

4. Cut trees flush to the ground and leave stumps, remove surface boulders that can be easily rolled off, remove vegetation over 6 inches long by mowing and removing cut vegetation. Prepare the site by breaking up, perpendicular to the slope, the top 7-8 inches to eliminate any surface mat that could impede the vertical flow of liquid into the in-situ soil. When using a moldboard plow, it should have as many bottoms as possible to reduce the number of passes over the area to be tilled and minimize compaction of the subsoil. Tilling with a moldboard plow is done along contours. Chisel type plowing is highly recommended especially in fine textured soils. Rototilling (or other means that pulverize the soil) and use of a frost tooth are not acceptable. The important point is that a rough, unsmeared surface be left. The sand fill will intermingle between the clods of soil, which improves the infiltration rate into the natural soil.

   Immediate application of at least 6 inches of fill material applied to the basal area is required after tilling. All vehicular traffic is prohibited on the tilled area. For sites where the effluent may move laterally, vehicle traffic is also prohibited for 15 ft. down slope and 10 ft. on both sides of level sites. If it rains after the tilling is completed, wait until the soil dries out before continuing construction and contact the local inspector for a determination on the damage done by rainfall.

5. Place the approved sand fill material, in the area designated as the required basal area being careful to leave adequate perimeter area, not covered by the sand fill, on which to place the soil cover. There should a minimum of two feet of roughed up soil adjacent to the AeroFin System basal area perimeter that is not covered by the sand fill. This area serves to tie the soil cover into the natural surface material that has been tilled and helps seal the toe from leakage. Work from the end and up slope sides. This will avoid compacting the soils on the down slope side, which, if compacted, affects lateral movement away from the fill and could cause surface seepage at the toe of the fill on slowly permeable soils.

6. Move the fill material into place using a small track type tractor with a blade or a large backhoe that has sufficient reach to prevent compaction of the tilled area. Do not use a tractor/backhoe having tires. Always keep a minimum of 6 inches of fill material beneath tracks to prevent compaction of the in-situ soil.

7. Place the fill material to the required depth.

8. Form the distribution cell. Hand level the bottom of the distribution cell per design.

9. Shape the sides with additional fill to the desired slopes.
10. Install the AeroFin products and distribution piping per instructions. Distribution pipe should be connected to the distribution manifold per the design.
11. Install observation pipes in each distribution cell of AeroFin products with the bottom 6 inches of the observation pipe slotted. Installations of all observation pipes include a suitable means of anchoring (Figures 7 and 8).

Observation Pipe Detail

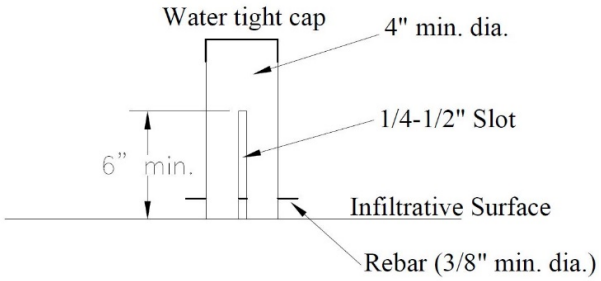


Figure 7

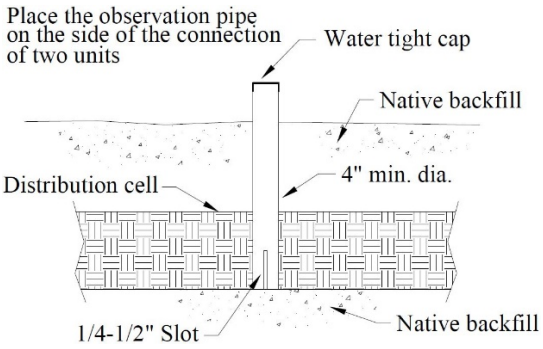


Figure 8

12. Place approved cover material over the system per Table 1.
13. Complete final grading to divert surface water drainage away from AeroFin mound. Sod or seed and mulch all disturbed areas.

VIII. OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

A. The component owner is responsible for the operation and maintenance of the component. The county, department or POWTS service contractor may make periodic inspections of the components, checking for surface discharge, treated effluent levels, etc.

   The owner or owner's agent is required to submit necessary maintenance reports to the appropriate jurisdiction and/or the department.

B. Design approval and site inspections before, during, and after the construction are accomplished by the county or other appropriate jurisdictions in accordance to ch. SPS 383 of the Wis. Adm. Code.

C. Routine and preventative maintenance aspects:

   1. Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
   2. Inspections of the AeroFin System mound component performance are required at least once every three years. These inspections include checking the liquid levels in the observation pipes and examination for any seepage around the AeroFin System mound component.
   3. Winter traffic on the AeroFin System mound is not advised to avoid frost penetration and to minimize compaction.

4. A good water conservation plan within the house or establishment will help assure that the AeroFin System mound component will not be overloaded.

D. User's Manual: A user's manual is to accompany the component. The manual is to contain the following as a minimum:

1. Diagrams of all components and their location. This should include the location of the reserve area, if one is provided.
2. Names and phone numbers of local health authority, component manufacturer or POWTS service contractor to be contacted in the event of component failure or malfunction.
3. Information on periodic maintenance of the component, including electrical/mechanical components.
4. Information on limited activities on reserve area if provided.
5. Supply a copy of the Infiltrator Users guide: *A Guide to the Proper Care and Maintenance of Your Onsite Wastewater Treatment System*.

E. Performance monitoring must be performed on AeroFin System mounds installed under this manual.

1. The frequency of monitoring must be:

a. At least once every three years following installation and,

b. At time of problem, complaint, or failure.

2. The minimum criteria addressed in performance monitoring of AeroFin System mounds are:

a. Type of use.
b. Age of system.
c. Nuisance factors, such as odors or user complaints.
d. Mechanical malfunction within the system including problems with valves or other mechanical or plumbing components.
e. Material fatigue or failure, including durability or corrosion as related to construction or structural design.
f. Neglect or improper use, such as exceeding the design rate, poor maintenance of vegetative cover, inappropriate cover over the AeroFin mound, or inappropriate activity over the AeroFin mound.
g. Installation problems such as compaction or displacement of soil, improper orientation or location.
h. Pretreatment component maintenance, including dosing frequency, structural integrity, groundwater intrusion or improper sizing.
i. Dose chamber maintenance, including improper maintenance, infiltration, structural problems, or improper sizing.
j. Distribution piping network, including improper maintenance or improper sizing.
k. Ponding in distribution cell, prior to the pump cycle, is evidence of development of a clogging mat or reduced infiltration rates.
l. Siphon or pump malfunction including dosing volume problems, breakdown, burnout, or cycling problems.

m. Overflow/seepage problems, as shown by evident or confirmed sewage effluent, including backup if due to clogging.

3. Reports are to be submitted in accordance with ch. SPS 383, Wis. Adm. Code.

IX. REFERENCES

"Wisconsin Mound Soil Absorption System: Siting, Design and Construction." Converse, J.C., and E. J. Tyler. Publication 15.22, Small Scale Waste Management Project., 1 Agriculture Hall, University of Wisconsin, Madison, WI.

"Mound Component Manual for Private Onsite Wastewater Treatment Systems." State of Wisconsin Department of Safety and Professional Services Division of Industry Services. Version 2.1, May 2022.

X. AeroFin SYSTEM MOUND WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Elevations and distances on the site so that slope, contours, and available areas can be determined.
- Description of several soil profiles where the component will be located.
- Limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - ___%

Occupancy – One or Two-Family Dwelling - ___(# of bedrooms)

Public Facility - _____ gal/day (Estimated wastewater flow)

Depth to limiting factor - _____inches

Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code - ____ inches

In-situ soil application rate used - _____ gpd/ft^2

FOG value of effluent applied to component - _____ mg/L

BOD_5 value of effluent applied to component - <30 mg/L

TSS value of effluent applied to component - <30 mg/L

Fecal Coliform monthly geometric mean value of effluent applied to component > 10^4 CFU/100ml __Yes __No

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling		
Combined wastewater flow: DWF = 150 gal/day/bedroom x # of bedrooms = 150 gal/day/bedroom x ___# of bedrooms = _____ gal/day	Clearwater and graywater only: DWF = 90 gal/day/bedroom x # of bedrooms = 90 gal/day/bedroom x # of bedrooms = _____ gal/day	Blackwater only: DWF = 60 gal/day/bedroom x # of bedrooms = 60 gal/day/bedroom x # of bedrooms = _____ gal/day
Public Facilities		
DWF = Estimated wastewater flow x 1.5 = _____ gal/day x 1.5 = _____ gal/day		

C. DESIGN OF THE AeroFin SYSTEM DISTRIBUTION CELL

a. Determine the minimum total conduit length

Determine the minimum total length of conduit from Table 4, based on the number of bedrooms. Commercial applications calculate conduit length by DWF divided by 1.88 gpd/lf.

Table 4 MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	**Minimum Conduit Length Required (ft)**
2	160
3	240
4	320
5	400
Each Add'l	80

b. Design the system sand configuration

Use Table 5 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 4) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Number of Conduit Rows	**Table 5 MINIMUM DISTRIBUTION CELL WIDTH**											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Each Additional**
Minimum Width (ft)	1.88	2.57	3.25	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	39.0	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

c. Check the distribution cell length (B)

For linear loading rate:

Linear Loading Rate ≤ DWF ÷ Cell length (B) or effective cell length for concave mound

Linear Loading Rate ≤ ___gal/day ÷ __ft

Linear Loading Rate ≤ ___ gal/ft

Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill must be less than ≤ 4.5 gal/ft/day.

Is the linear loading rate ≤ what is allowed? __ yes ____no. If no, then the length and/or width of the distribution cell must be changed so it does.

Distribution cell length (B) = Design Wastewater Flow ÷ Maximum Linear Loading Rate

Distribution cell length (B) = ___ gal/day ÷ ___ gal/day

Distribution cell length (B) = ___ ft

Distribution cell total width (A) = ___ft.^{2} (Distribution cell area) ÷ ft. (B)

Distribution cell total width (A) = ___ft.

D. DESIGN OF ENTIRE AeroFin MOUND AREA

1. Fill Depth

a. The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-3 WI Adm. Code. Beneath 12 inches (for 1 ft depth credit) of sand required for the AeroFin distribution cell any additional sand fill that is required is on an inch-by-inch basis. If 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.

1) Depth at up slope edge of distribution cell (D) = distance required by Table 383.44-3, Wis. Adm. Code, minus distance in inches to limiting factor

Calculation with 1 ft depth credit.

D = _____ inches - _____ inches to limiting factor – 12 inches depth credit

D = _____ inches

2) Depth at down slope edge of distribution cell (E)

E = Depth at up slope edge of distribution cell (D) + (% natural slope expressed as a decimal x distribution cell width (A))

E = D + (% natural slope expressed as a decimal x A)

E = _____ inches + (___ x ____ feet x 12 inches/ft)

E = _____ inches

b. Distribution cell depth for AeroFin product distribution cell.

System with 1 ft depth credit:
F = AeroFin conduit diameter + system sand height = 12.75 inches + 12 inches
F = 24.75 inches

c. Cover material

1) Depth at distribution cell center (H) ≥ 12 inches.
2) Depth at distribution cell edges (G) ≥ 6 inches

2. AeroFin System mound length

   a. End slope width (K) = Total fill at center of distribution cell x horizontal gradient of side slope

      K = {([(D + E) ÷ 2] + F + H) x horizontal gradient of side slope} ÷ 12 inches/foot

      K = {([(___ inches + _____ inches) ÷ 2] + _____ inches + _____ inches) x ___} ÷ 12 inches/ft

      K = _____ ft

   b. AeroFin System mound length (L) = Distribution cell length + (2 x end slope width)

      L = B + 2K

      L = _____ ft + (2 x _____ ft)

      L = _____ feet

3. AeroFin System mound width

   a. Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x horizontal gradient of side slope x slope correction factor {100 ÷ [100 + (gradient of side slope x % of slope) or (value from Table 6)]}

      J = (D + F + G) x horizontal gradient of side slope x slope correction factor {(100 ÷ [100 + (gradient of side slope x % of slope)] or (value from Table 6)]}

      J = (___ in + ____ in + ___ in) ÷ 12 in/ft x ____ x {(100 ÷ [100 + (____ x ___)]) or (__)}

      J = _____ feet

   b. Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 6)]}

      I = (E + F + G) x horizontal gradient of side slope x down slope correction factor {(100 ÷ [100 - (gradient of side slope x % of slope)]) or (value from Table 6)]}

      I = (___ in + ____ in + ____ in) ÷ 12 in/ft x __3__x {(100 ÷ [100 - (___ x ___)]) or (___)}

      I = _____ in ÷ 12 in/ft x __3__x {(100 ÷ [100 - (____ x ___)]) or (_ __)}

      I = _____ feet

   c. AeroFin System mound width (W) = Up slope width (J) + Distribution cell width (A) + Down slope width (I)

      W = J + A + I

      W = _____ ft + ____ ft + _____ ft

      W = _____ feet

4. Check the basal area

   a. Basal area required = Daily wastewater flow ÷ soil application rate of in-situ soil (The soil application rate may be that which is listed for BOD5 and TSS > or ≤ 30 mg/L depending on wastewater characteristics or fill depth below distribution cell. See Table 7.)

      Basal area required = _____ gal/day ÷ _____ gpd/ft^2

      = _____ft^2

   b. Mound footprint

      1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (A + I)

         = _____ ft x [(_____ x _____ ft) + ({ _____ -1} x _____ ft) + _____ ft]

         = _____ ft x (_____ft + _____ ft + _____ ft)

         = _____ ft x _____ ft

         = _____ ft^2

      2) Level site = Cell length (B) x total AeroFin System mound width (W)

         = _____ft x _____ ft

         = _____ ft^2

   c. Is mound footprint sufficient? _____ yes _____ no

      Basal area required ≤ mound footprint

      _____ft^2 ≤ _____ft^2

      See d. for recalculation of basal area.

   d. Mound footprint available (recalculation of mound footprint)

      1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (A+I)

         = ___ ft x [(___ x ___ ft) + ({____ -1} x _____ ft) + _____ ft]

         = ___ ft x (___ ft + ____ ft + _____ ft)

         = _____ ft x _____ ft

         = _____ ft^2

      2) Level site = Cell length (B) x total AeroFin System mound width (W)

         = _____ft x _____ ft

         = _____ ft^2

5. Determine the location of observation pipes along the length of distribution cell.

XI. EXAMPLE AeroFin SYSTEM MOUND WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Elevations and distances on the site so that slope, contours, and available areas can be determined.
- Description of several soil profiles where the component will be located.
- Limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - 0 %

Occupancy – One or Two-Family Dwelling - 3 (# of bedrooms)

Public Facility - _____ gal/day (Estimated wastewater flow)

Depth to limiting factor - 25 inches

Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code - 36 inches

In-situ soil application rate used - 1.6 gpd/ft^2

FOG value of effluent applied to component - <30 mg/L

BOD_5 value of effluent applied to component - <30 mg/L

TSS value of effluent applied to component - <30 mg/L

Fecal Coliform monthly geometric mean value of effluent applied to component > 10^4 CFU/100ml __Yes X No

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling		
Combined wastewater flow: DWF = 150 gal/day/bedroom x # of bedrooms = 150 gal/day/bedroom x 3 # of bedrooms = 450 gal/day	Clearwater and graywater only: DWF = 90 gal/day/bedroom x # of bedrooms = 90 gal/day/bedroom x # of bedrooms = _____ gal/day	Blackwater only: DWF = 60 gal/day/bedroom x # of bedrooms = 60 gal/day/bedroom x # of bedrooms = _____ gal/day
Public Facilities		
DWF = Estimated wastewater flow x 1.5 = _____ gal/day x 1.5 = _____ gal/day		

C. DESIGN OF THE AeroFin SYSTEM DISTRIBUTION CELL

a. Determine the minimum total conduit length

The minimum total length of conduit from Table 4, based on 3 bedrooms is 240 feet.

Table 4 MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	**Minimum Conduit Length Required (ft)**
2	160
3	**240**
4	320
5	400
Each Add'l	80

b. Design the system sand configuration

Using 4 60-foot rows provides the 240 ft minimum conduit required. 4 rows of conduit require a minimum distribution cell width of 3.25 ft.

Number of Conduit Rows	**Table 5 MINIMUM DISTRIBUTION CELL WIDTH**											
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Each Additional**
Minimum Width (ft)	1.88	2.57	**3.25**	3.94	4.63	5.32	6.00	6.69	7.38	8.07	8.75	0.69
Minimum Width (in)	22.5	30.8	**39.0**	47.2	55.5	63.8	72.0	80.2	88.5	96.8	105.0	8.3

c. Check the distribution cell length (B)

For linear loading rate:

Linear Loading Rate ≤ DWF ÷ Cell length (B) or effective cell length for concave mound

Linear Loading Rate ≤ _____gal/day ÷ ____ft

Linear Loading Rate ≤ _____ gal/ft

Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill must be less than ≤ 4.5 gal/ft/day.

Is the linear loading rate ≤ what is allowed? ___ yes ____no. If no, then the length and/or width of the distribution cell must be changed so it does.

Distribution cell length (B) = Design Wastewater Flow ÷ Maximum Linear Loading Rate

Distribution cell length (B) = _____ gal/day ÷ _____ gal/day

Distribution cell length (B) = _61__ ft

Distribution cell total width (A) = _____ft.^{2} (Distribution cell area) ÷ ft. (B)

Distribution cell total width (A) = _3.25_ft.

D. DESIGN OF ENTIRE AeroFin MOUND AREA

1. Fill Depth

a. The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-3 WI Adm. Code. Beneath the 12 inches of sand required for the AeroFin distribution cell any additional sand fill that is

required is on an inch-by-inch basis. If 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.

1) Depth at up slope edge of distribution cell (D) = distance required by Table 383.44-3, Wis. Adm. Code, minus distance in inches to limiting factor

Calculation with 1 ft depth credit.

D = 36 inches - 24 inches to limiting factor – 12 inches depth credit

D = 0 inches

2) Depth at down slope edge of distribution cell (E)

E = Depth at up slope edge of distribution cell (D) + (% natural slope expressed as a decimal x distribution cell width (A))

E = D + (% natural slope expressed as a decimal x A)

E = 0 inches + (0 x 3.25 feet x 12 inches/ft)

E = 0 inches

c. Distribution cell depth for AeroFin product distribution cell.

System with 1 ft depth credit:
F = AeroFin conduit + system sand height = 12.75 inches + 12 inches
F = 24.75 inches

c. Cover material

1) Depth at distribution cell center (H) ≥ 12 inches.
2) Depth at distribution cell edges (G) ≥ 6 inches

2. AeroFin System mound length

a. End slope width (K)= Total fill at center of distribution cell x horizontal gradient of side slope

K = {([(D + E) ÷ 2] + F + H) x horizontal gradient of side slope} ÷ 12 inches/foot

K = {([(0 inches + 0 inches) ÷ 2] + 24.75 inches + 12 inches) x 3 } ÷ 12 inches/ft

K = 9.19 ft

b. AeroFin System mound length (L) = Distribution cell length + (2 x end slope width)

L = B + 2K

L = 60 ft + (2 x 9.19 ft)

L = 78.4 feet

3. AeroFin System mound width

a. Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x Horizontal gradient of side slope x Slope correction factor {(100 ÷ [100 + (gradient of side slope x % of slope)]) or (value from Table 6)}

J = (D + F + G) x horizontal gradient of side slope x slope correction factor {(100 ÷ [100 + (gradient of side slope x % of slope)]) or (value from Table 6)}

J = (0 in + 24.75 in + 6 in) ÷ 12 in/ft x 3 x {(100 ÷ [100 + (3 x 0)])or (1__)}

J = 30.75 in ÷ 12 in/ft x 3 x {(100 ÷ [100 + (3 x 0)])or (1__)}

J = 7.7 feet

b. Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {(100 ÷ [100 - (gradient of side slope x % of slope)]) or (value from Table 6)}

I = (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {(100 ÷ [100 - (gradient of side slope x % of slope)]) or (value from Table 6)}

I = (0 in + 24.75 in + 6 in) ÷ 12 in/ft x 3 x {(100 ÷ [100 - (3 x 0)]) or (_1__)}

I = 30.75 in ÷ 12 in/ft x 3 x {(100 ÷ [100 - (3 x 0)]) or (_1__)}

I = 7.7 feet

c. AeroFin System mound width (W) = Up slope width (J) + Distribution cell width (A) + Down slope width (I)

W = J + A + I

W = 7.7 ft + 3.25 ft + 7.7 ft

W = 18.7 feet

4. Check the basal area

a. Basal area required = Daily wastewater flow ÷ soil application rate of in-situ soil (The soil application rate may be that which is listed for BOD5 and TSS > or ≤ 30 mg/L depending on wastewater characteristics or fill depth below distribution cell. See Table 7.)

Basal area required = 450 gal/day ÷ 1.6 gpd/ft^2

= 281.25 ft^2

= 281.25 ft^2 ÷ 61 ft (B) = 4.61 ft wide minimum
SSEs required: 4.61 – 3.25 = 1.36 ÷ 2 (level system) = 0.68. Round up to .75 for ease of construction. Basal area width = 3.25 + (0.75 x 2) = 4.75

Basal area provided = 4.75 x 61 = 289.75 ft^2

c. Mound footprint

1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] or (A + I)

= _____ ft x [(__ x ___ ft) + ({ ___ -1} x _____ ft) + _____ ft]

= _____ ft x (__ft + ___ ft + _____ ft)

= _____ ft x _____ ft

= _____ ft^2

2) Level site = Cell length (B) x total AeroFin System mound width (W)

= 60 ft x 18.7 ft

= 1,122 ft^2

c. Is mound footprint sufficient? x yes _____ no

Basal area provided ≤ mound footprint

289.75 ft^2 ≤ 1,122 ft^2

See d. for recalculation of basal area.

d. Basal area available (recalculation of basal area)

1) Sloping site: Basal area width = Basal area required ÷ Cell length (B)

= _____ ft^2 ÷ ___ ft

= _____ ft

Note: Basal area width (A + I) extends entirely on the downslope side of the distribution cell on sloping sites.

2) Level site = Basal area width = Basal area required ÷ Cell length (B)

= _____ ft^2 ÷ ___ ft

= _____ ft

Note: Basal area width (A + I + J) extends equally on both sides of the distribution cell.

5. Determine the location of observation pipes along the length of distribution cell.

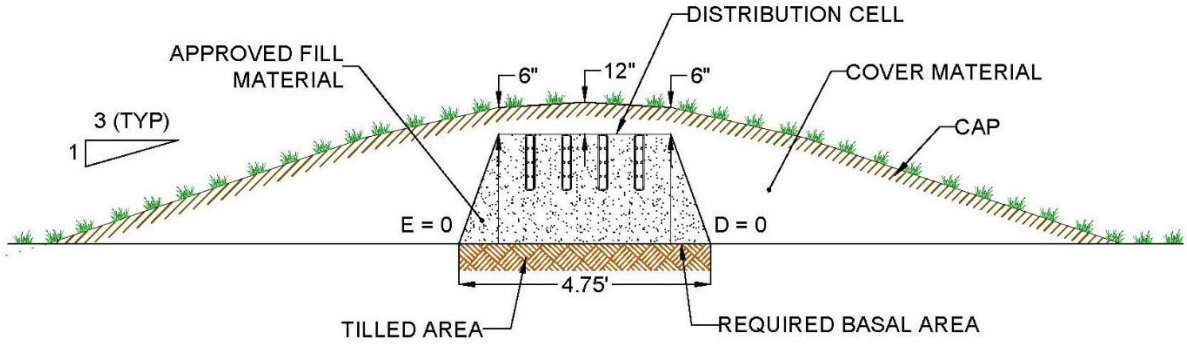


Figure 7. Detailed cross-section of AeroFin system mound example

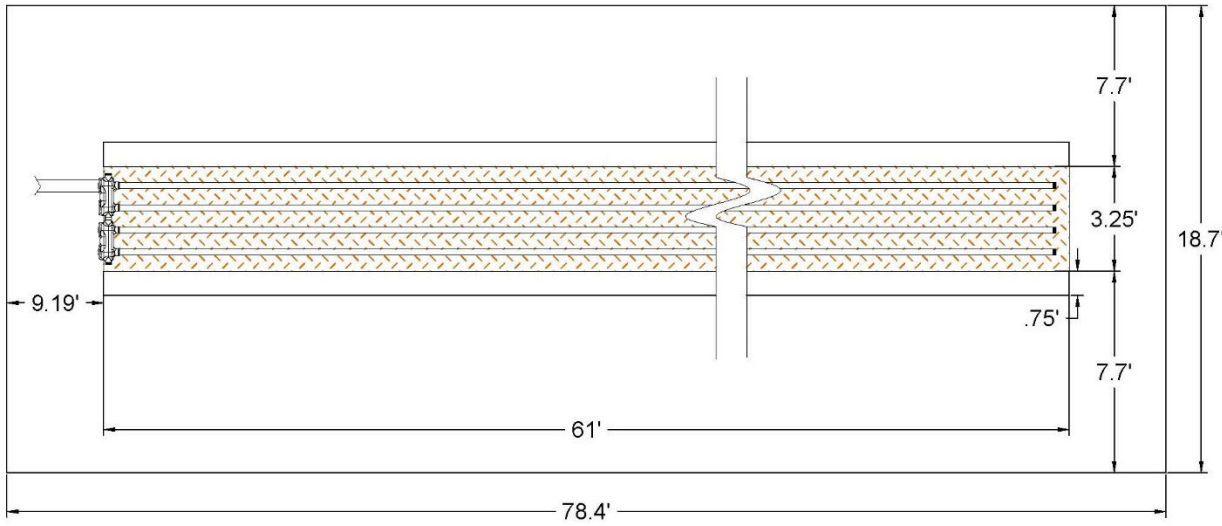


Figure 8. Detailed plan view of AeroFin system mound example

XII. PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

In order to install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a **general guide**. Not all needed information may be included in this list. Some of the information may not be required to be submitted due to the design of the system. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a particular project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

<u>General Submittal Information</u>

- Photocopies of soil report forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
- Submittal of additional information requested during plan review or questions concerning a specific plan must be referenced to the Plan Identification indicator assigned to that plan by the reviewing agency.
- Plans or documents must be permanent copies or originals.

Forms and Fees

- Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.

Soils Information

- Complete Soils and Site Evaluation Report (form # SBD-8330) for each soil boring described; signed and dated by a certified soil tester, with license number.
- Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

Documentation

- Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
- Master Plumbers must sign, date and include their license number on each page of the submittal or provide an index page, which is signed, sealed and dated.
- A detailed project description must be submitted with all commercial plans. Any facility creating non-domestic wastewater may require concurrence approval from the WI DNR. Please check with a state plan reviewer if there are any questions.
- Submittals if on paper must measure at least 8-1/2 by 11 inches.
- Designs that are based on department approved component manual(s) must include reference to the manual by name, publication number and published date.

Plot Plan

- Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
- Slope directions and percent in system area.
- Benchmark and north arrow.
- Setbacks indicated as per appropriate code.
- Two-foot contours or other appropriate contour interval within the system area.
- Location information; legal description of parcel must be noted.
- Location of any nearby existing system or well.

Plan View

- Dimensions for distribution cell(s).
- Location of observation pipes.
- Dimensions of AeroFin mound.
- Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length; and number, location and size of orifices.
- Manifold and force main locations, with materials, length and diameter of each.

Cross Section of System

- Include tilling requirement, distribution cell details, percent slope, side slope, and cover material.
- Lateral elevation, position of observation pipes, dimensions of distribution cell, and type of cover material such as geotextile fabric, if applicable.

System Sizing

- For one and two-family dwellings, the number of bedrooms must be included.
- For public buildings, the sizing calculations must be included.

Tank and Pump or Siphon Information

- All construction details for site-constructed tanks.
- Size and manufacturer information for prefabricated tanks.
- Notation of pump or siphon model, pump performance curve, friction loss for force main and calculation for total dynamic head.
- Notation of high water alarm manufacturer and model number.
- Cross section of dose tank / chamber to include storage volumes; connections for piping, vents, and power; pump "off" setting; dosing cycle and volume, high water alarm setting, and storage volume above the highwater alarm; and location of vent and manhole.
- Cross section of two compartments tanks or tanks installed in a series must include information listed above.

B. Inspections

Inspection shall be made in accordance with s. 145.20, Wis. Stats. and s. SPS 383.26, Wis. Adm. Code. The inspection form found on DSPS POWTS website may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

Chapter SPS 385

SOIL AND SITE EVALUATIONS

Note: Chapter H 65 as it existed on May 31, 1983 was repealed and a new Chapter ILHR 85 was created effective June 1, 1983. Chapter ILHR 85 was renumbered Chapter Comm 85 under s. 13.93 (2m) (b) 1., Stats., and corrections made under s. 13.93 (2m) (b) 7., Stats., Register, February, 1997, No. 494. Chapter Comm 85 as it existed on June 30, 2000 was repealed and a new chapter Comm 85 was created, Register, April, 2000, No. 532, eff. 7−1−00. Chapter Comm 85 was renumbered chapter SPS 385 under s. 13.92 (4) (b) 1., Stats., Register December 2011 No. 672.

SPS 385.01 Purpose. The purpose of this chapter is to establish the minimum requirements for evaluating and reporting soil and site characteristics that may affect treatment or dispersal of wastewater, treated wastewater, final effluent or nonwater−carried human wastes.

History: Cr. Register, April, 2000, No. 532, eff. 7−1−00.

SPS 385.02 Scope. (1) Pursuant to s. 145.02, Stats., this chapter applies to all soil and site evaluations conducted relative to the treatment or dispersal of wastewater, treated wastewater, final effluent or nonwater−carried human wastes into soil.

(2) A department interpretation of the requirements in this chapter shall supersede any differing interpretation by a lower level jurisdiction. A department decision on the application of the requirements in this chapter shall supersede any differing decision by a lower level jurisdiction.

Note: A decision of the department may be appealed. Section 101.02 (6) (e), Stats., outlines the procedure for submitting requests to the department for appeal hearings and the department procedures for hearing appeals.

History: Cr. Register, April, 2000, No. 532, eff. 7−1−00; CR 07−100: renum. to (1), cr. (2) Register September 2008 No. 633, eff. 10−1−08.

SPS 385.10 Qualifications. (1) SOIL EVALUATION. A soil evaluation for treatment or dispersal of wastewater, treated wastewater, final effluent or nonwater−carried human wastes regulated by chs. SPS 383 and 391 shall be performed by an individual who is a certified soil tester. A soil evaluation for the treatment or dispersal of stormwater regulated under ch. SPS 382 shall be performed by an individual who is either a certified soil tester or one who holds a professional soil scientist license under ch. GHSS 4.

Note: Section SPS 305.33 delineates the qualifications and certification procedures for certified soil testers.

(2) SITE EVALUATION. A site evaluation, relative to the installation of a POWTS treatment, holding or dispersal component location, or to determine land slope or setback distances to topographic or other site features shall be performed by a Wisconsin registered architect, professional engineer, designer of plumbing systems, designer of private sewage systems or land surveyor; a certified soil tester or POWTS inspector; or a licensed master plumber or master plumber−restricted service.

(3) SOIL SATURATION DETERMINATIONS. Soil saturation determinations may only be conducted and reported by an individual who is a certified soil tester.

History: Cr. Register, April, 2000, No. 532, eff. 7−1−00; CR 04−035: am. (1) Register November 2004 No. 587, eff. 12−1−04; correction in (1) made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672.

SPS 385.20 Soil evaluations. (1) GENERAL. (a) Soil boring methods and procedures shall comply with this section.

(b) Maximum soil application rates shall be determined relative to the soil texture, structure and consistence for each soil horizon or layer.

Note: Section SPS 383.44 establishes maximum soil application rates and soil treatment capability for the design of POWTS treatment or dispersal components consisting in part of in situ soil.

(2) NUMBER, TYPE AND DEPTH OF EVALUATIONS. (a) *General.* The number, type, depth and location of soil profile evaluations shall be sufficient to delineate the area under investigation and to assure consistency of the data within that area.

(b) *Number and area.* 1. a. Except as provided in subd. 1. d. and subd. 2., a minimum of 3 soil profile evaluation excavations shall be used to delineate a site within which POWTS treatment or dispersal components consisting in part of in situ soil are to be located.

b. For estimated daily flows of 1,000 gallons per day or less, at least one soil profile evaluation excavation per treatment or dispersal site shall be constructed as a soil pit, and described in accordance with s. SPS 385.30 (1) (c).

c. For estimated daily flows greater than 1,000 gallons per day, at least 3 soil profile evaluations per treatment or dispersal site shall be constructed as soil pits, and described in accordance with s. SPS 385.30 (1) (c).

d. The department or governmental unit may require additional soil profile evaluation excavations to be constructed where soil variability considerations may not be adequately addressed. The department or governmental unit may specify that soil profile descriptions in accordance with s. SPS 385.30 (1) (c) be conducted for any additional soil profile evaluation excavations.

2. At least one soil pit or soil boring shall be used to establish soil suitability for a pit privy.

Note: Sections SPS 383.44 (3) and 391.12 (1) (b) 1. contain further information regarding privy siting and soil requirements.

(c) *Type.* 1. Soil profile evaluations used to determine soil application rates shall be conducted using soil pits.

2. Soil profile evaluations used to determine or identify soil horizon depths, soil color, soil texture, redoximorphic feature colors or depth to groundwater or bedrock shall be conducted using either soil pits or soil borings.

(d) *Depth.* Soil profile evaluations shall extend an adequate depth below the land surface to identify soil properties critical to soil treatment or dispersal of wastewater, treated wastewater, final effluent or nonwater−carried human waste.

(3) EXCAVATION METHODS. (a) *Soil profile excavations.* A soil profile excavation shall be of such size and construction to allow accurate determination of soil characteristics.

(b) *Soil borings.* 1. Soil borings shall be created by means of a soil bucket auger, soil probe, split−spoon sampler or Shelby tube having at least a 2 inch diameter.

2. A soil boring may not be created by means of a power auger.

(c) *Soil pits.* A soil pit shall be of adequate size, depth and construction to enable a person to safely enter and exit the pit and to complete a morphological soil profile description.

Note: Occupational safety and health administration regulations (29 CFR 1926, Subpart P) apply to certain types of excavations, and the persons entering such excavations need to be familiar with those regulations.

(4) SOIL EVALUATION CONDITIONS. (a) Soil color evaluations shall be performed on days when light conditions permit accurate color determinations.

(b) Frozen soil material shall be thawed prior to conducting evaluations for soil color, texture, structure and consistence.

History: Cr. Register, April, 2000, No. 532, eff. 7–1–00; correction in (2) (b) 1. b., c., d. made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672.

SPS 385.30 Soil profile description and interpretations. (1) GENERAL. (a) A soil profile description shall be prepared for each soil profile excavation constructed.

(b) Soil profile descriptions shall be written in accordance with the descriptive procedures, terminology and interpretations found in Chapter 3 of the *Soil Survey Manual*, USDA, October, 1993, except where modified by, or in conflict with, this chapter.

(c) A soil profile description to substantiate soil application rates shall include at least all of the following morphological information for each soil horizon or layer:

1. Thickness in inches or decimal feet.

2. Munsell soil color notation.

3. Soil mottle or redoximorphic feature color, abundance, size and contrast.

4. United States Department of Agriculture, USDA, soil textural class with rock fragment modifiers.

5. Soil structure grade, size and shape.

6. Soil consistence.

7. Root abundance and size.

8. Soil boundary.

9. Occurrence of saturated soil, groundwater, bedrock or disturbed soil.

(d) A soil profile description to substantiate soil characteristics other than for application rates shall include the information specified in par. (c) 1. to 4. and 9.

(2) SOIL INTERPRETATIONS. (a) Redoximorphic features or mottles shall be interpreted as zones of seasonal or periodic soil saturation or groundwater, except as provided under sub. (3).

(b) Unless otherwise determined under s. SPS 385.60, the highest elevation of seasonal soil saturation shall be the ground surface where redoximorphic features are present within 4 inches of any of the following:

1. An A horizon that extends to the ground surface.

2. The lower boundary of overlying fill material where no buried A horizon exists.

3. An A horizon buried by overlying fill material.

(3) SOIL COLOR PATTERN EXEMPTIONS. (a) Without filing a report under s. SPS 385.60 (2), a certified soil tester may discount the following conditions, not limited by enumeration, as indicators of seasonally saturated soil:

1. Fossilized soil color patterns formed by historic periodic soil saturation.

2. A soil profile where redoximorphic features are confined within 12 inches of tension saturated silt loam or finer textured soil immediately overlying unsaturated coarse sandy loam or coarser textured soil that has a depth in the coarser material adequate to accommodate a distribution cell and dispersal zone.

3. A soil profile where redoximorphic features are confined within 24 inches of tension saturated silt loam or finer textured soil immediately overlying unsaturated coarse loamy sand or coarser textured soil that has a depth in the coarser material adequate to accommodate a distribution cell and dispersal zone.

4. Residual sandstone colors.

5. Unevenly weathered glacially deposited material, glacially deposited material naturally gray in color, or concretionary material in various stages of decomposition.

6. Deposits of lime.

7. Light colored silt or fine sand coatings on soil ped surfaces.

(b) Without filing a report under s. SPS 385.60 (2) for a specific site, the department may accept the results of soil saturation determinations or of the hydrograph procedure under s. SPS 385.60 previously conducted for areas adjacent to the site, provided that the soil profile descriptions and interpretations confirms that the soil and site conditions are similar for the specific site and the adjacent areas.

(4) SOIL COLOR PATTERN REPORTS. The certified soil tester shall report and describe any soil color pattern exemptions encountered.

(5) DETERMINATION REQUESTS. A certified soil tester may request assistance by the governmental unit or department staff in evaluating the significance of unusual soil color patterns as indicators of soil saturation that may not indicate saturated soil conditions. The governmental unit or department may decline to provide such assistance, and defer to the use of soil saturation determinations pursuant to s. SPS 385.60 or some other method.

History: Cr. Register, April, 2000, No. 532, eff. 7–1–00; CR 02–129: r. and recr. (2) (b) and (3) (a) 2. and 3. Register January 2004 No. 577, eff. 2–1–04; CR 07–100: am. (5) Register September 2008 No. 633, eff. 10–1–08; correction in (2) (b) (intro.), (3) (a) (intro.), (b), (5) made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672.

SPS 385.40 Evaluation reports. (1) GENERAL. A soil evaluation report shall be prepared and submitted to the governmental unit having jurisdiction upon the completion of the evaluation and associated report form.

(2) SOIL REPORT CERTIFICATION AND FORMAT. (a) *Soil evaluation reports.* Soil evaluation reports shall be prepared in a format specified by the department and this chapter.

Note: The Department forms required in this chapter are available for a nominal fee at telephone 800–DOC–SALE or 411 (Telecommunications Relay) or at docsales@doa.state.wi.us, or at no charge at the Department's Web site at http://dsps.wi.gov through links to Division of Industry Services forms.

(b) *Certification.* 1. Except as provided in subd. 2., each page of a soil evaluation report shall bear:

a. The signature of the certified soil tester who collected the data;

b. The certified soil tester's identification number; and

c. The date the report is signed.

2. When more than one sheet of a soil evaluation report is bound together into one volume, only the title sheet shall:

a. Be required to be signed, dated and bear the identification number of the certified soil tester who collected the data; and

b. Clearly identify all other sheets comprising the bound volume.

Note: Nothing in this chapter is intended to prohibit the submission and acceptance of planning documents in an electronic or digital media.

(3) REPORT CONTENTS. (a) *Site report.* A site evaluation report shall include at least all of the following:

1. The site's legal description to within 40 acres.

2. The date the data was collected.

3. A legible and permanent site plan that complies with all of the following:

a. Is presented on paper no smaller than 8 ½ inches by 11 inches in size.

b. Is drawn to scale or fully dimensioned.

c. Shows the extent of the site evaluated for soil dispersal or treatment.

4. Location information for all points under investigation including structures, property lines and other encumbrances to the treatment or dispersal component placement on the site.

5. Pertinent elevation data, such as:

a. A reference to, and description of, a permanent vertical and horizontal reference point or bench mark from which all distances and elevations are delineated on the site plan;

b. The natural, undisturbed surface grade elevation for all soil profile excavations;

c. The percent and direction of land slope for the site under evaluation;

d. Ground surface contour lines at an interval appropriate for the conditions present;

e. The floodplain elevation, if established, and current surface elevation of any adjacent navigable waters or reservoir; and

f. The existing grade adjacent to the groundwater elevation observation pipe, the top of the observation pipe, and the bottom of the observation pipe.

(b) *Soil report.* A soil evaluation report shall include at least all of the following:

1. A site evaluation report pursuant to par. (a).

2. The date soil evaluations were conducted.

3. The site's legal description to within 40 acres.

4. Soil profile descriptions pursuant to s. SPS 385.30 for all soil profile evaluation excavations.

History: Cr. Register, April, 2000, No. 532, eff. 7–1–00; CR 02–129: am. (3) (a) 3. (intro) Register January 2004 No. 577, eff. 2–1–04; correction in (3) (b) 4. made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672; **CR 17–065: am. (2) (b) 1. a. Register June 2018 No. 750, eff. 7–1–18.**

SPS 385.50 Governmental unit review. (1) GENERAL. (a) A governmental unit shall review all soil evaluation reports and site evaluation reports within 6 months of receipt.

(b) Upon completing the review of a soil evaluation report a governmental unit shall accept the report, reject the report, request additional information or clarification, or require verification under sub. (2).

(c) When a report is deemed acceptable, a governmental unit shall so indicate on the report and file the report for future reference.

(d) If the report is not acceptable, a governmental unit shall notify the submitter in writing and shall state the deficiencies or actions, or both, necessary to bring the report into compliance with this chapter or ch. SPS 383.

(2) VERIFICATION. (a) *Soil.* 1. The governmental unit or the department may require the property owner or the certified soil tester to provide soil pits in accordance with s. SPS 385.20 (3) for verification of soil profile evaluation data.

2. The certified soil tester who is responsible for the soil report shall be present at the site during the verification of soil profile evaluation data if so requested by the governmental unit or the department.

3. Soil verifications may not be conducted under adverse weather or light conditions that may lead to inaccurate results.

(b) *Site.* 1. The governmental unit or the department may require the property owner or certified individual who prepared the site report to provide assistance and equipment to verify site conditions.

2. The certified individual who is responsible for the site report shall be present at the site during the verification of site conditions if so requested by the governmental unit or department.

(c) *Report.* The governmental unit or the department shall complete a written report for each soil or site verification completed, and the results or findings of the report shall be filed with the soil and site evaluation report for future reference.

History: Cr. Register, April, 2000, No. 532, eff. 7–1–00; correction in (1) (d), (2) (a) 1. made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672.

SPS 385.60 Soil saturation determinations. (1) GENERAL. (a) A property owner, or the owner's agent, may submit documentation to prove that redoximorphic features, or other soil color patterns, at a particular site are not indicative of periodically saturated soil conditions or high groundwater elevation.

(b) Documentation shall be in the form of an interpretive determination, soil saturation determination, hydrograph procedure or artificially controlled navigable water determination pursuant to this section.

(2) INTERPRETIVE DETERMINATIONS. (a) A written report by a certified soil tester evaluating and interpreting redoximorphic soil features, or other soil color patterns, may be submitted to the department in lieu of high groundwater determination data. The written report shall conclusively determine current conditions of periodic soil saturation and assess their effect upon the operation of a POWTS.

(b) The department shall make a determination on the validity of the data, results and conclusions set forth in the report.

(c) The written report shall include, but is not limited to, all of the following information:

1. A soil evaluation report pursuant to s. SPS 385.40.

2. An interpretive review of the site including, but not limited to, all of the following:

a. Local hydrology.

b. A historical interpretation of the local geomorphology.

c. Soil disturbance and hydraulic modification.

d. The landscape position and local topography in the area under investigation.

3. Soil series and mapping units, if available, for the immediate area, as listed in the USDA soil survey.

4. Data, if any, from previous soil saturation determinations in similar soil conditions and landscape position.

5. Any written reports, comments or recommendations by the governmental unit or department staff.

(3) SOIL SATURATION DETERMINATION. (a) *General.* Actual elevations of soil saturation may be determined at specific sites in accordance with the soil saturation determination procedures in par. (c).

(c) *Precipitation.* 1. Precipitation data reported for soil saturation determination purposes shall include monthly totals for September through May, and daily totals for February through May.

2. Precipitation data totals under subd. 1. shall be from either the closest local station to the site where the observation pipe is installed, or the average from the 3 closest local stations to the site. If averaging is used, the totals under subd. 1. shall be submitted for all 3 stations.

(d) *Regional water tables.* 1. Where sites are subject to a broad, relatively uniform, regional water table, the fluctuation observed over a several year cycle shall be considered.

2. At such sites, and where free water levels are more than 5 feet below grade, determinations shall be made using the hydrograph procedures contained in sub. (4).

3. Areas affected by a regional water table shall be delineated by the department in consultation with the affected counties and the Wisconsin Geological and Natural History Survey.

(e) *Fine textured soil.* 1. The department may prohibit soil saturation determinations in fine textured soil with high matric potentials where determination results may be inconclusive.

2. In such cases, the department may approve alternative methods to address the direct determination of saturated or near saturated soil conditions not enumerated in this section.

(f) *Groundwater elevation observation pipe installation and construction.* 1. Number of observation pipes. a. At least 3 groundwater elevation observation pipes shall be installed to delineate the area under investigation.

b. The governmental unit or department may require more than 3 observation pipes to adequately evaluate potential soil saturation conditions.

2. Observation pipe depth. a. At the request of the department or governmental unit, at least one observation pipe shall be constructed to a depth of 15 feet below the ground surface to deter-

mine if high groundwater elevation conditions are due to a perched water table and the possible extent of the saturated zone.

b. Other observation pipes shall terminate at specific depths below grade that will serve to evaluate where shallow perched zones of soil saturation occur within the soil profile.

c. The governmental unit or department may designate specific observation pipe depths and locations based on soil and site conditions, or experience in a particular geographic area or topographic position.

d. An observation pipe may not be less than 24 inches deep.

3. Observation pipe construction. The direct observation of soil saturation conditions shall be accomplished by means of observation pipes conforming to this subdivision and Figure 385.60−1.

a. The observation pipe shall be of a material meeting the standards in s. SPS 384.30 Table 384.30−1, except that lead pipe may not be used.

b. The inside diameter of an observation pipe may not be less than 2 inches or more than 4 inches nominal size.

c. The borehole diameter shall be 2 to 4 inches larger than the outside diameter of the observation pipe.

d. The top of the observation pipe shall terminate at least 18 inches above grade and be provided with a vented cap.

e. The bottom of the observation pipe shall terminate with a slotted, or screened pipe. The slots or screen shall extend 6 to 18 inches above the bottom of the pipe and be at least 4 inches below the filter pack seal. The slots or screen shall not be hand cut and shall be designed to retain soil particles with a diameter of greater than 0.02 inch.

f. Except for the vented end cap, joints between lengths of pipe and fittings shall conform to s. SPS 384.40.

g. Finished grade around the observation pipe shall be sloped away from the observation pipe using soil material.

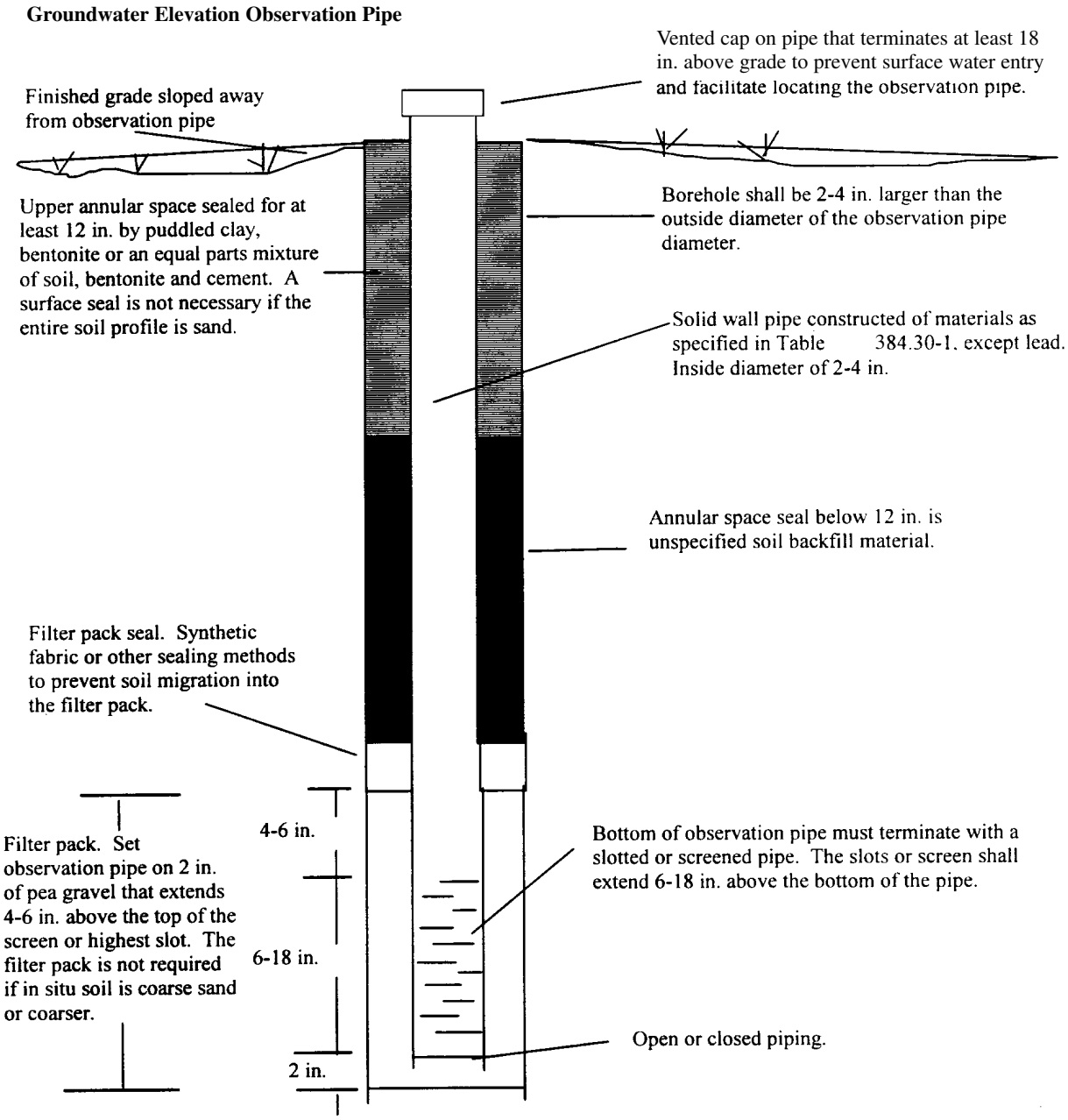
h. At a minimum, the upper 12 inches of annular space surrounding the observation pipe shall be sealed by puddled clay, bentonite, or an equal−parts mixture of soil, bentonite and cement. A surface seal may not be necessary if the entire soil profile is sand.

i. The annular space seal below 12 inches and to the top of the filter pack seal may be of unspecified soil material.

j. A filter pack seal shall be installed above the filter pack to prevent soil migration downward into the filter pack.

k. The observation pipe shall be set on at least 2 inches of pea gravel that extends 4 to 6 inches above the top of the screen or highest slot. The gravel filter pack is not necessary if the natural soil is coarse sand or coarser.

Figure 385.60–1



(g) *Observations.* 1. Observation period. The observation period for soil saturation determinations shall begin on or before the appropriate date specified in Figure 385.60–2, and end June 1.

2. Alternate observation period. The department may approve an alternate observation period if the data presented conclusively demonstrates equivalency to conditions encountered during a normal spring observation period.

3. Minimum frequency. Observations shall be made on the first day of the observation period and at least every 7 days thereafter until the observation period is complete.

(h) *Conclusions.* 1. The highest level of soil saturation shall be considered the highest level of free water observed in an observation pipe on 2 occasions 7 days apart during the observation period.

2. The results of soil saturation determinations under this section shall be considered inconclusive if the precipitation totals under par. (c) do not equal or exceed:

a. 8.5 inches from September 1 through the last day of February; and

b. 7.6 inches from March 1 through May 31.

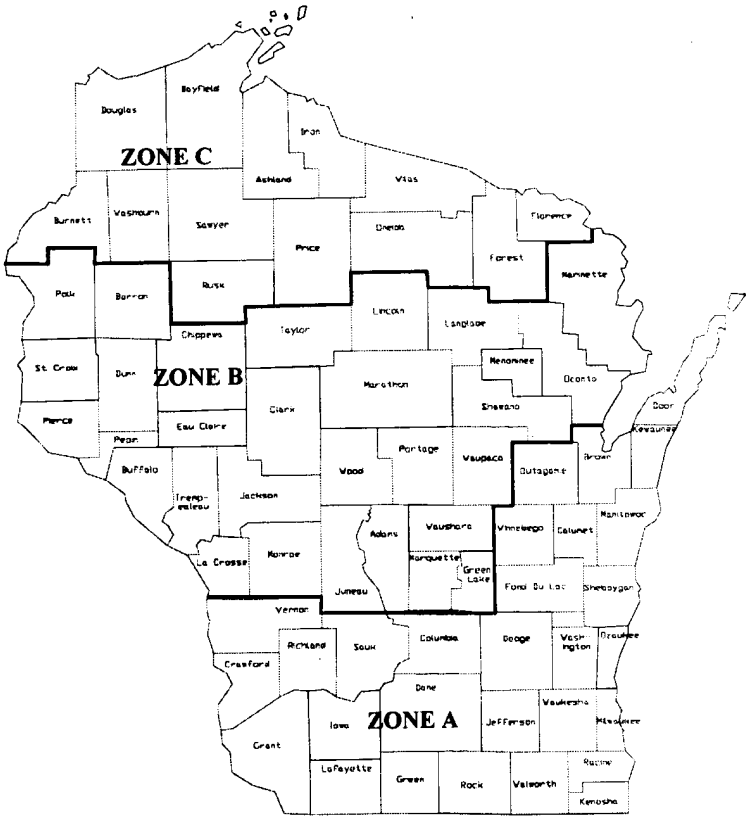


Figure 385.60–2
Latest Date to Begin Spring Soil Saturation Monitoring

Zone A	**February 15**
Zone B	**March 1**
Zone C	**March 15**

(i) *Reporting data.* 1. Within 180 days of the completion of the observations, 3 copies of the following data shall be submitted to the department for review:

a. A soil and site evaluation report pursuant to s. SPS 385.40.

b. Observation pipe installation, depth, location and elevation information.

c. Precipitation data and name of any local station used.

d. Observation dates.

e. Current and any prior observation results.

f. Any governmental unit observations or reports pertaining to the soil saturation determination observations, observation pipe construction or soil/site conditions.

2. Within 180 days of the completion of the observations, one copy of the data specified in subd. 1. shall be filed with the governmental unit having jurisdiction.

(j) *Report forms.* Soil saturation determination results shall be reported on forms specified by the department.

Note: The Department forms required in this chapter are available for a nominal fee at telephone 800–DOC–SALE or 411 (Telecommunications Relay) or at docsales@doa.state.wi.us, or at no charge at the Department's Web site at http://dsps.wi.gov through links to Division of Industry Services forms.

(k) *Failure to report.* Failure to file soil saturation determination results with the governmental unit and department within 60 days may disqualify the site from future soil saturation or interpretive determinations.

(4) HYDROGRAPH PROCEDURE. (a) 1. Except as provided in subd. 3., where regional water table fluctuations are considered in deep sandy soil, the predicted high groundwater elevation shall be established using hydrograph documentation.

2. Except as provided in subd. 3., the highest groundwater elevation shall be determined by direct observation during the soil profile evaluation or by one of the hydrograph methods outlined in pars. (b) to (d), whichever is highest.

3. The department or governmental unit may accept use of the hydrograph procedure to predict regional water table levels on sites where inclusions of sandy loam or finer soil material, or massive conditions exist.

(b) 1. If there is less than 5 feet to free water below original grade, the procedures detailed in sub. (2) or (3) shall be used to determine the highest predicted groundwater elevation at the site.

2. If there is 5 feet or more to free water below original grade, the hydrograph procedure may be used to determine the highest predicted groundwater elevation at the site.

(c) When free water at the site is 5 to 10 feet below grade, all of the following procedures apply:

1. A completed soil and site evaluation report pursuant to s. SPS 385.40 that confirms the elevation of free water, if observed, shall be prepared.

2. a. A slotted or screened groundwater elevation observation pipe shall be installed at the proposed system location to a depth of at least 12 inches below the free water elevation.

b. The observation pipe shall be installed pursuant to sub. (3) (f) 3.

3. a. The water level in the observation pipe shall be recorded after completion of the observation pipe installation and 7 days later.

b. The highest of the 2 water levels shall be used to complete the hydrograph procedure.

4. The permanent USGS groundwater elevation well or wells as assigned by the governmental unit or department shall be read within 24 hours of establishing the actual free water elevation at the site.

5. The hydrograph procedure shall be completed and the results shall be submitted for review to the governmental unit having jurisdiction in a format specified by the department.

Note: The Department forms required in this chapter are available for a nominal fee at telephone 800−DOC−SALE or 411 (Telecommunications Relay) or at docsales@doa.state.wi.us, or at no charge at the Department's Web site at http://dsps.wi.gov through links to Division of Industry Services forms.

(d) When free water at the site is more than 10 feet below grade, all of the following procedures apply:

1. A completed soil and site evaluation report pursuant to s. SPS 385.40 that confirms the elevation of free water, if observed, shall be prepared.

2. The permanent USGS groundwater elevation well or wells assigned to the project by the governmental unit or department shall be read within 24 hours of the actual free water determination at the site.

3. The hydrograph procedure shall be completed and the results shall be submitted for review to the governmental unit having jurisdiction in a format specified by the department.

Note: The Department forms required in this chapter are available for a nominal fee at telephone 800−DOC−SALE or 411 (Telecommunications Relay) or at docsales@doa.state.wi.us, or at no charge at the Department's Web site at http://dsps.wi.gov through links to Division of Industry Services forms.

(e) The governmental unit or the department may request more than one USGS groundwater well or other wells assigned by the governmental unit or the department be used to complete the hydrograph procedure.

(f) The governmental unit or the department may reject or suspend use of the hydrograph procedure when erratic groundwater tables are present due to recent, significant recharge events.

(5) ARTIFICIALLY CONTROLLED NAVIGABLE WATERS DETERMINATION. (a) If the groundwater elevation at a site is influenced by the artificial control of navigable waters by a recognized management entity, all of the following conditions shall be addressed:

1. If loamy sand or coarser soil textures prevail at a site, the groundwater elevation at the site shall be compared to the current and highest controlled navigable water elevation.

2. The highest normal groundwater elevation at such sites shall be the higher of either the observed elevation or an adjusted elevation based on the controlled water.

(b) An artificially controlled navigable waters determination report shall be prepared and submitted for review to the governmental unit having jurisdiction upon completion of the determination and associated report.

(6) SOIL SATURATION OBSERVATION PIPE REMOVAL. The following requirements shall apply to all groundwater elevation observation pipes installed pursuant to this section:

(a) *Removal timeline.* Unless specifically approved by the governmental unit or department, all groundwater elevation observation pipes shall be removed within 60 days after the completion of soil saturation determination.

(b) *Contamination conduit.* Any groundwater elevation observation pipe found by the department or governmental unit to be acting as a conduit for groundwater contamination shall be ordered removed immediately.

(7) VERIFICATION. (a) *Verification.* 1. The governmental unit or department may request verification of soil saturation determinations pursuant to s. SPS 385.50 (2), and proper observation pipe installation pursuant to this section.

2. The governmental unit or the department may require any groundwater elevation observation pipe deemed by the governmental unit or the department to be in poor contact with the surrounding soil to be reinstalled pursuant to this section.

(b) *On−site visits.* 1. The governmental unit or department may visit sites during soil saturation determination periods or at other reasonable times to determine the accuracy of data.

2. A written record of on−site visits in subd. 1. shall be maintained by the agency conducting the visits.

History: Cr. Register, April, 2000, No. 532, eff. 7−1−00; CR 02−129: r. and recr. (1) and (3) (h) 1., am. (2) (c) (intro.), (2) (c) 2. b., (3) (i) 1. (intro.) and 2., (4) (a) 1. and 2., (4) (c) (intro.), 2. b., 5., (d) (intro.) and 3., r. (3) (b), cr. (4) (a) 3., (4) (e) and (f), and (5), renum. (5) and (6) to be (6) and (7) Register January 2004 No. 577, eff. 2−1−04; corrections in (3) (a) and (h) made under s. 13.93 (2m) (b) 7., Stats., Register January 2004 No. 577; CR 07−100: am. (4) (c) 5., (d) 3. and (5) (b) Register September 2008 No. 633, eff. 10−1−08; correction (2) (c) 1., (f) 3. (intro.), a., f., (g) 1., (i) 1. a., (4) (c) 1., (d) 1., (7) (a) 1. made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672; **CR 17−065: am. (2) (a) Register June 2018 No. 750, eff. 7−1−18.**