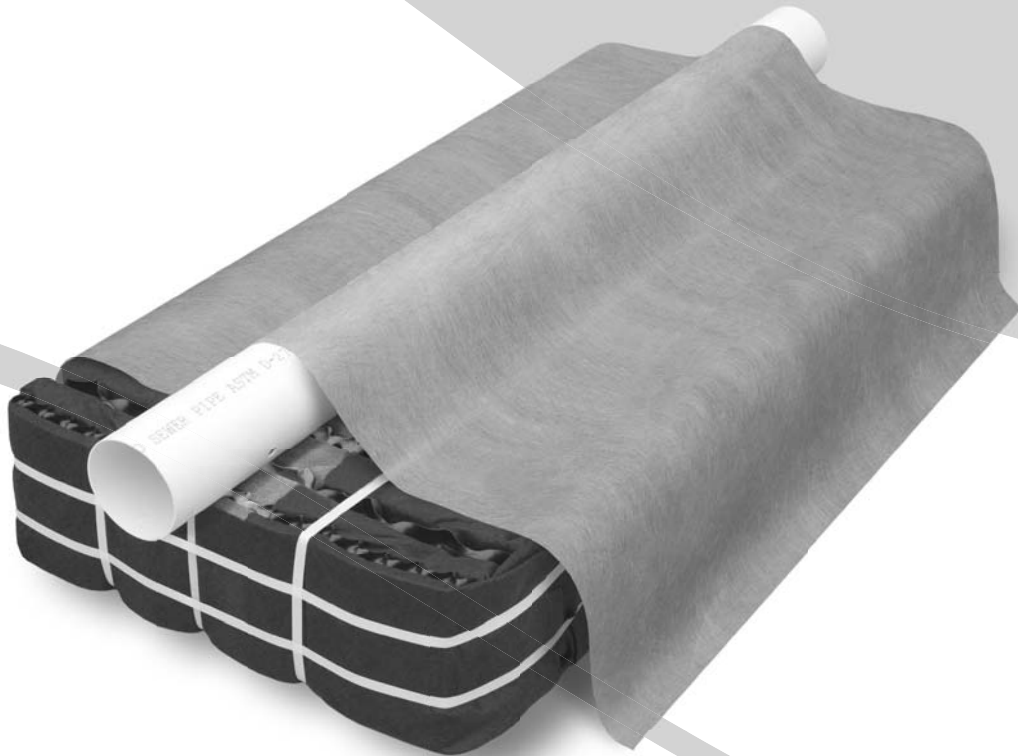




**Geotextile Sand Filter**

# Minnesota Type 1 Mound Design & Installation Manual



**eljen**  
CORPORATION

*Innovative Onsite Products & Solutions Since 1970*

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[www.eljen.com](http://www.eljen.com)

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## Glossary of Terms

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<b>A42 Module</b>	48" x 24" x 7" (L x W x H)
<b>B43 Module</b>	48" x 36" x 7" (L x W x H)
<b>Cover Fabric</b>	The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules.
<b>Design Flow</b>	The estimated peak flow that is used to size a GSF system is 150 gallons per day per Bedroom.
<b>GSF</b>	The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and 6 inches along the sides of the modules.
<b>GSF Module</b>	The individual module of a GSF system. The module is comprised of a cusped plastic core and geotextile fabric.
<b>Specified Sand</b>	To ensure proper system operation, the system <b>MUST</b> be installed using ASTM C33 Sand.  ASTM C33 sand will have less than 10% passing the #100 Sieve and less than 5% passing the # 200 sieve. Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

**TABLE 1: SPECIFIED SAND SIEVE REQUIREMENTS**

ASTM C33 SAND SPECIFICATION		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
3/8 inch	9.52 mm	100
No. 4	4.76 mm	95 - 100
No. 8	2.38 mm	80 - 100
No. 16	1.19 mm	50 - 85
No. 30	590 µm	25 - 60
No. 50	297 µm	10 - 30
No. 100	149 µm	< 10
No. 200	75 µm	< 5

## 1.0 System Preconditions

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**1.1 REQUIREMENTS:** GSF systems must meet the local rules and regulations except as outlined in this manual. The Minnesota Regulations Chapter 7080 and the local regulations will be referred to as the *guidelines*. The designs in this manual are guided by the design instructions for Type 1 Mound system in the guidelines.

Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems.

**1.2 WATER SOFTENER BACKWASH:** At no time should water softener backwash be disposed of in the septic system. Water softener backwash should be discharged to a separate soil absorption field.

**1.3 GARBAGE DISPOSALS:** The use of a garbage disposal is not recommended as they can cause septic system problems by generating an increased amount of suspended solids, grease and nutrients.

However, if such units are proposed to be used, other measures should be taken to mitigate the increased nutrients to the field. Minnesota code requires that systems where a garbage disposal unit is anticipated or installed in a dwelling, the septic tank capacity must be at least 50 percent greater than that required in 7080.1930 subpart 2 of the regulations and must include either multiple compartments or multiple tanks. In addition, an effluent screening device is recommended.

NOTE: Eljen requires the use of septic tank outlet effluent filters on all systems. Filters with higher filtration are recommended for systems with garbage disposals.

**1.4 ADDITIONAL FACTORS AFFECTING RESIDENTIAL SYSTEM SIZE:** Homes with expected higher than normal water usage may consider increasing the septic tank volume as well as incorporating a multiple compartment septic tank. Consideration for disposal area may be up-sized for expected higher than normal water use.

For example:

- Luxury homes, homes with a Jacuzzi style tubs, and other high use fixtures.
- Homes with known higher than normal occupancy.

**1.5 SYSTEM PROHIBITED AREAS:** All vehicular traffic is prohibited over the GSF system. GSF systems shall not be installed under paved or concreted areas. If the system is to be installed in livestock areas, the system must be fenced off around the perimeter to prevent compaction of the cover material and damage to the system.

## 2.0 Design and Installation

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### 2.1 GSF UNITS:

FIGURE 1: TYPICAL A42 UNIT

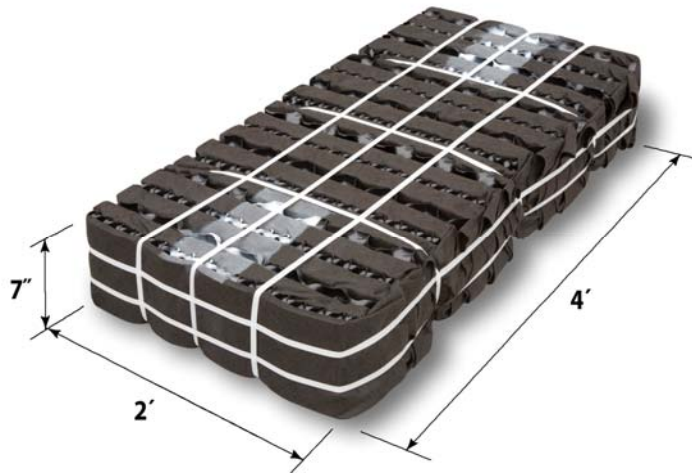
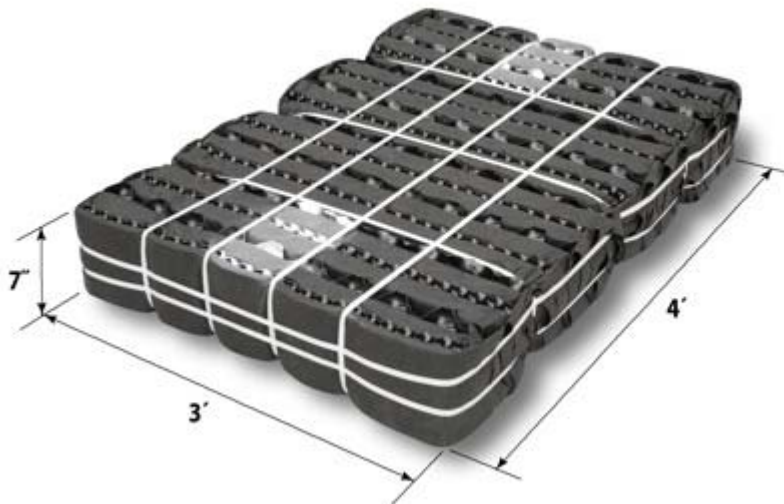


FIGURE 2: TYPICAL B43 UNIT



**All systems are required to have a minimum of:**

- 6 inches of Specified Sand is at the edges of the GSF module.
- 6 inches of Specified Sand is at the beginning and end of each GSF Row.
- 12 inches of Specified Sand is directly below the GSF module.
- Minimum 12 inches of cover above the module.

## 2.0 Design and Installation

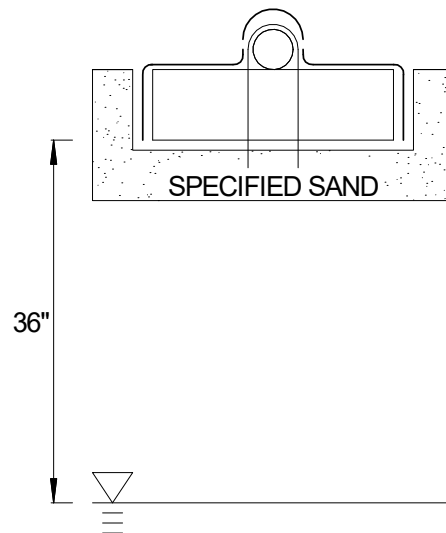
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**2.2 SEPTIC TANKS:** Dual compartment tanks are recommended for all systems. Eljen supports this practice as it helps to promote long system life by reducing TSS and BOD to the effluent disposal area. Effluent filters are required.

**2.3 SEPTIC TANK FILTERS:** Septic tank effluent filters are **REQUIRED** on the outlet end of septic tank. Filter manufactures require that filters be cleaned from time to time. Ask your installer or designer for specific cleaning requirements based on the type or make of the filter installed. Eljen requires the septic tank to be pumped every three years or as needed which would be a good time to check and conduct filter maintenance.

**2.4 VERTICAL SEPARATION TO LIMITING LAYER:** A minimum vertical separation of 36 inches of unsaturated soil or sand between the bottom of the specified sand and the periodically saturated soil level or bedrock. Specified sand may count towards constructability requirements for mounds.

FIGURE 3: VERTICAL SEPARATION TO RESTRICTIVE LAYER



**2.5 SPECIFIED SAND SPECIFICATION FOR GSF SYSTEMS:** The sand immediately under, between rows and around the perimeter of the GSF system must meet **ASTM C33 SPECIFICATIONS, WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 5% PASSING A #200 SIEVE**. Please place a prominent note to this effect on each design drawing. See Table 1 for more information on the sand and sieve specifications. Washed concrete sand easily meets the above specification and is a reliable choice. Suitability of bank run sand must be verified.

**2.6 PLACING GSF MODULES:** The “Painted Stripe” on the GSF modules indicates the top of the module and is not intended to indicate the location of the distribution pipe. With the painted stripe facing up, all rows of GSF modules are set level, end to end on the Specified Sand layer. No mechanical connection is required between modules.

**2.7 DISTRIBUTION:** Pressure distribution must be used. Two delivery methods are acceptable. Orifice shields are placed over a SCH 40 pipe, one per unit.

A second delivery method is also permissible. Place perforated pipe on top of GSF modules with holes at 4 and 8 o'clock. Secure pipe to GSF modules with provided wire clamps, one clamp per Eljen module. A pressure manifold is placed inside the distribution pipe. All piping must meet state and local regulations.

Section 7.0 of this manual goes into details of how to construct the distribution network.

## 2.0 Design and Installation

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**2.8 CONNECTIONS AND FITTINGS:** Connections of lines to tanks and distribution boxes must be made using watertight mechanical seals. Use of any grouting material is not permitted.

**2.9 COVER FABRIC:** Geotextile cover fabric is provided by Eljen Corporation for all GSF systems. It is placed over the top and sides of the module rows to prevent long term siltation and failure. **Cover fabric substitution is not allowed.** Fabric should drape vertically over the pipe and must not block holes in the distribution pipe or be stretched from the top of the pipe to the outside edge of the modules. "Tenting" will cause undue stress on fabric and pipe.

**2.10 SYSTEM VENTING:** It is strongly recommended to vent all systems that are over 18" below finished grade and systems beneath any surface condition that would not allow for surface air exchange with the system. See Section 6.0 for a more detailed explanation of venting GSF products.

**2.11 BACKFILL & FINISH GRADING:** Complete backfill with a minimum of 12 inches of clean porous fill measured from the top of the GSF unit. Backfill exceeding 18 inches requires venting at the far end of the trench. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the Effluent Disposal Area, (EDA). Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

**2.12 SYSTEM GEOMETRY:** Design systems as long and narrow as practical along site contours to minimize ground water mounding especially in poorly drained low permeability soils. If possible, design level systems with equal number of modules per row.

For trench system using the A42, the edge to edge spacing is a minimum of 6 ft. For the B43 unit, the edge to edge spacing for trenches is 8 ft.

**2.13 NUMBER OF GSF MODULES REQUIRED:** Residential systems use a minimum of six (6) A42 modules per bedroom or five (5) B43 modules per bedroom. See Section 1.16 for more information on systems sizing.

### 2.14 SIZING GSF SYSTEM FOR SAND MOUNDS:

**TABLE 2: LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING PERCOLATION TESTS**

Percolation Rate (MPI)	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
<0.1	-	1.0
0.1 to 5	1.2	1.0
0.1 to 5 (fine sand and loamy fine sand)	0.6	2.0
6 to 15	0.8	1.5
16 to 30	0.6	2.0
31 to 45	0.5	2.4
46 to 60	0.5	2.6
61 to 120	-	5.0
>120	-	-

## 2.0 Design and Installation

**TABLE 3: LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING DETAILED SOIL DESCRIPTIONS**

USDA Soil Texture	Soil Structure and Grade	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
Sand, Coarse Sand, Loamy Sand, Loamy Coarse Sand, Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand, 35 to 50% Rock Fragments	Single grain, granular, blocky, or prismatic structure; weak grade	**	1.0
Sand, Coarse Sand, Loamy Sand, Loamy Coarse Sand, <35% Rock Fragments	Single grain, granular, blocky, or prismatic structure; weak grade	1.20	1.0
Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand, <35% Rock Fragments	Single grain, granular, blocky, or prismatic structure; weak grade	0.60	2.0
Sandy Loam, Coarse Sandy Loam, Fine Sandy Loam, Very Fine Sandy Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.78	1.5
Sandy Loam, Coarse Sandy Loam, Fine Sandy Loam, Very Fine Sandy Loam	Platy with weak grade or massive	0.68	1.8
Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.60	2.0
Loam	Platy with weak grade or massive	0.52	2.3
Silt Loam, Silt	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.50	2.4
Silt Loam, Silt	Platy with weak grade or massive	0.42	2.9
Clay Loam, Sandy Clay Loam, Silty Clay Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.45	2.6
Clay, Sandy Clay, Silty Clay	-	**	**



### 3.0 Level Mound Sizing

**Level Mound Example:**

House size:	3 Bedrooms
Classification:	Classification I
Soil Evaluation:	Loam; Blocky
Depth to Limiting Condition	36 inches
Site Slope	0%
Berm Ratio	4:1
Distribution Type:	Pressure Distribution

**1.A: Daily Design Flow:** From 7080.1860: 450 gpd

**1.B: In situ soil application rate**

USDA Soil Texture	Soil Structure and Grade	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.60	2.0

**1.C: Depth to Limiting Condition** 36 inches

**1.D: Site Slope** 0%

**1.E: Design Media Loading Rate** 1.2 gpd/ft<sup>2</sup>

**1.F: Mound Absorption Ratio**

USDA Soil Texture	Soil Structure and Grade	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.60	2.0

**Eljen GSF Media Sizing**

**2.A: Dispersal Bed Area = 1.A ÷ 1.E**

450 gpd ÷ 1.2 gpd/ft<sup>2</sup> = 375 ft<sup>2</sup>

**2.B: Dispersal Bed Width (if using A42 = 2 ft, B43 = 3 ft)** 3 ft

**2.C: Contour Loading Rate = 2.B x 1.E (if greater than 12, reduce Dispersal Bed Width in 2.B)**

3 ft x 1.2 gpd/ft<sup>2</sup> = 3.6 gal/ft

**2.D: Number of Cells = (Designer may shorten the mound using additional cells)**

3 cells

**2.E: Dispersal Bed Length = 2.A ÷ 2.B ÷ 2.D**

375 ft<sup>2</sup> ÷ 3 ft ÷ 3 = 41.6 ft, round to next greater number that is divisible by 4

44 ft

**Absorption Area Sizing**

**3.A: Absorption Width per Cell = 2.B x 1.F**

3 ft x 2.0 = 6.0 ft

**3.B: Absorption Width Beyond Bed = (3.A – 2.B) ÷ 2**

(6.0 ft – 3 ft) ÷ 2 = (3.0 ft) ÷ 2 = 1.5 ft

### 3.0 Level Mound Sizing

#### Mound Sizing

**6.A: Clean Sand Lift = 48 inches – 1.C**

48 inches – 36 inches = 12 inches, convert to feet 1 ft

**6.B: Mound Height = 6.A + 1.58 ft (1.58 = Height of Unit + Cover at Edge of Mound)**

1 ft + 1.58 ft = 2.58 ft

**6.C: Berm Width = 6.B x Berm Ratio**

2.58 ft x 4 = 10.32 ft

**6.D: Total Landscape Width = (3.A x 2.D) + (2 x 6.C)**

(6.0 ft x 3 cells) + (2 x 10.32 ft) = 18 ft + 20.64 ft = 38.64 ft

**6.E: Additional Berm Width (if (3.A x 2.D) – 6.D is 0 or less, 0 ft, otherwise (3.A x 2.D) – 6.D)**

(6.0 ft x 3 cells) – 38.64 ft = -20.64, therefore 0 ft

**6.F: Final Berm Width = 6.C + 6.E**

10.32 ft + 0 ft = 10.32 ft

**6.G: Total Mound Width = (2 x 6.F) + (3.A x 2.D – (3.A – 2.B))**

(2 x 10.32 ft) + (6 ft x 3 cells – (6 ft – 3 ft)) = 20.64 ft + 18 ft – 6 ft = 35.64 ft

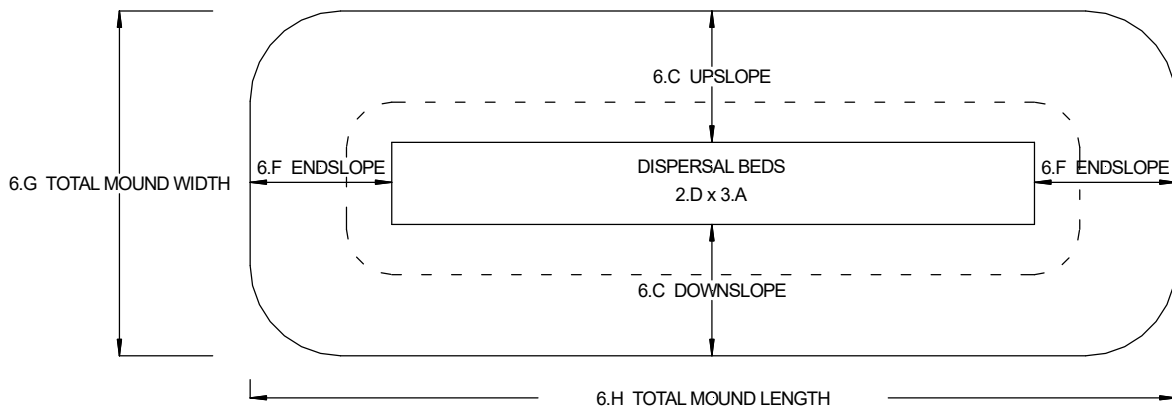
**6.H: Total Mound Length = (2 x 6.F) + 2.E**

(2 x 10.32 ft) + 44 ft = (20.64 ft) + 44 ft = 64.64 ft

**6.I: Setbacks from the Bed = (3.A – 2.B) ÷ 2**

(6.0 ft – 3 ft) ÷ 2 = (3.0 ft) ÷ 2 = 1.5 ft

FIGURE 4: PLAN VIEW LEVEL MOUND



### 3.0 Level Mound Sizing

FIGURE 5: CROSS SECTION LEVEL MOUND

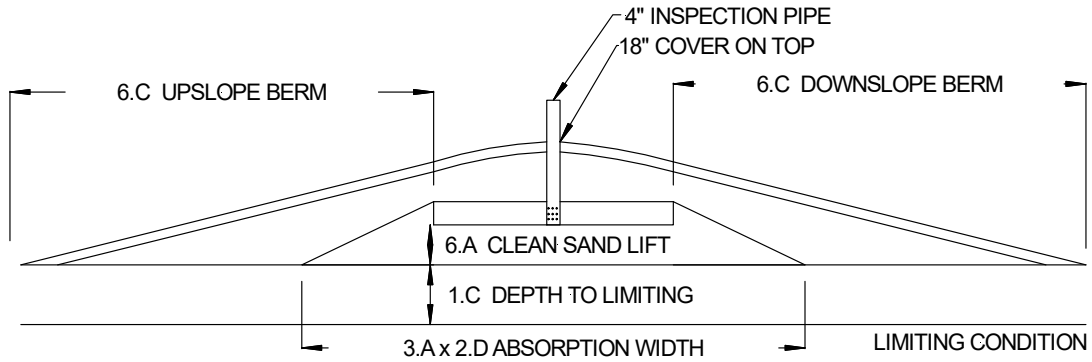


FIGURE 6: PLAN VIEW LEVEL MOUND EXAMPLE

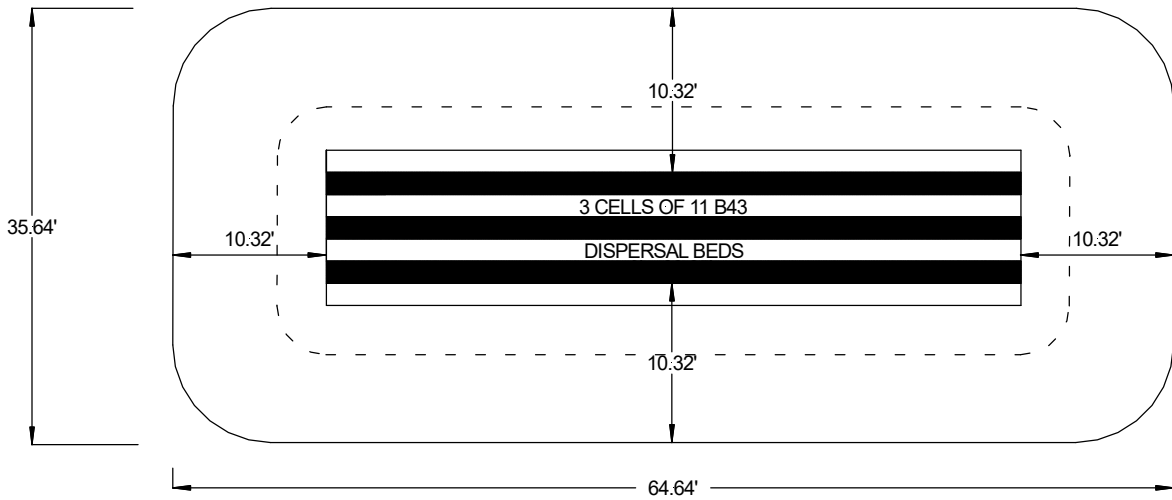
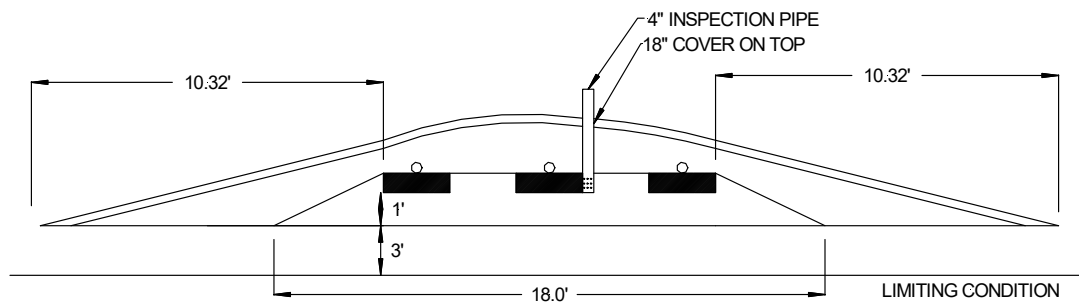


FIGURE 7: CROSS SECTION LEVEL MOUND EXAMPLE



## 4.0 Sloped Mound Sizing

### Sloped Mound Example:

House size:	3 Bedrooms
Classification:	Classification I
Soil Evaluation:	Loam; Blocky
Depth to Limiting Condition	36 inches
Site Slope	5%
Berm Ratio	4:1
Distribution Type:	Pressure Distribution

**1.A: Daily Design Flow:** From 7080.1860: 450 gpd

### 1.B: In situ soil application rate

USDA Soil Texture	Soil Structure and Grade	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.60	2.0

**1.C: Depth to Limiting Condition** 36 inches

**1.D: Site Slope** 5%

**1.E: Design Media Loading Rate** 1.2 gpd/ft<sup>2</sup>

### 1.F: Mound Absorption Ratio

USDA Soil Texture	Soil Structure and Grade	Mound Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	Mound Absorption Ratio
Loam	Granular, Blocky or Prismatic Structure; Weak to Strong Grade	0.60	2.0

### Eljen GSF Media Sizing

#### 2.A: Dispersal Bed Area = 1.A ÷ 1.E

450 gpd ÷ 1.2 gpd/ft<sup>2</sup> = 375 ft<sup>2</sup>

**2.B: Dispersal Bed Width (if using A42 = 2 ft, B43 = 3 ft)** 3 ft

#### 2.C: Contour Loading Rate = 2.B x 1.E (if greater than 12, reduce Dispersal Bed Width in 2.B)

3 ft x 1.2 gpd/ft<sup>2</sup> = 3.6 gal/ft

#### 2.D: Number of Cells = (Designer may shorten the mound using additional cells)

3 cells

#### 2.E: Dispersal Bed Length = 2.A ÷ 2.B ÷ 2.D

375 ft<sup>2</sup> ÷ 3 ft ÷ 3 = 41.6 ft, round to next greater number that is divisible by 4

44 ft

### Absorption Area Sizing

#### 3.A: Absorption Width = 2.B ÷ 1.F

3 ft x 2.0 = 6.0 ft

#### 3.B: Downslope Absorption Width Beyond Bed = (3.A – 2.B)

6.0 ft – 3 ft = 3.0 ft

## 4.0 Sloped Mound Sizing

### Mound Sizing

#### 6.A: Clean Sand Lift = 48 inches – 1.C

48 inches – 36 inches = 12 inches, convert to feet 1 ft

#### 6.B: Upslope Mound Height = 6.A + 1.58 ft (Height of Unit + Cover at Edge of Mound)

1 ft + 1.58 ft = 2.58 ft

#### 6.C: Upslope Berm Multiplier

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Upslope Berm	3:1	3.00	2.91	2.83	2.75	2.68	2.61	2.54	2.48	2.42	2.36	2.31	2.26	2.21
Ratio	4:1	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.12	3.03	2.94	2.86	2.78	2.70

We used the 4:1 ratio as that was specified in the example conditions.

#### 6.D: Upslope Berm Width = 6.C x 6.B

3.33 x 2.58 ft = 8.59 ft

#### 6.E: Drop in Elevation Under Bed = 2.B x 1.D

3 ft x .05 = 0.15 ft

#### 6.F: Downslope Mound Height = 6.B + 6.E

2.58 ft + 0.15 ft = 2.73 ft

#### 6.G: Downslope Berm Multiplier

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Downslope	3:1	3.00	3.09	3.19	3.30	3.41	3.53	3.66	3.80	3.95	4.11	4.29	4.48	4.69
Berm Ratio	4:1	4.00	4.17	4.35	4.54	4.76	5.00	5.26	5.56	5.88	6.25	6.67	7.14	7.69

We used the 4:1 ratio as that was specified in the example conditions.

#### 6.H: Downslope Berm Width = 6.G x 6.F

5.00 x 2.73 ft = 13.65 ft

#### 6.I: Berm to Cover Absorption Area = 3.B + 4 ft

3.0 ft + 4 ft = 7.0 ft

#### 6.J: Downslope Berm = either 6.H or 6.I, whichever is larger

13.65 ft > 7.0 ft 13.65 ft

#### 6.K: Berm Multiplier = usually 3.0 or 4.0

We used the 4:1 ratio as that was specified in the example conditions. 4.0

#### 6.L: Endslope Berm Width = 6.K x 6.F

4.0 x 2.73 ft 10.92 ft

#### 6.M: Total Mound Width = 6.D + (3.A x 2.D) – (3.A – 2.B) + 6.H

8.59 ft + (6 ft x 3 cells) – (6 ft – 3 ft) + 13.65 ft 37.24 ft

#### 6.N: Total Mound Length = 6.L + 2.E + 6.L

10.92 ft + 44 ft + 10.92 ft 65.84 ft

## 4.0 Sloped Mound Sizing

FIGURE 8: PLAN VIEW SLOPED MOUND

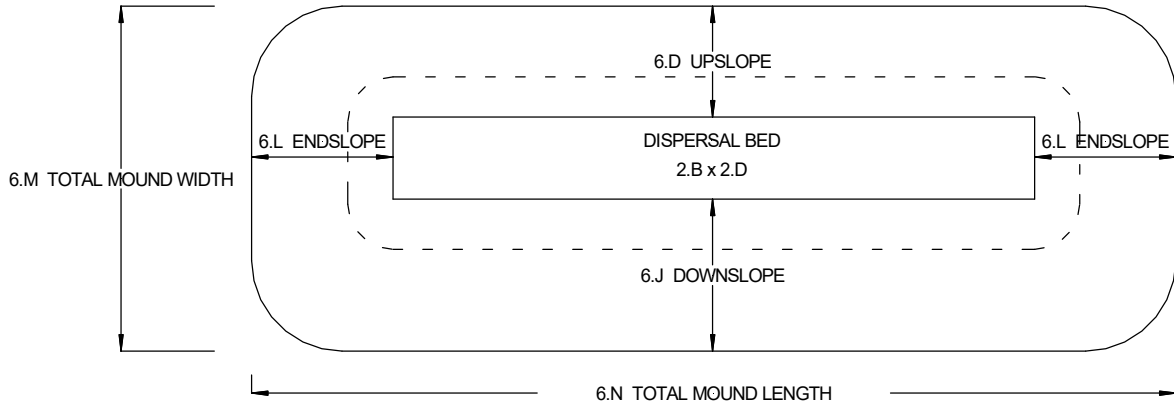
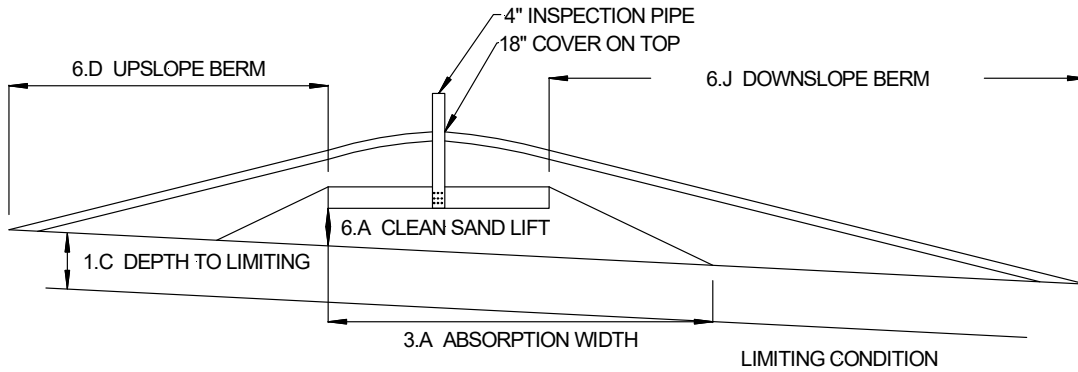


FIGURE 9: CROSS SECTION SLOPED MOUND



## 4.0 Sloped Mound Sizing

FIGURE 10: PLAN VIEW SLOPED MOUND EXAMPLE

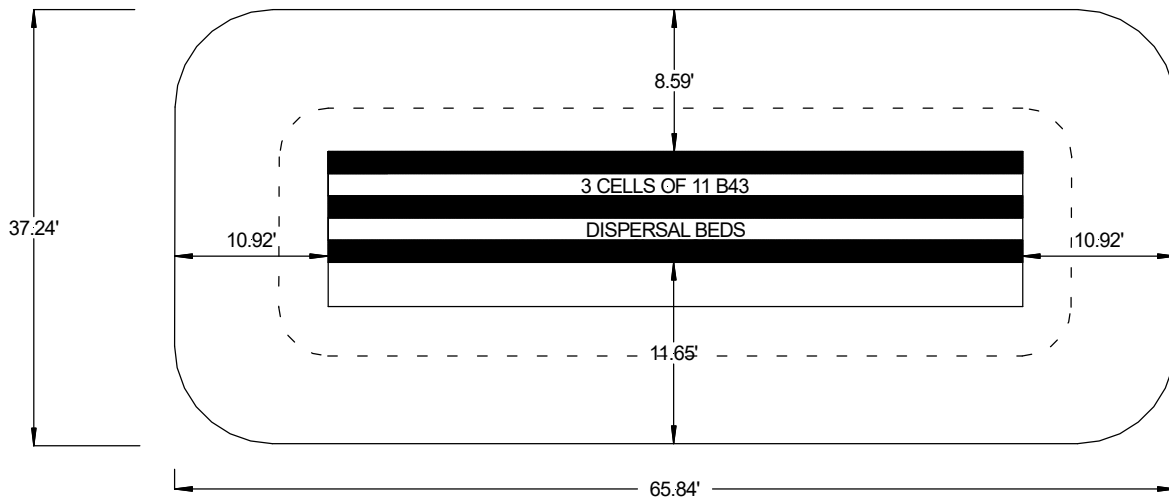
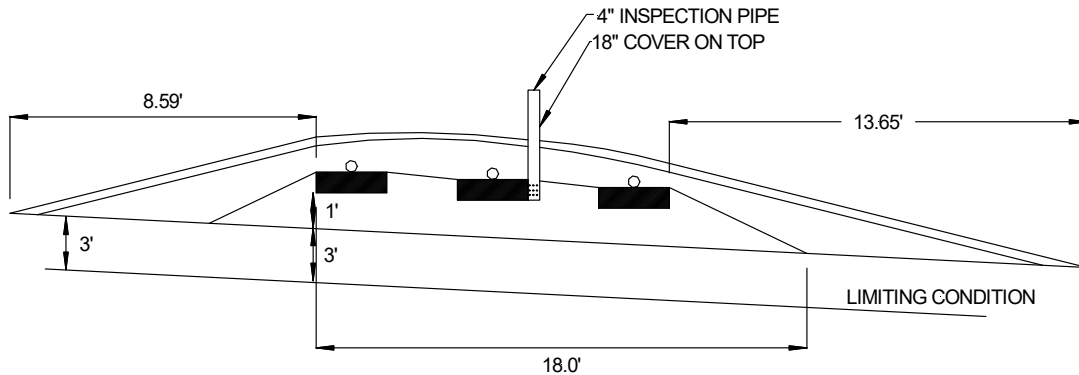


FIGURE 11: CROSS SECTION SLOPED MOUND EXAMPLE



## 5.0 Dispersal Bed Construction for Mounds

**DISPERSAL BED SIZING:** Options are 2 or 3 ft using the A42 or B43 respectively.

**A42 UNITS:** Have a width of 2 feet when used in a Dispersal Bed.

**B43 UNITS:** Have a width of 3 feet when used in a Dispersal Bed.

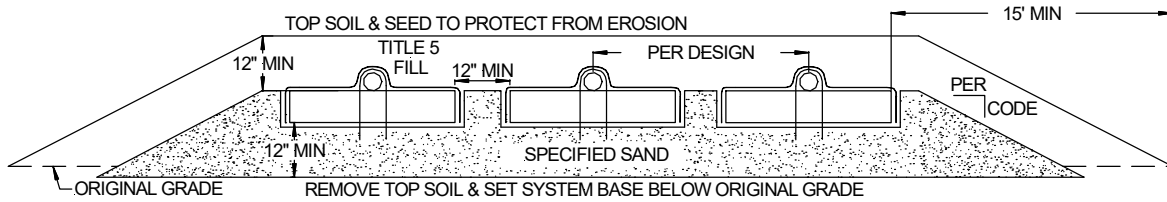
**UNITS REQUIRED:** Units are 4 feet long. Divide the Dispersal Bed Length by 4 and round up to determine the units required per row. Keep equal distance from the ends of the Dispersal Bed when placing the unit rows. Multiply the number of units required per row and that will determine the number of units required.

## 6.0 Mound Installation Guidelines

**6.1 MOUND REFERENCE:** The following guidelines provide an overview for mound design and construction. Mound distribution can either be pump to gravity or pressurized. Systems with 2000 GPD or greater shall require pressure distribution in accordance with 310 CMR 15.231.

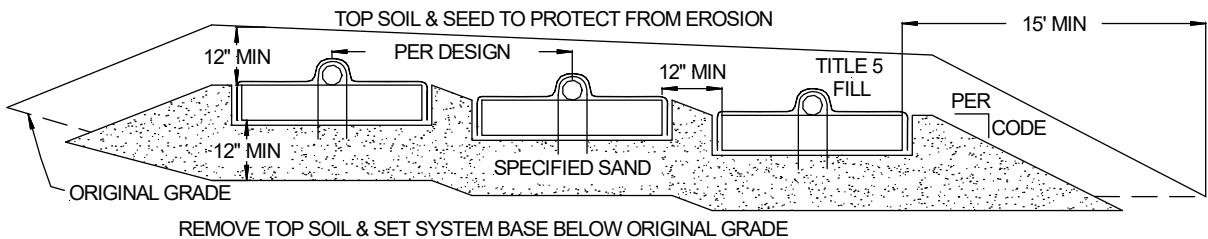
**FIGURE 12: CROSS SECTION – MOUND SYSTEM**

\*Note: Design Can Utilize Either B43 or A42 Modules



**FIGURE 13: CROSS SECTION – SLOPED MOUND SYSTEM**

\*Note: Design Can Utilize Either B43 or A42 Modules





## 6.0 Mound Installation Guidelines

---

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.
2. Determine the number of GSF Modules required using the sizing formula.
3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during preparation. Keep machinery off infiltrative areas.
4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.
5. Remove the organic soil layer. Prepare the receiving layer to maximize the interface between the native soil and Specified Sand. Minimize walking in the absorption area prior to placement of the Specified Sand to avoid soil compaction.
6. Place fill material meeting local requirements (or Specified Sand requirements) onto the soil interface as you move down the excavated area. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must shall meet the mound design requirements.
7. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.
8. A standard perforated 4-inch distribution pipe is centered along the modules 4-inch length. Orifices are set at the 4 & 8 o'clock position.
9. All distribution pipes are secured with manufacturers supplied wire clamps, one per module.
10. (Pressure Distribution Systems) Insert a PVC Sch. 40 pressure pipe (size per design and code) into the standard perforated distribution pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall include sweeping cleanouts at the terminal ends and be accessible from grade.
11. **Cover fabric substitution is not allowed.** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
  - a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
  - b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.
12. Ensure there is 6 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.
13. Complete backfill with a minimum of 12 inches of cover material measured from the top of the module. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.
14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

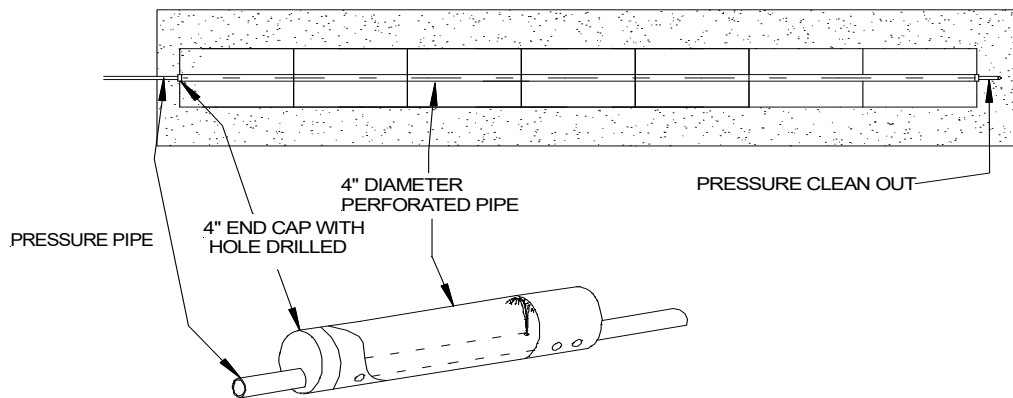
## 7.0 Pressure Distribution Guidance

**7.1 DOSING DESIGN AND FLOW RATE:** Dosing volume must be set to deliver a maximum of **4 gallons per B43 Module** and **3 gallons per A42 Module** per dosing cycle. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

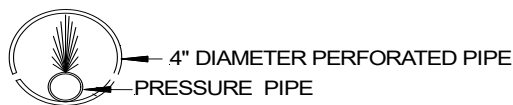
**7.2 PRESSURE DISTRIBUTION:** Dosing with small diameter pressurized laterals is acceptable for GSF systems. The pipe networks must be engineered and follow principles established for pressure distribution. Using pipe-in-pipe networks as shown in Figure 14, the orifice size and spacing of 3/16 inch and 4 feet is respectively recommended. On sloping sites, the orifices should be offset by 2 feet on each line. For example, the orifice on line one may be at 1 ft, 5 ft, 9 ft etc. with the next line at 3 ft, 7 ft, 11 ft etc. Flushing ports are required to maintain the free flow of effluent from orifices at the distal ends of each lateral. Contact Eljen's Technical Resource Department at 1-800-444-1359 for more information on pressure distribution systems

Standard procedures for design of pressure distribution networks apply to the GSF filter. A minimum orifice size according to the regulations shall be maintained. A drain hole is required at the 6 o'clock position of each pressure lateral for drainage purposes. The lateral pipe network, constructed of PVC Sch. 40 pipe (*size per design and code*), is placed within a standard 4-inch perforated pipe. The perforation in the 4-inch outer pipe are set at the 4 and 8 o'clock position, the drilled orifices on the pressure pipe are set to spray at the 12 o'clock position directly to the top of the 4-inch perforated pipe as shown below. Pressure clean outs are required at the end of each lateral.

FIGURE 14: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS



## 7.0 Pressure Distribution Guidance

FIGURE 15: PRESSURE CLEAN OUT

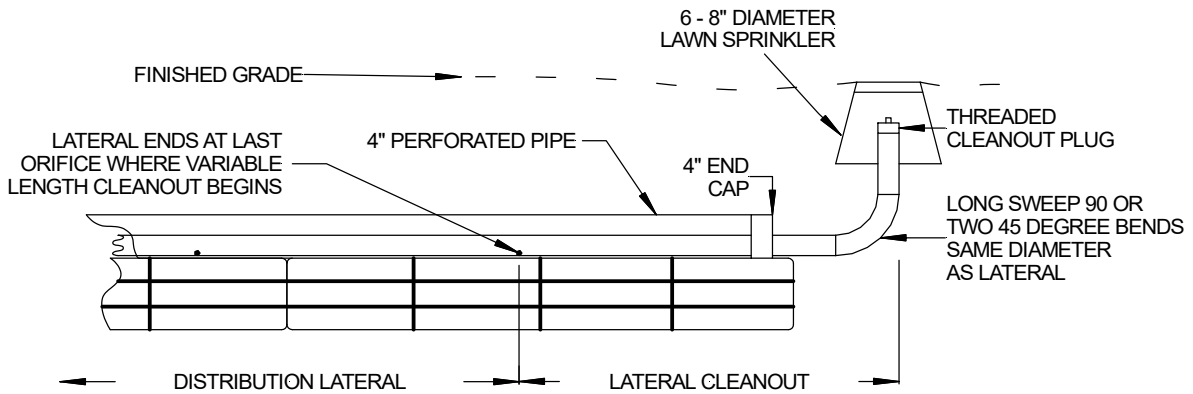
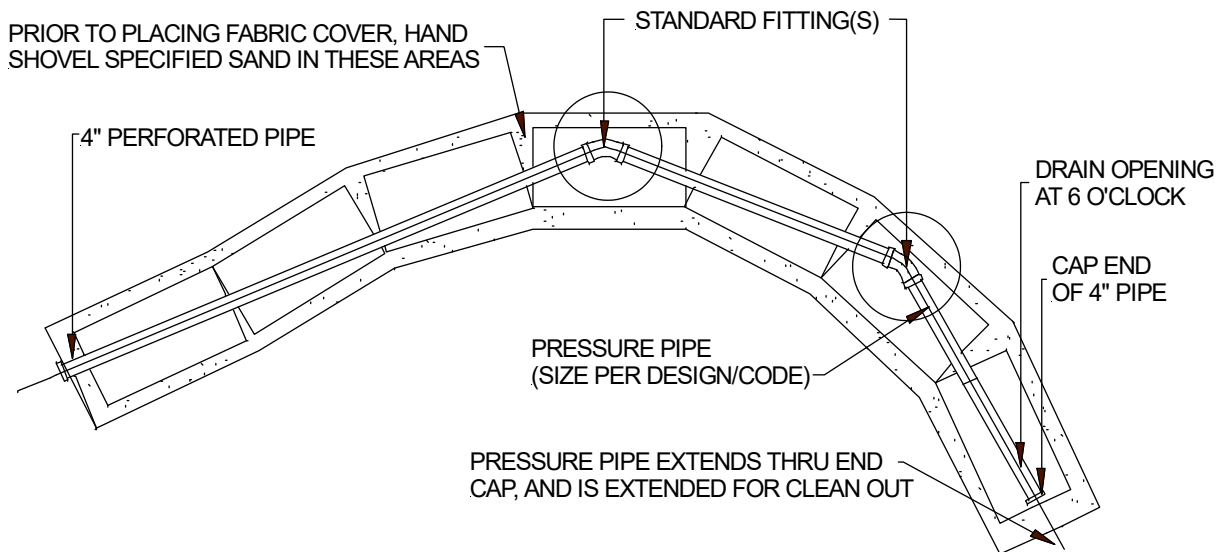


FIGURE 16: CONTOURED TRENCH PRESSURE DISTRIBUTION



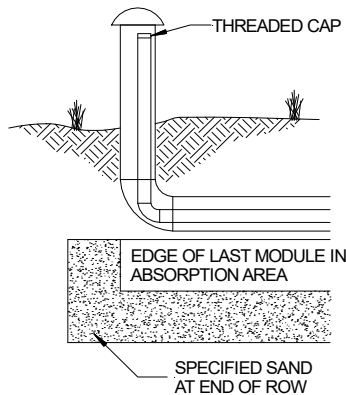
GSF Pressure Distribution trench placed on a contour or winding trenches to maintain horizontal separation distances may also be used in Dosed or Gravity system by removing the pressure pipe and using the 4-inch diameter perforated distribution pipe.

## 8.0 System Ventilation

**8.1 SYSTEM VENTILATION:** Air vents are required on all absorption systems located under impervious surfaces or systems **with more than 18 inches of cover material** as measured from the top of the GSF module to finished grade. This will ensure proper aeration of the modules and sand filter. The GSF has aeration channels between the rows of GSF modules connecting to cuspations within the GSF modules. Under normal operating conditions, only a fraction of the filter is in use. The unused channels remain open for intermittent peak flows and the transfer of air.

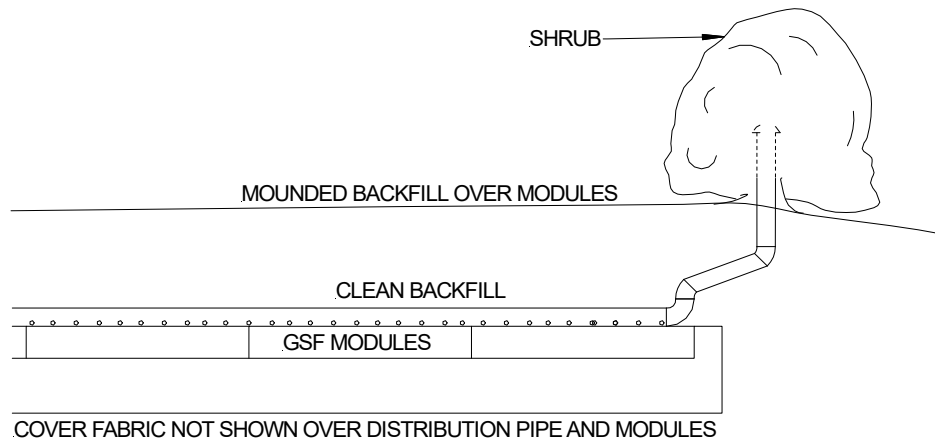
**8.2 VENT PIPE FOR GRAVITY AND LOW-PRESSURE SYSTEMS:** Systems with over 18" of cover over the top of the modules require a vent. If the system is a low-pressure distribution system, ensure that the LPP clean outs are located in the vent for easy access.

FIGURE 17: VENT LAYOUTS FOR GRAVITY AND LOW-PRESSURE SYSTEMS



**8.3 VENTILATION PLACEMENT:** In a GSF system, the vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs, as shown in the figure below. Corrugated pipe may be used. If using corrugated pipe, ensure that the pipe does not have any bends that will allow condensation to pond in the pipe. This may close off the vent line. The pipe must have an invert higher than the system so that it does not drain effluent.

FIGURE 18: GSF WITH 4" VENT EXTENDED TO CONVENIENT LOCATION



## **COMPANY HISTORY**

Established in 1970, Eljen Corporation created the world's first prefabricated drainage system for foundation drainage and erosion control applications. In the mid-1980s, we introduced our Geotextile Sand Filter products for the passive advanced treatment of onsite wastewater in both residential and commercial applications. Today, Eljen is a global leader in providing innovative products and solutions for protecting our environment and public health.

## **COMPANY PHILOSOPHY**

Eljen Corporation is committed to advancing the onsite industry through continuous development of innovative new products, delivering high quality products and services to our customers at the best price, and building lasting partnerships with our employees, suppliers, and customers.



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