



**Geotextile Sand Filter**

Oklahoma  
Design & Installation Manual



**eljen**  
CORPORATION

*Innovative Onsite Products & Solutions Since 1970*

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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>Cover Fabric</b>	The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules.
<b>Design Flow</b>	Individual on-site sewage treatment systems. The average daily flow for an individual on-site sewage treatment system shall be based on an average water usage of two hundred (200) gallons per day for a residence of two (2) bedrooms or less, with an additional sixty-six (66) gallons per day for each additional bedroom.
<b>GSF</b>	The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and the 12-inch layer 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>Serial or Sequential Distribution</b>	Designs common to sloping sites where GSF lines are laid on the contour, receiving effluent from a series of Drop-Boxes starting at upper Modified Trench / Line and overflows effluent when required to down-slope Modified Trenches / Lines.
<b>Specified Sand</b>	To ensure proper system operation, the system MUST be installed ASTM C33 SAND. Sand must be used with not more than 10% passing the #100 Sieve and not more 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

# GSF System Description

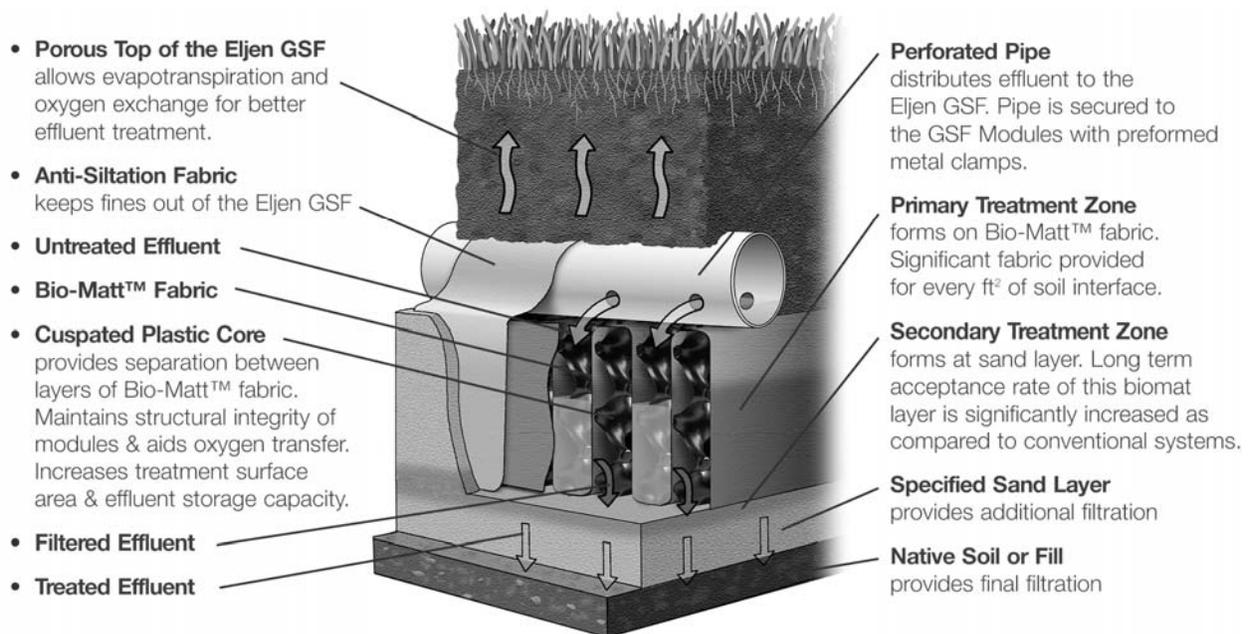
## Primary Treatment Zone

- Perforated pipe is centered above the GSF module to distribute septic effluent over and into corrugations created by the cusped core of the geotextile module.
- Septic effluent is filtered through the Bio-Matt fabric. The module's unique design provides increased surface area for biological treatment that greatly exceeds the module's footprint.
- Open air channels within the module support aerobic bacterial growth on the modules geotextile fabric interface, surpassing the surface area required for traditional absorption systems.
- An anti-siltation geotextile fabric covers the top and sides of the GSF module and protects the Specified Sand and soil from clogging, while maintaining effluent storage within the module.

## Secondary Treatment Zone

- Effluent drips into the Specified Sand layer and supports unsaturated flow into the native soil. This Specified Sand/soil interface maintains soil structure, thereby maximizing the available absorption interface in the native soil. The Specified Sand supports nitrification of the effluent, which reduces oxygen demand in the soil, thus minimizing soil clogging from anaerobic bacteria.
- The Specified Sand layer also protects the soil from compaction and helps maintain cracks and crevices in the soil. This preserves the soil's natural infiltration capacity, which is especially important in finer textured soils, where these large channels are critical for long-term performance.
- Native soil provides final filtration and allows for groundwater recharge.

FIGURE 1: GSF SYSTEM OPERATION



## 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 Title 252, Department of Environmental Quality, Chapter 641, Individual and Small Public On-Site Sewage Treatment Systems and the local regulations will be referred to as the *guidelines* in this manual. The sizing charts apply to residential systems only.

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:** Eljen discourages the use of garbage disposals with septic systems. If a GSF system is to be designed and installed with garbage disposals the following measures must be taken to prevent solids from leaving the tank and entering the GSF system:

- Increasing the septic tank capacity by a minimum of 30%, or
- Installation of a second septic tank installed in series, or
- Installation of an appropriate sized septic tank outlet effluent filter.

Eljen requires the use of septic tank outlet effluent filters on all systems especially on those systems that have single compartment tanks, even if up-sized, and when the dwelling has a garbage disposal installed.

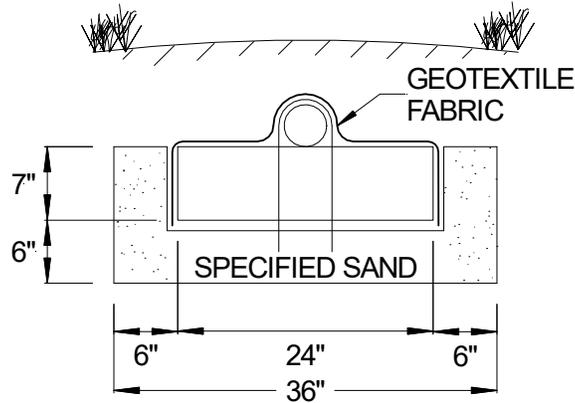
**1.4 ADDITIONAL FACTORS AFFECTING RESIDENTIAL SYSTEM SIZE:** Homes with expected higher than normal water usage may consider increasing the septic tank volume as well as incorporating a multiple compartment septic tank. Consideration for disposal area may be up-sized for expected higher than normal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

FIGURE 2: TYPICAL A42 CROSS SECTION



A42 MODULE (L x W x H) 48" x 24" x 7"

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

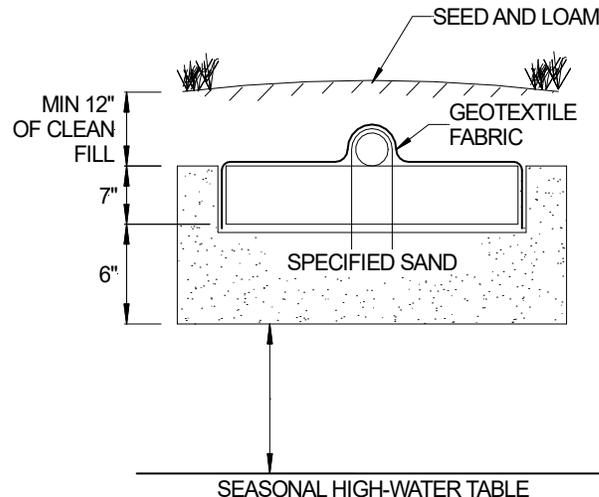
- 6 inches of Specified Sand is at the edges of the GSF module.
- 6 inches of Specified Sand is at the beginning and end of each GSF Row.
- 6 inches of Specified Sand is directly below the GSF module.
- Minimum 12 inches of cover above the module.

**2.1 SEPTIC TANK:** Septic tanks should be fitted with an effluent filter and sized according to state regulations. Refer 252:641-7-4 of Title 252 for further guidelines.

**2.2 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.

**2.3 SEASONAL HIGH-WATER TABLE:** Reduction in vertical separation may be allowed by your approving authority in accordance with Appendix A of the Title 252.

FIGURE 3: VERTICAL SEPARATION DISTANCE



## 2.0 Design and Installation

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**2.4 SPECIFIED SAND SPECIFICATION FOR GSF SYSTEMS:** The first 6 inches of Specified Sand immediately under and the 12 inches between rows and around the perimeter of the GSF system must be an **ASTM C33 WASHED CONCRETE SAND 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 ASTM C33 sand and sieve specifications.

**2.5 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.

**2.6 DISTRIBUTION:** Gravity, pump to gravity or pressure distribution are acceptable when using the GSF System. Piping shall meet the requirements guidelines; however, Eljen strongly recommends the use of SDR 35 pipe and fittings as to prevent crushing during backfill. All distribution piping must meet a minimum 2,500-pound crush test specification for polyvinyl chloride (PVC) drain, waste and vent pipe.

All systems require a perforated 4” diameter pipe centered on top of the GSF modules unless the system is curving. The distribution pipe continues along the entire length of all modules in a trench or row. Holes are set at the 4 and 8 o’clock position and secured by the Eljen provided wire clamps.

When using pressure distribution, a pressure manifold is placed inside the 4-inch distribution pipe. Section 7 of this manual goes into details of how to construct the distribution network. All piping must meet state and local regulations.

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

**2.8 DISTRIBUTION BOX:** Set the gravity system D-box outlet invert a minimum of  $\frac{1}{8}$  inch drop in elevation per linear foot to the top first module in the row. Set a 2-inch minimum drop for dosed systems from the D-box to the modules. Ensure that the distribution box and pipes feeding the system are placed on compacted soil. Flow Dials may be used in either Gravity or Dosed installations.

**2.9 INSTALLING ON SLOPING TERRAIN:** For trench systems, edge-to-edge spacing will be a minimum of 4 feet. For bed systems, edge-to-edge minimum spacing will be 1 foot. For sloping sites, a minimum edge-to-edge spacing on the units is 2 feet.

Provide a D-box at the beginning of the first row of modules for effluent distribution and velocity reduction and as a system inspection port. Lower rows may also be loaded from one or more D-boxes with Flow Dials to insure effluent is distributed per design requirements. Sequential or equal distribution is permitted.

Equal Distribution: Set Flow Dials to insure effluent is distributed equally to all rows in the system.

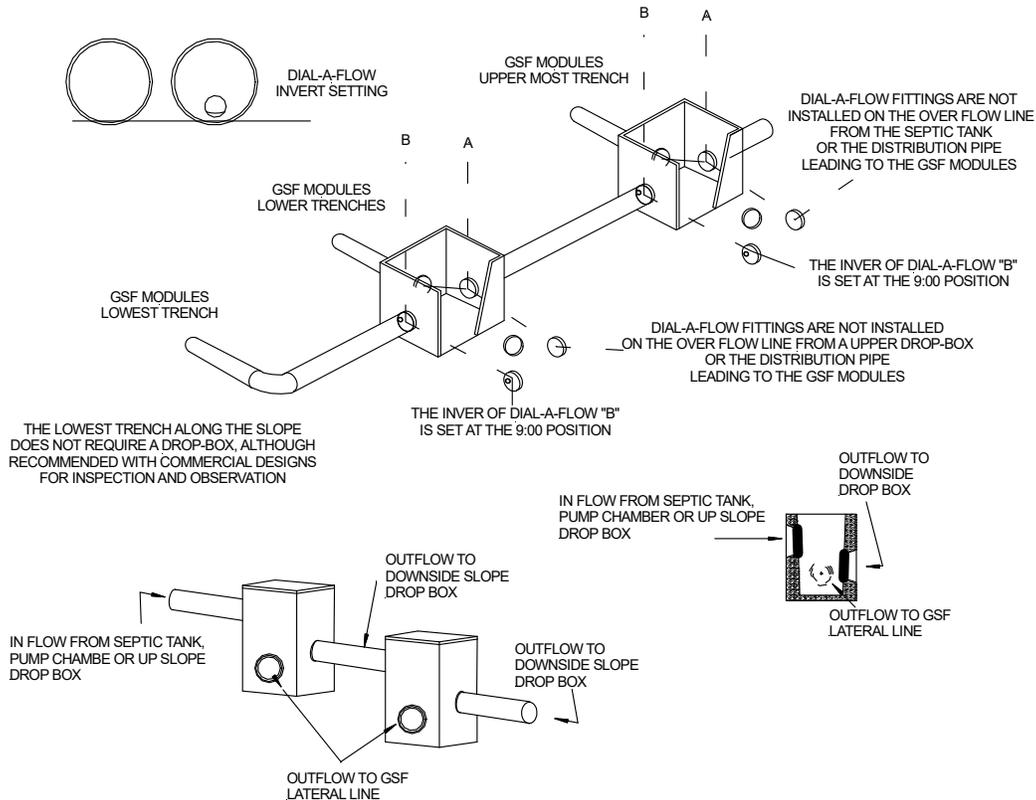
Sequential Distribution: Set Flow Dials to insure effluent is loaded to the upslope trench first before continuing to lower trenches within the system.

**2.10 EQUAL DISTRIBUTION:** Parallel distribution is the preferred method of dosing to a gravity or pump to gravity system. It encourages equal flows to each of the lines in the system. It is recommended for most trench systems.

## 2.0 Design and Installation

**2.11 SEQUENTIAL DISTRIBUTION:** Sequential Distribution using a distribution box will fully utilize the uppermost section of the system prior to spilling effluent into a lower row of modules. This is for use on any site with greater than 0.5% slope when not using parallel distribution.

FIGURE 4: SEQUENTIAL DISTRIBUTION DROP-BOX DETAIL



**2.12 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.

**2.13 SYSTEM VENTING:** It is required 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 such as patios. See Section 8.0 for a more detailed explanation of venting GSF products.

**2.14 BACKFILL & FINISH GRADING:** Complete backfill with a minimum of 12 inches of clean porous fill measured from the top of modules. Use well graded sandy 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 absorption area. Finish grade to prevent surface ponding. Seed and loam system area to protect from erosion.

**2.15 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.

There is a minimum 4-foot separation between trenches, measured from sidewall to sidewall.

In bed and trench systems, it is acceptable to space the units to maximize points of application to the basal area.

## 2.0 Design and Installation

**2.16 BED SYSTEMS:** Bed systems require a minimum of 2 rows and Eljen recommends a maximum lateral to lateral spacing of 12 feet.

**2.17 NUMBER OF GSF MODULES REQUIRED:** Calculations on how to determine the number of GSF module for residential systems use are based on the following information:

- a maximum loading rate of 25 gallons per day per module for A42 modules;
- a minimum of 6 A42 Modules per bedroom.

**2.18 SIZING GSF SYSTEM FOR TRENCHES, BEDS & SAND MOUNDS:** When determining the correct sizing for your GSF system, it is important to follow your local codes and regulations for proper surface and subsurface classifications.

### 2.19 SIZING CHARTS:

**TABLE 2: SQUARE FOOTAGE REQUIRED**

SOIL GROUP	NUMBER OF BEDROOMS IN RESIDENCE			
	Two or Fewer	Three	Four	Each Additional Bedroom
1	230	300	370	80
2	230	300	370	80
2a	350	460	580	120
3	480	630	770	150
3a	700	930	1160	240
4	920	1240	1540	320
5	1400	1880	2340	500

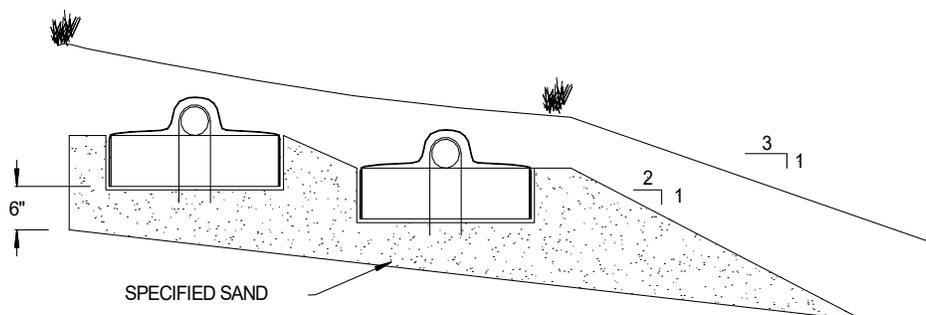
**TABLE 3: MINIMUM NUMBER OF MODULES REQUIRED BEDS AND MOUNDS**

Bedrooms	2	3	4	Each Additional Bedroom
Number of Modules Required for A42	12	18	24	6

**2.20 DESIGN NOTE:** All systems must meet the requirements of 2.15 and 2.16 or 2.17. The system must have the minimum number of units and it must have the minimum footprint required. Some designs will require additional modules or bottom area to meet these requirements.

**2.21 BED DESIGN:** Evenly distribute the bed laterals in the basal area for level bed installations. A minimum separation distance between laterals for A42's is 3 feet. On sloping bed installations over 5% slope, move the uppermost lateral to 2 feet from the upper cell edge, and space the rows afterwards at 3 feet lateral to lateral.

**FIGURE 5: SECTION VIEW – SLOPING BED SYSTEM**



### 3.0 Trench Installation Sizing and Guidelines

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**Trench Example:**

House size: 3 Bedrooms  
 Soil Group: 2a  
 Absorption field type: Trench

**Calculate the Bottom Area Required**

Lookup the information required from Table 2:

NUMBER OF BEDROOMS IN RESIDENCE				
SOIL GROUP	Two or Fewer	Three	Four	Each Additional Bedroom
2a	350	460	580	120

**Calculate Minimum Number of Units Required**

Bottom Area Required ÷ 12 ft<sup>2</sup>/A42 = Minimum Units Required

A42: 460 ft<sup>2</sup> ÷ 12 ft<sup>2</sup>/A42      38.33,  
 A42: Round up to                      39 A42 Modules

**Calculate Minimum Trench Length**

Modules Required x 4 + 1 ft

A42: 39 Units x 4 + 1 ft              157 linear feet

**Trench Width**

A42: 3 ft

**Final Dimension Layout**

*(Note: System layout and number of rows will vary based on site constraints)*

**A42**

Min. Trench Length	157 ft
Trench Width	3 ft
Minimum Number of Units	39 A42 modules
Designed Absorption Area	471 ft <sup>2</sup>

### 3.0 Trench Installation Sizing and Guidelines

FIGURE 6: PLAN VIEW – A42 TRENCH SYSTEM EXAMPLE

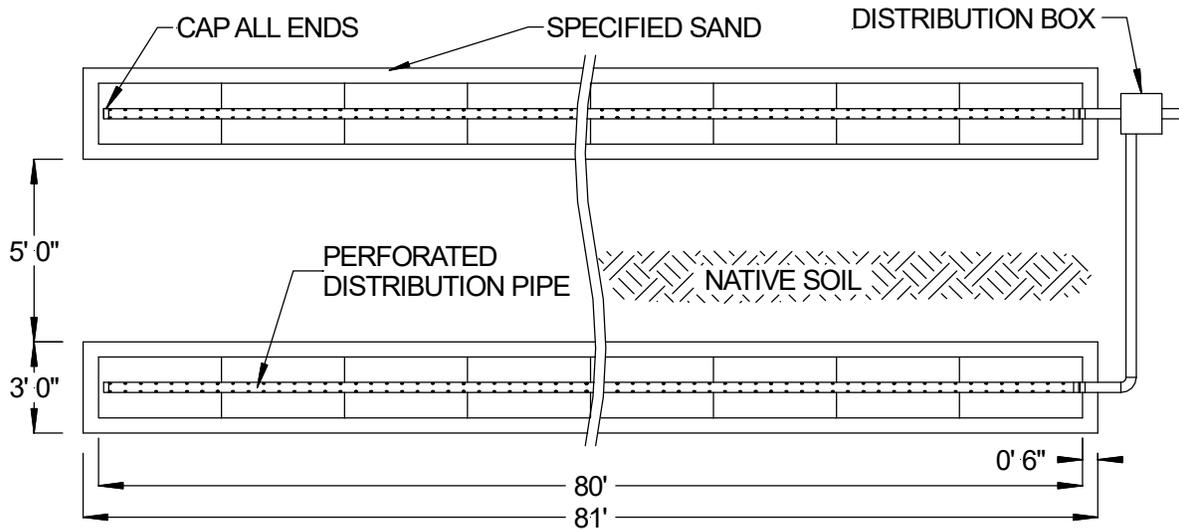


FIGURE 7: SECTION VIEW – A42 TRENCH SYSTEM EXAMPLE – LEVEL SITE

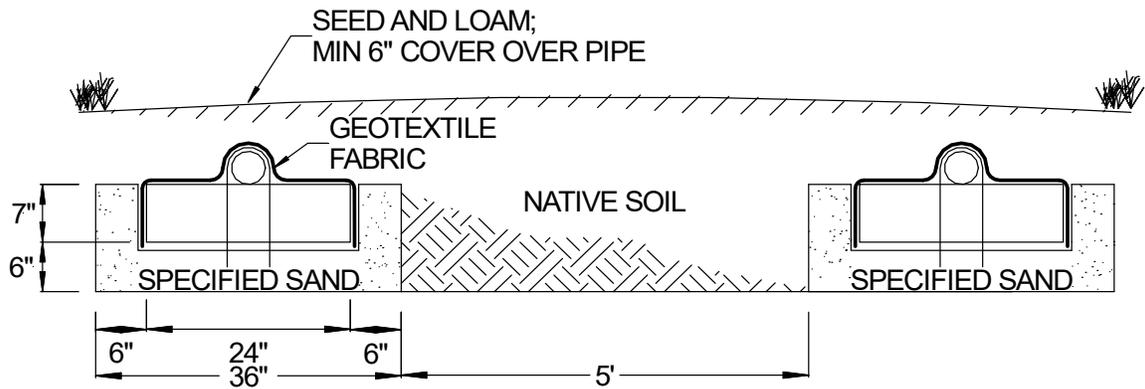
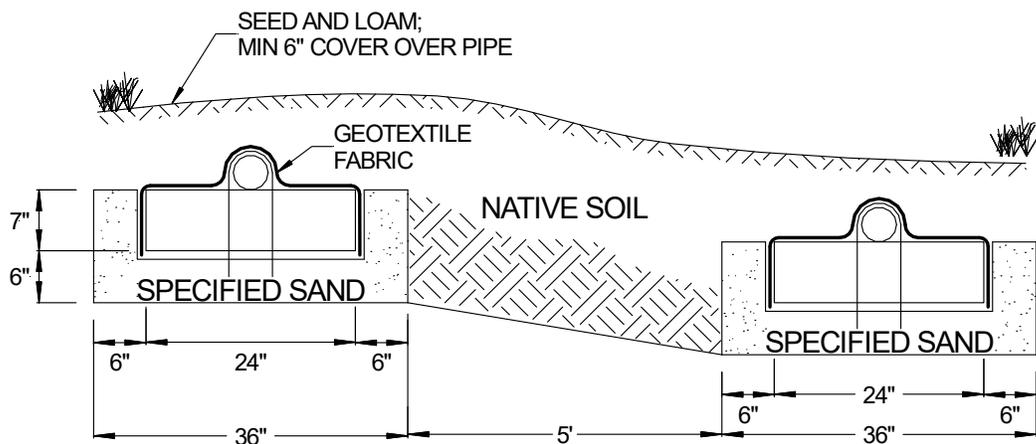


FIGURE 8: SECTION VIEW – A42 TRENCH SYSTEM – SLOPING SITE



### 3.0 Trench Installation Sizing and Guidelines

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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 trench sizing example.
3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during excavation. 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. Excavate the trench; prepare the receiving layer to maximize the interface between the native soil and specified sand.
6. Minimize walking in the trench prior to placement of the specified sand to avoid soil compaction.
7. Place specified sand in a 6" lift and stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The minimum stabilized height below the GSF module must be level at 6".
8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.
9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.
10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.
11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 13. 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.
12. **Cover fabric substitution is not allowed.** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the trench, 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.
13. Place the sand extensions along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each trench.
14. Complete backfill with a minimum of 6 inches of clean porous fill measured from the top of the distribution pipe. 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.
15. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

## 4.0 Bed Installation Sizing and Guidelines

### Bed

#### Example:

House size: 3 Bedrooms  
 Soil Group: 3  
 Absorption field type: Bed

#### Minimum Number of Units

Lookup the information required from Table 3:

Bedrooms	2	3	4	Each Additional Bedroom
Number of Modules Required for A42	12	18	24	6

A42: 18 Units

#### Square Footage Required

Lookup the information required from Table 2:

NUMBER OF BEDROOMS IN RESIDENCE				
SOIL GROUP	Two or Fewer	Three	Four	Each Additional Bedroom
3	480	630	770	150

**Minimum Bed Bottom Required 630 ft<sup>2</sup>**

#### Bed Width

Number of Rows x Desired Row Width (Recommend Max of 12 feet)

A42: 2 Rows x 6 feet 12 ft

#### Calculate Bed Length – Minimum 2 Rows

Minimum Absorption Area Required ÷ Bed Width

A42: 630 ft ÷ 12 ft 52.5 ft

A42: Round to 53 ft

#### Calculate Unit Length

A42: 18 A42s ÷ 2 Rows 9 A42s per Row

A42: 9 A42s x 4 ft per A42 36 ft

#### Determine Lateral Spacing

Lateral to Lateral Spacing = Bed Width ÷ Number of Rows

A42: 12 ft ÷ 2 Rows 6 ft

Lateral to Edge Spacing = Lateral to Lateral Spacing ÷ 2

A42: 6 ft ÷ 2 3 ft

#### Determine Module Spacing in Bed

(Bed Length – Unit Length) ÷ 2

A42: (53 ft – 36 ft) ÷ 2 8.5 ft

A42: Round to 8.5 ft

#### A42

Bed Length	53 ft.
Bed Width	12 ft.
Minimum Number of Units	18 Units
Units per Row	9 units per row
Lateral to Lateral Spacing	6 ft.
Lateral to Edge Spacing	3 ft.
Edge of System to Module	8.5 ft
System Area	636 ft <sup>2</sup>

## 4.0 Bed Installation Sizing and Guidelines

### Final Dimension Layout

(Note: System layout and number of rows will vary based on site constraints)

FIGURE 9: PLAN VIEW –BED SYSTEM EXAMPLE – LEVEL SITE

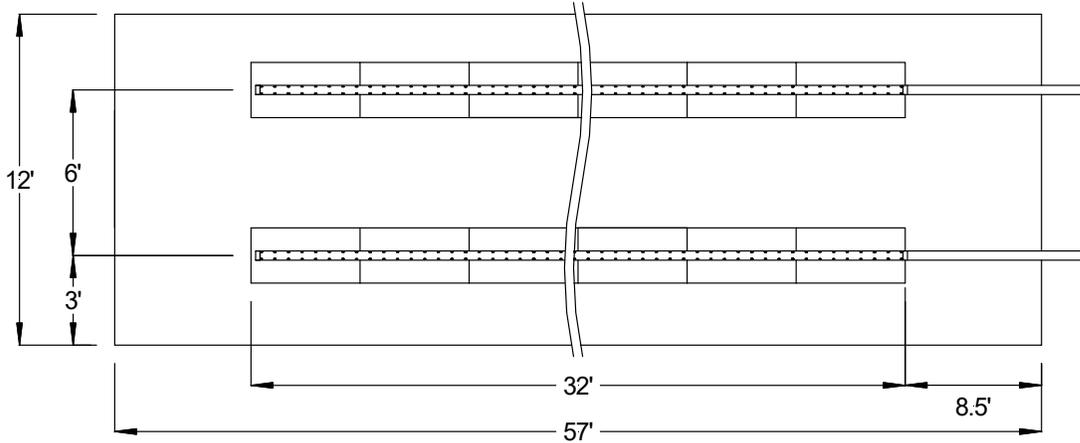
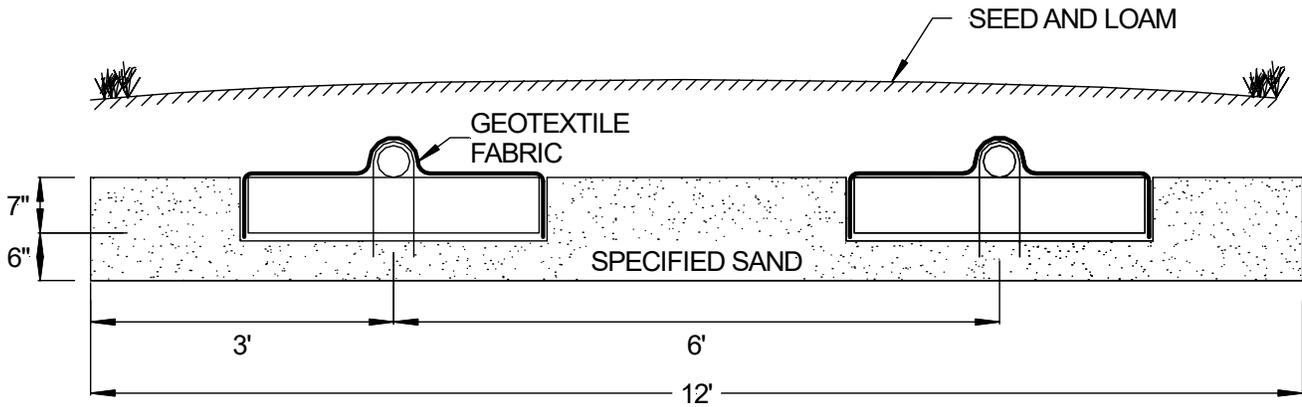


FIGURE 10: SECTION VIEW – BED SYSTEM EXAMPLE



## 4.0 Bed Installation Sizing and Guidelines

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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 bed sizing example.
3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during excavation. 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. Excavate the bed absorption area; prepare the receiving layer to maximize the interface between the native soil and specified sand.
6. Minimize walking in the absorption area prior to placement of the specified sand to avoid soil compaction.
7. Place specified sand in 6" lifts, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The minimum stabilized height below the GSF module must be level at 6".
8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.
9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.
10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.
11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 13. 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.
12. **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.
13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each module row. Beds on level sites require a minimum spacing of 12" of Specified Sand between parallel module rows.
16. Complete backfill with a minimum of 6 inches of clean porous fill measured from the top of the distribution pipe. 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.
14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

## 5.0 Mound Installation Guidelines

**5.1 INSTALLING ABOVE NATURAL SOIL GRADE:** If the portions of the installation are installed above natural soil grade, follow the guidelines provided and the local regulations. Mound distribution can be either gravity feed or pressure dosed. Use a minimum of 12 inches of sand under the units for all installations in less than 6 inches of grade.

FIGURE 11: INSTALLING ABOVE NATURAL SOIL GRADE

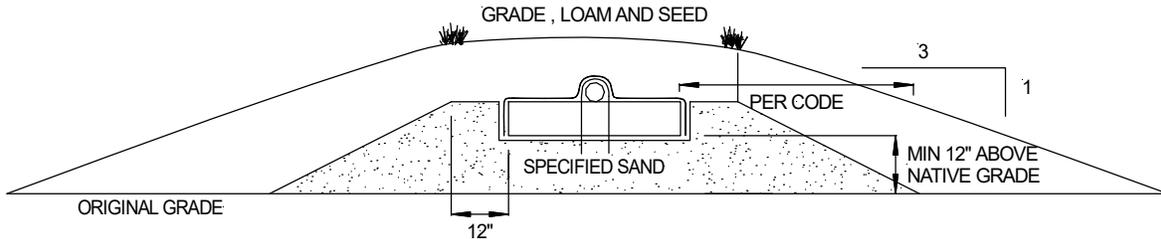
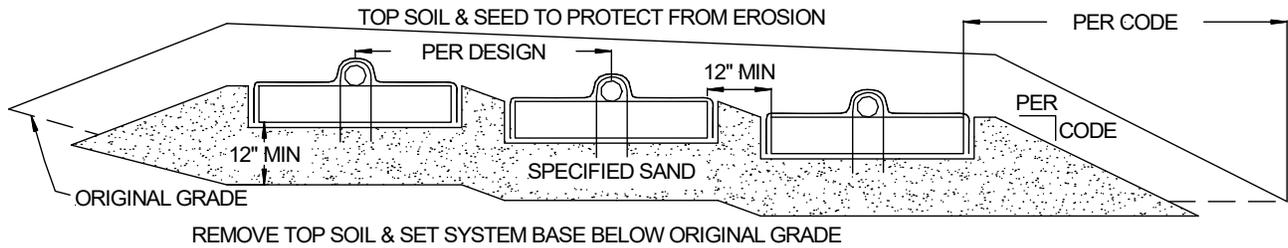


FIGURE 12: CROSS SECTION – SLOPED MOUND SYSTEM



## 5.0 Mound Installation Guidelines

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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 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-foot 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 13. 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 12 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.
17. Complete backfill with a minimum of 6 inches of clean porous fill measured from the top of the distribution pipe. 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.
13. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

## 6.0 Dosing Distribution Guidance

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**6.1 PUMP TO DISTRIBUTION BOX:** Specify an oversized distribution box for pumped dosed systems. Provide velocity reduction in the d-box with a tee or baffle. Set d-box outlets at the same elevation to equalize flow to each line or use drop boxes at the head of each line for sequential distribution. If the absorption area is installed deeper than 18 inches, the system must be vented. See Section 8.0 of this manual for detailed information on venting of systems.

**6.2 DOSING DESIGN AND FLOW RATE:** Dosing volume must be set to deliver a maximum of 3 gallons per A42 Module per dosing cycle. Higher flow rates and short dose cycle push the effluent down the line and thus disperse the effluent over a larger area. A valve on the force main is recommended to set the flow rate so that the outlet pipes are submerged but prevents the d-box from over flowing.

For residential strength wastewater; the maximum A42 Module design flow shall not exceed 25 gallons per day per module.

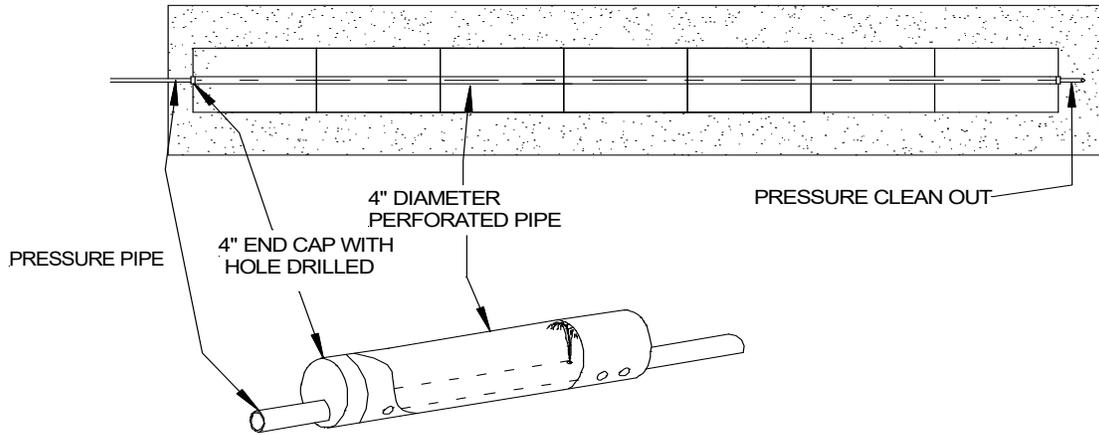
## 7.0 Pressure Distribution Guidance

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**7.1 LOW PRESSURE DOSING:** 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 13, the orifice size and spacing of 3/16 inch and 4 feet is respectively recommended. 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 13: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

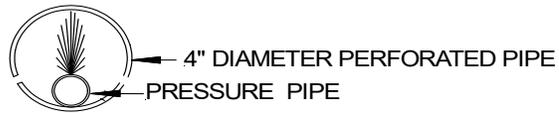
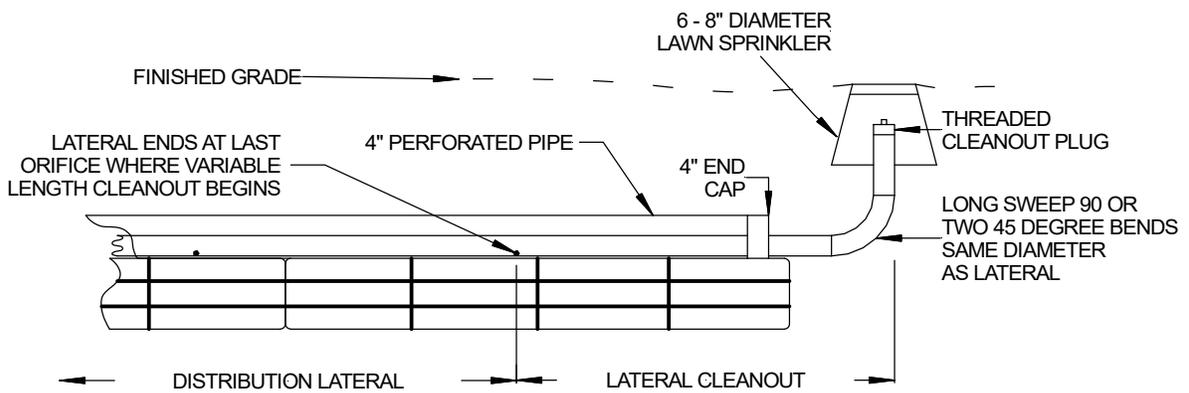


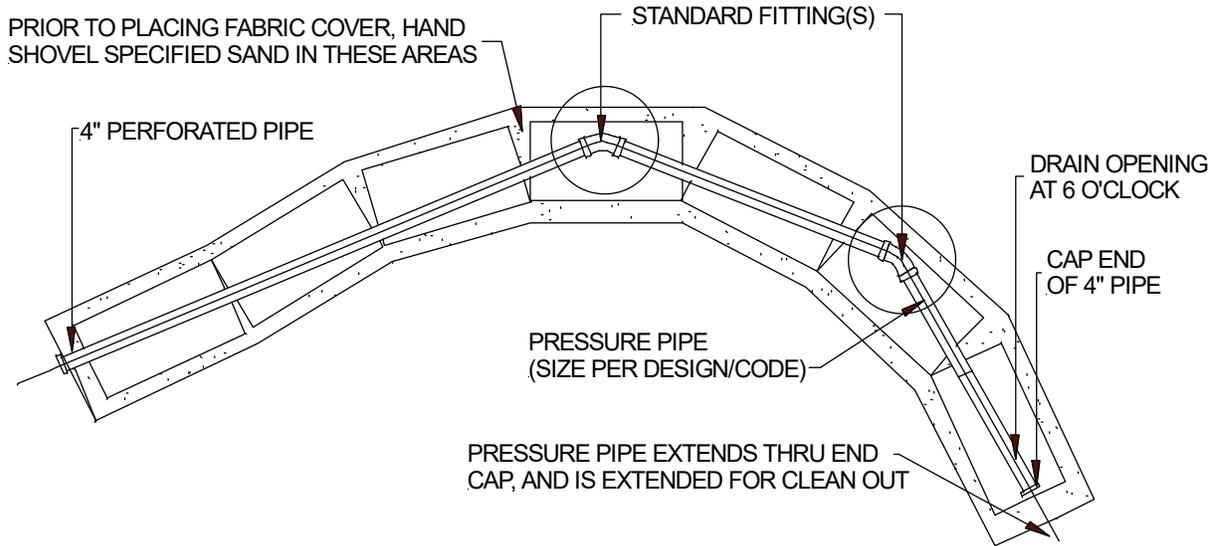
FIGURE 14: PRESSURE CLEAN OUT



## 7.0 Pressure Distribution Guidance

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FIGURE 15: CONTOURED TRENCH PRESSURE DISTRIBUTION



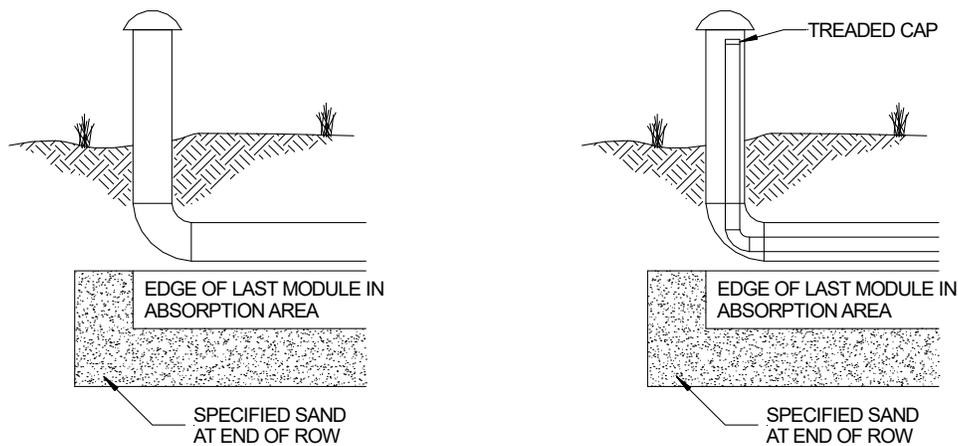
GSF Pressure Distribution trench placed on a contour or winding trenches to maintain horizontal separation distances may also be used in Dosed or Gravity system by removing the pressure pipe and using the 4-inch diameter perforated distribution pipe.

## 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 cuspatations 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.

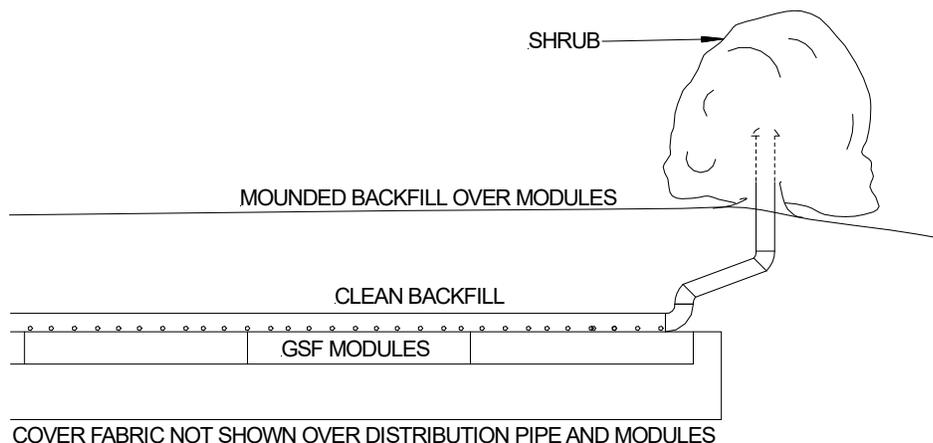
**8.2 VENT PIPE FOR GRAVITY AND LOW-PRESSURE SYSTEMS:** Systems with over 18" of cover over the top of the modules require a vent. If the system is a low-pressure distribution system, ensure that the LPP clean outs are located in the vent for easy access.

FIGURE 16: 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 17: 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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