GSF®

Geotextile Sand Filter

Washington
Design & Installation Manual

eljen
CORPORATION

Innovative Onsite Products & Solutions Since 1970

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Glossary of Terms

A42 Module 48” x 24” x 7” (L x W x H)

Cover Fabric The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules. Barrier material cannot be substituted.

Design Flow The estimated peak flow that is used to size a GSF system is 120 gallons per day per Bedroom.

GSF Unit The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and 6 inches along the sides of the modules.

GSF Module The individual module of a GSF system. The module is comprised of a cuspated plastic core and geotextile fabric.

Specified Sand To ensure proper system operation, the system MUST be installed using ASTM C33 Sand.

ASTM C33 sand will have less than 10% passing the #100 Sieve and less than 3% 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	5 - 30
No. 100	149 µm	0 - 10
No. 200	75 µm	0 - 3

The sand must not have more than 45% pass any one sieve and be retained on the next consecutive sieve of those shown above.

The fineness modules must be neither less than 2.3 nor more than 3.1. The fineness modules is calculated by adding the cumulative percentages of material in the sample retained in the sieves shown above and dividing the sum by 100.

GSF System Description

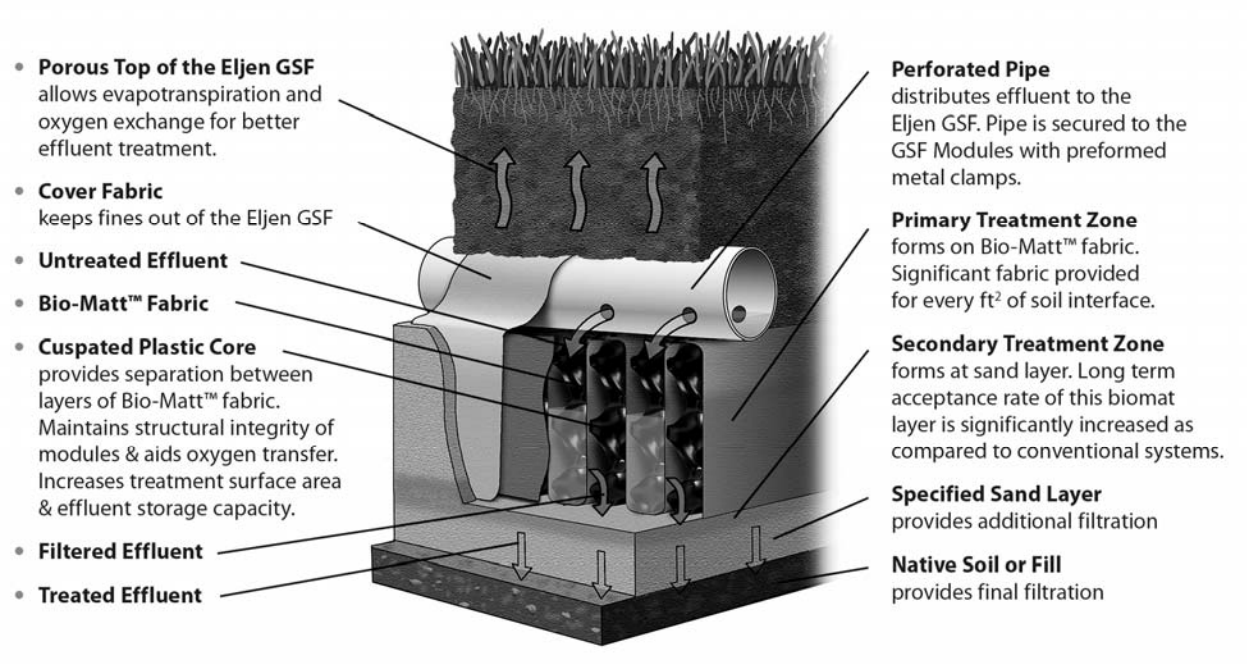
Primary Treatment Zone

- Perforated pipe is centered above the GSF module to distribute septic effluent over and into corrugations created by the cuspated core of the geotextile module.
- Septic effluent is filtered through the Bio-Matt (geotextile) 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.
- A cover 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 Conditions for Use

1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. The Washington Regulations WAC 246-272A and the local regulations will be referred to as the *guidelines*. The designs in this manual are guided by the design instructions for Treatment Level C in the guidelines.
The sizing charts apply to residential systems only and are found in section 2.17. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems.

1.2 ALTERATION OF MODULES: GSF modules shall not be altered by cutting or any other type of physical modification.

1.3 WATER SOFTENER BACKWASH: Water softener backwash shall be discharged to a separate soil absorption field meeting all required state codes and local regulations.

1.4 SEPTIC TANK OUTLET FILTERS: Eljen requires the use of outlet filters on all tanks including single compartment tanks, up-sized tanks or when the dwelling has a garbage disposal installed.

1.5 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:

- Increase the septic tank capacity by a minimum of 30% *or*
- Installation of a second septic tank installed in series if a multi-compartment tank isn't used

1.6 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.

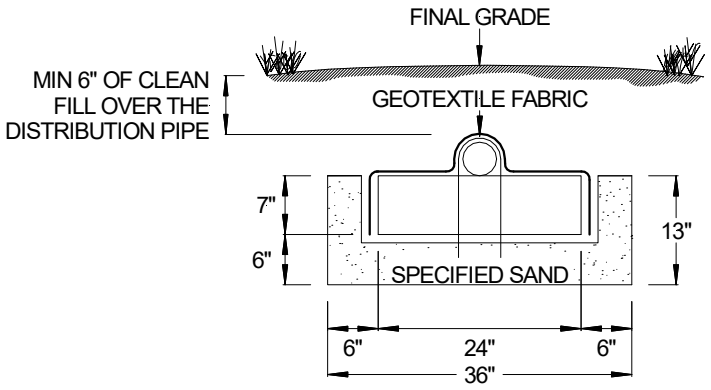
1.7 SYSTEM PROHIBITED AREAS: All vehicular traffic is prohibited over the GSF system. GSF systems shall not be installed under paved or concreted areas. If the system is to be installed in livestock areas, the system must be fenced off around the perimeter to prevent compaction of the cover material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

1.8 ELJEN INSTALLER CERTIFICATION: All installers are required to be trained and certified by an authorized Eljen representative. Contact your local distributor for training information.

2.0 General System Design and Installation

2.1 GENERAL TRENCH CROSS SECTION

FIGURE 2: A42 TRENCH CROSS SECTION



All trenches are required to have a minimum of:

- 6 inches of Specified Sand at the edges of the GSF module.
- 6 inches of Specified Sand at the beginning and end of each GSF Row.
- 6 inches of Specified Sand directly below the GSF module.
- 6 inches of clean fill material above the distribution pipe.

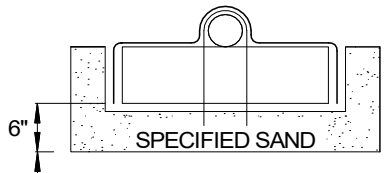
2.2 SEPTIC TANK: Septic tanks shall meet state and local sizing standards. Dual compartment tanks are required for all systems. Eljen supports this practice as it helps to promote long system life by reducing TSS and BOD to the effluent disposal area. Gas baffles and/or effluent filters are also required.

2.3 SEPTIC TANK FILTERS: An effluent filter is ***REQUIRED*** for use with Eljen GSF products. Effluent filter sizing should be based on effluent filter manufacturers recommendations.

Septic tank effluent filters are used as a means of preventing solids from leaving the tank and entering your system. Effluent filters should be cleaned from time to time. Cleaning requirements should be based on the type or make of the effluent filter installed.

2.4 VERTICAL SEPARATION TO GROUND WATER OR LIMITING LAYER AND DISTRIBUTION METHOD:

FIGURE 3: VERTICAL SEPARATION TO RESTRICTIVE LAYER



VERTICAL SEPARATION IN INCHES	SOIL TYPE		
	1	2	3-6
≥ 24 < 36		PRESSURE	PRESSURE
≥ 36 < 60		PRESSURE	GRAVITY
≥ 60	PRESSURE	GRAVITY	GRAVITY

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 3% 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.

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 units.

2.7 DISTRIBUTION: Gravity, pump to gravity or pressure distribution are acceptable when using the GSF System. All piping must meet state and local regulations.

All gravity and pump to gravity 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.

There are two options when using pressure distribution. The first is placing a pressure lateral inside the 4-inch distribution pipe. The second option is the use of orifice shields on the pressure laterals for non-pipe in pipe installations. Section 6.0 of this manual goes into details of how to construct the distribution network.

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 DISTRIBUTION BOX: Set the gravity system D-box outlet invert a minimum of ⅛ 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.

2.10 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.

2.11 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.

2.12 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 7.0 for a more detailed explanation of venting GSF products.

2.13 BACKFILL & FINISH GRADING: 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. Divert surface runoff from the Effluent Disposal Area, (EDA). Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

2.14 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. **Serial piping in level systems is not allowed.**

2.15 NUMBER OF GSF MODULES REQUIRED: Residential systems use a minimum of six (6) modules per bedroom. See Section 2.17 for more information on systems sizing.

2.16 BED SYSTEMS: Bed systems can be no wider than 10 feet and can be only designed in soil types 1, 2, 3, or fine sands.

2.17 SIZING GSF SYSTEM FOR TRENCHES, BEDS & SAND MOUNDS:

TABLE 2: MAXIMUM HYDRAULIC LOADING RATE

Soil Type	Soil Textural Classification Description	Loading Rate for Residential Effluent Using Gravity or Pressure Distribution (gal./sf. ft./day)	Units Required per Bedroom in Bed Installations
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils excluding Soil types 5 & 6, all soil types with greater than or equal to 90% rock fragments.		
2	Coarse sands.	2	6
3	Medium sands, loamy coarse sands, loamy medium sands.	1.6	
4	Fine sands, loamy fine sands, sandy loams, loams.	1.2	
5	Very fine sands, loamy very fine sands; or silt loams, sandy clay loams, clay loams and silty clay loams with a moderate structure or strong structure (excluding a platy structure).	0.6	
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	0.3	
7	Sandy clay, clay, silty clay and strongly cemented firm soils, soil with a moderate or strong platy structure, any soil with appreciable amounts of expanding clays.		

3.0 Trench Design Example

Trench Example:

House size:	3 Bedrooms
Design Flow:	360 gpd
Soil Type:	3
Absorption Field Type:	Trench
Depth to Limiting Layer	64 inches
Distribution Type, from Figure 3:	Gravity or better

Calculate Minimum Absorption Area

Lookup loading rate from Table 2 and determine the loading rate:

Soil Type	Soil Textural Classification Description	Loading Rate for Residential Effluent Using Gravity or Pressure Distribution (gal./sf. ft./day)
3	Medium sands, loamy coarse sands, loamy medium sands.	1.6

Absorption Area: Design Flow ÷ Loading Rate

360 gpd ÷ 1.6 gpd / ft^2 = 225 ft^2

Calculate Number of Modules Required

Number of units required = Absorption Area ÷ 12 Square Foot Per Module

Units required

225 ft^2 ÷ 12 ft^2 / module =	18.75 Modules
Round to:	19 Modules

Calculate Minimum Trench Length

19 Units x 4 ft/unit =	76 linear ft

Trench Width

3 ft

Final Dimension Layout

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

Min. Product Length	76 ft
(note: 6 inches of sand required at each end of trench which makes the minimum trench length 77 ft)	
Trench Width	3 ft
Minimum Number of Units	19 Modules
Min. System Area	231 ft^2

3.0 Trench Design Example

FIGURE 4: PLAN VIEW –TRENCH SYSTEM

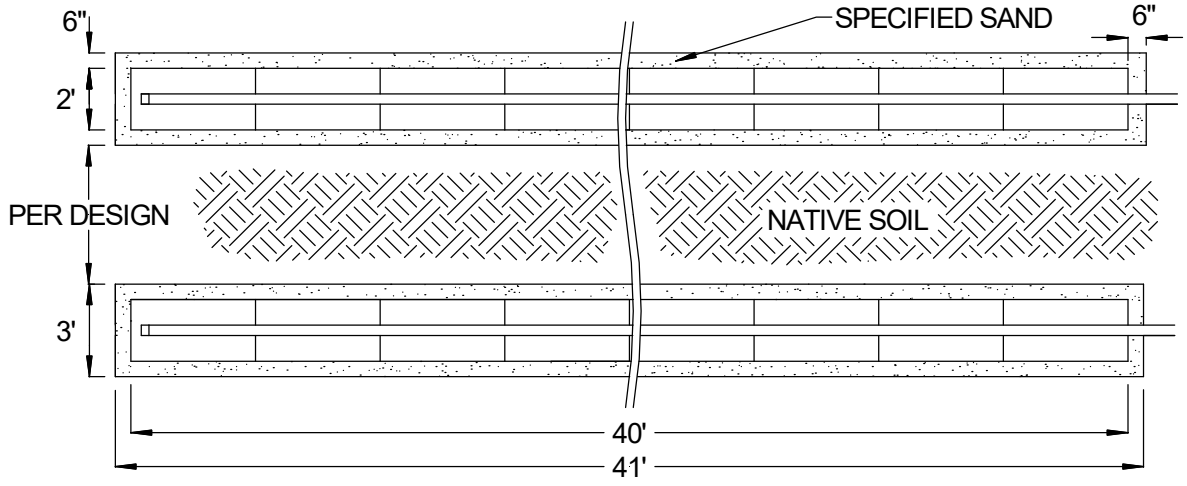


FIGURE 5: SECTION VIEW – TRENCH SYSTEM – LEVEL SITE

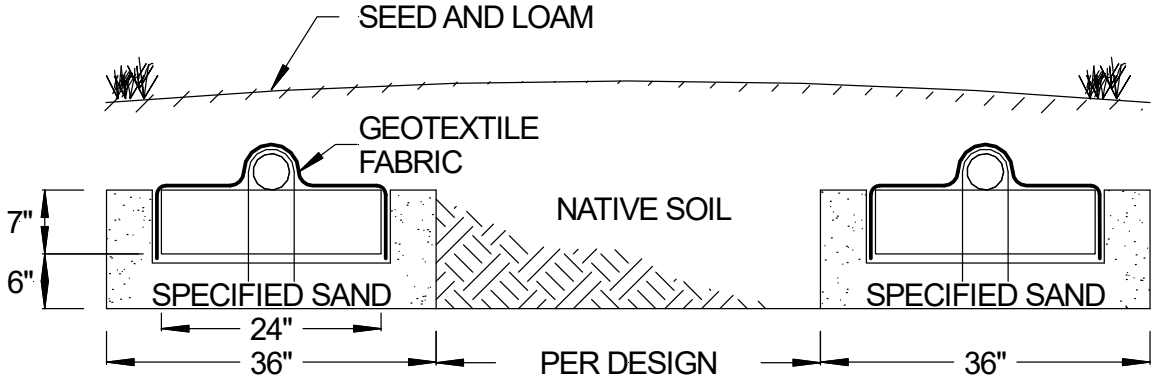
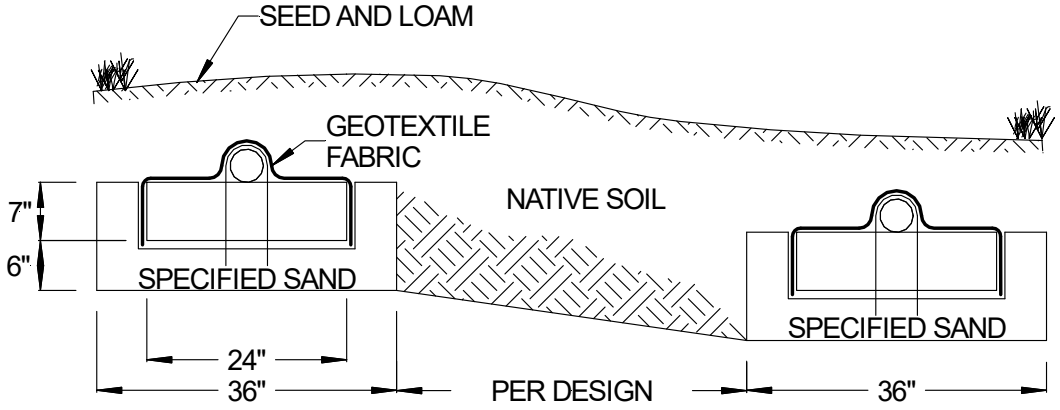


FIGURE 6: SECTION VIEW – TRENCH SYSTEM – SLOPING SITE



3.1 Trench Design Installation Steps

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 in 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; scarify 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, stabilize by foot, a hand-held tamping tool or a portable vibrating compactor. The 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) The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 9. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of the trench. Refer to Section 6.0 for guidelines on how to use pressure distribution.

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 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 trench.

14. Complete backfill with a minimum of 6 inches of approved cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit 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 Design Example

Bed Example:

House size:	3 Bedrooms
Design Flow:	360 gpd
Soil Type:	3
Absorption Field Type:	Bed
Depth to Limiting Layer	64 inches
Distribution Type, from Figure 3:	Gravity or better

Calculate Minimum Absorption Area

Lookup loading rate from Table 2 and determine the loading rate:

Soil Type	Soil Textural Classification Description	Loading Rate for Residential Effluent Using Gravity or Pressure Distribution (gal./sf. ft./day)	Units Required per Bedroom in Bed Installations
3	Medium sands, loamy coarse sands, loamy medium sands.	1.6	6

Absorption Area: Design Flow ÷ Loading Rate

360 gpd ÷ 1.6 gpd / ft^2 = 225 ft^2

Calculate Number of Modules Required

Lookup units required per bedroom from Table 2:

Soil Type	Soil Textural Classification Description	Loading Rate for Residential Effluent Using Gravity or Pressure Distribution (gal./sf. ft./day)	Units Required per Bedroom in Bed Installations
3	Medium sands, loamy coarse sands, loamy medium sands.	1.6	6

Units Required: Number of Bedrooms x Units Required per Bedroom

3 x 6 = 18 Units

Calculate Minimum Bed Length

Maintain a minimum of 2 rows in a bed system. (2 Rows for this example)

18 Units ÷ 2 Rows =	9 Mods/Row
Round up	9 Mods/Row

Calculate Minimum Row Length

9 Units x 4 ft/unit =	37 ft per Row

Bed Width

Bed systems can be no wider than 10 feet.

Bed Width = Absorption Area ÷ Bed Length

2 Rows

225 ft^2 ÷ 37 ft = 6.1 ft, round to	7 ft

Determine Lateral Spacing

Lateral to Lateral Spacing = Bed Width ÷ Number of Rows

2 Rows

7 ft ÷ 2 rows	3.5 ft

Lateral to Edge Spacing = Lateral to Lateral Spacing ÷ 2

3.5 ft ÷ 2	1.75 ft

4.0 Level Bed Design Example

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

Bed Length	37 ft
Bed Width	7 ft
Minimum Number of Units	18 Units
Units per Row	9 units per row
Lateral to Lateral Spacing	3.5 ft
Lateral to Edge Spacing	1.75 ft
System Area	259 ft^2

FIGURE 7: PLAN VIEW – BED SYSTEM

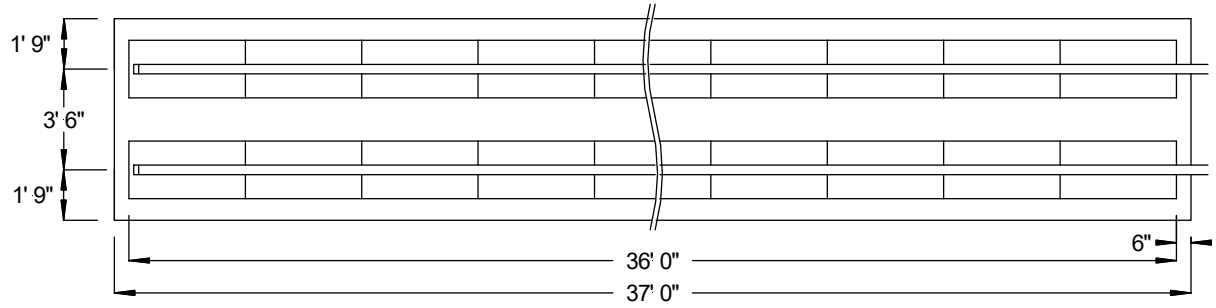
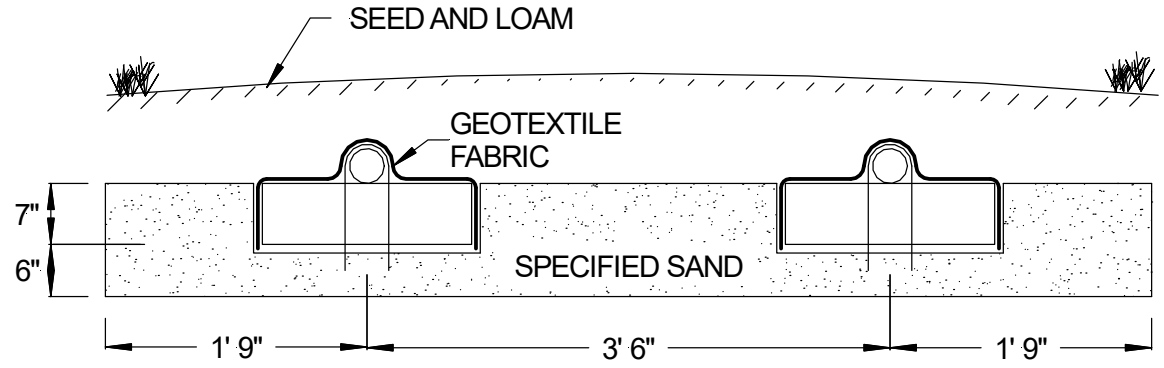


FIGURE 8: SECTION VIEW – BED SYSTEM



4.1 Bed Design Installation Steps

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 in 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; scarify 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 a 6" lift, stabilize by foot, a hand-held tamping tool or a portable vibrating compactor. The 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) The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 9. Orifice shields are placed over the lateral. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of the trench. Refer to Section 6 for guidelines on how to use pressure distribution.

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. A minimum of 12 inches of Specified Sand is placed in between module rows.

14. Complete backfill with a minimum of 6 inches of approved cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit requires venting at the far end of the bed. 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.

5.0 Dosing Distribution Requirements

5.1 DOSING DESIGN CRITERIA: Dosing volume must be set to deliver a maximum of **3 gallons per Module** per dosing cycle. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

6.0 Pressure Distribution Requirements

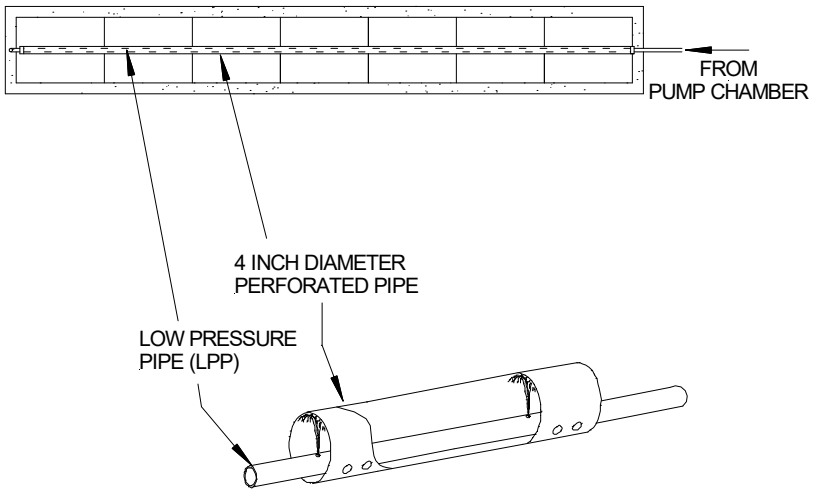
6.1 PRESSURE DISTRIBUTION: Dosing with small diameter pressurized laterals is acceptable for GSF systems. The pipe networks must be engineered and follow principles established for pressure distribution. Flushing ports are required to maintain the free flow of effluent from orifices at the distal ends 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. Minimum orifice and lateral pipe size are based on design. A drain hole is required at the end of each row at the 6 o'clock position of each pressure lateral for drainage purposes. The lateral pipe network 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.

Orifice shields are an acceptable replacement for the 4" pipe.

6.2 DOSING DESIGN CRITERIA: For all pump systems; use a maximum of 3 gallons per dose per A42 module in the system. Adjust pump flow and run time to achieve the above maximum dose. Use a minimum pump run time of one minute. Longevity of currently available effluent pumps are not affected by shorter run times. Choose force main diameter to minimize percentage of dose drain back.

FIGURE 9: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

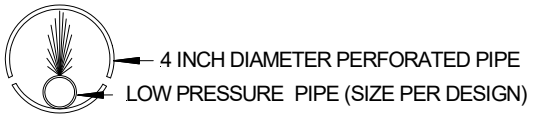


FIGURE 10: PRESSURE CLEAN OUT

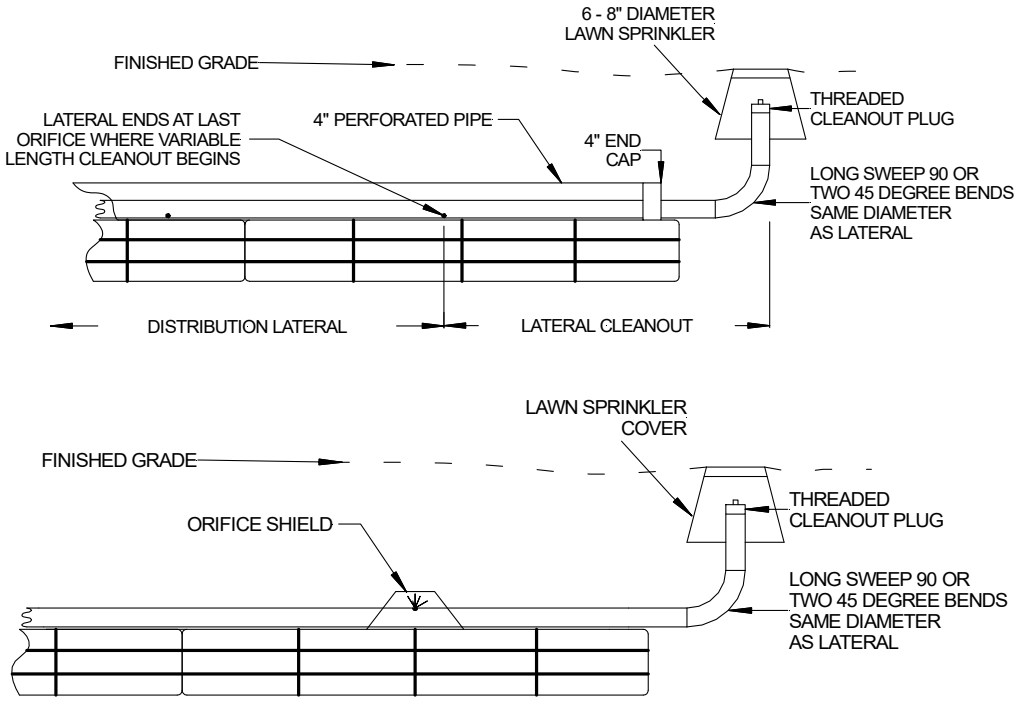
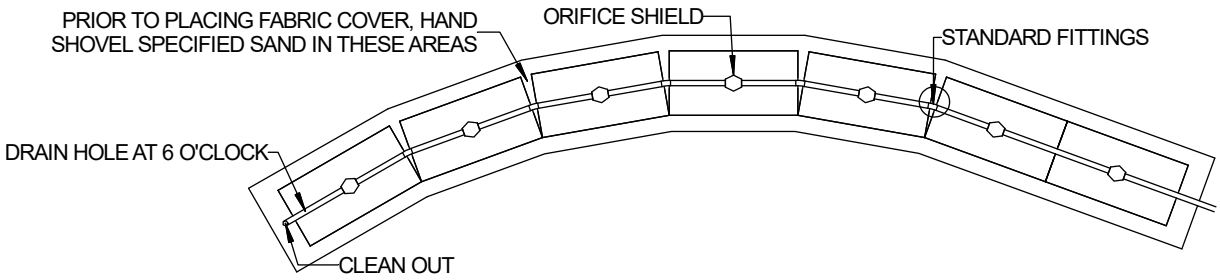


FIGURE 11: CONTOURED TRENCH PRESSURE DISTRIBUTION USING ORIFICE SHIELDS



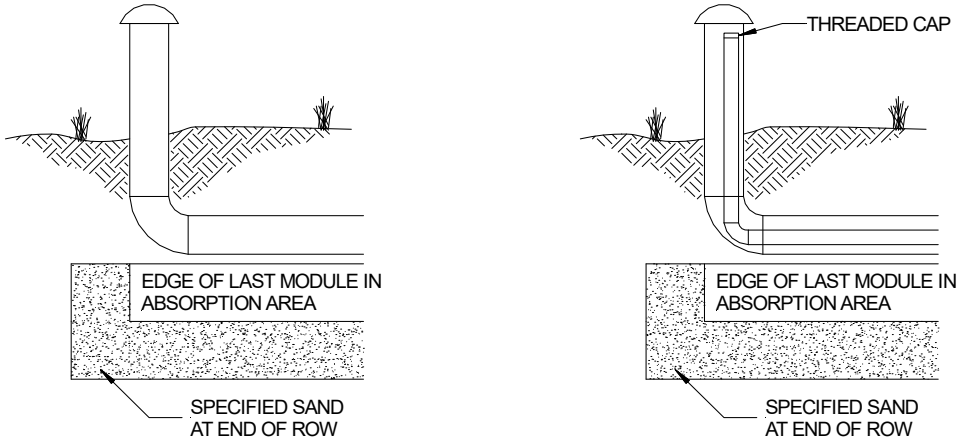
GSF Pressure Distribution trench placed on a contour or winding trenches to maintain horizontal separation distances.

7.0 System Ventilation

7.1 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.

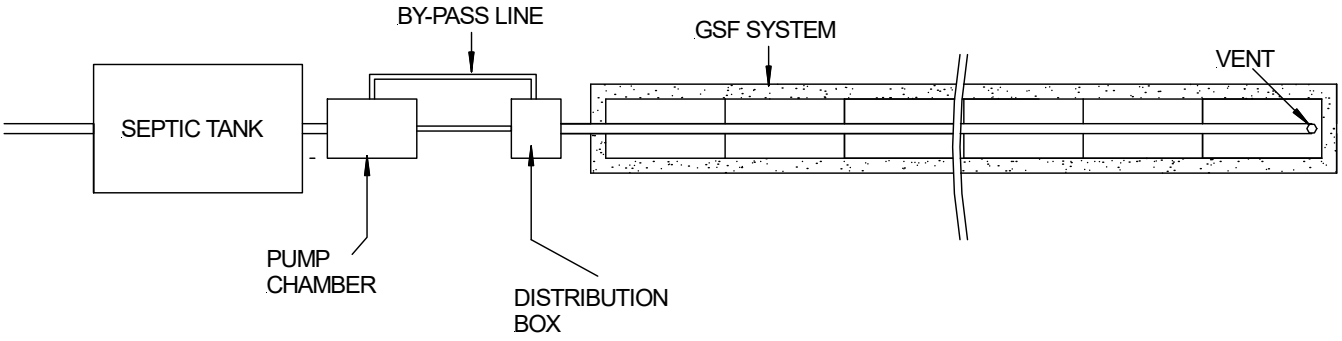
7.2 VENT PIPE FOR GRAVITY AND LOW-PRESSURE SYSTEMS: Systems with over 18" of cover, over the top of the modules, require a vent. If the system is a low-pressure distribution system, ensure that the LPP clean outs are located in the vent for easy access.

FIGURE 12: VENT LAYOUTS FOR GRAVITY AND LOW-PRESSURE SYSTEMS



7.3 AIR BY-PASS LINE: Systems with over 18" of cover that are pumped or pressure dosed require an air by-pass line to continue flow from the low vent on the system to the high vent of the house. Simply plumb an airline from the distribution system back to the pump chamber or septic tank to provide unobstructed flow.

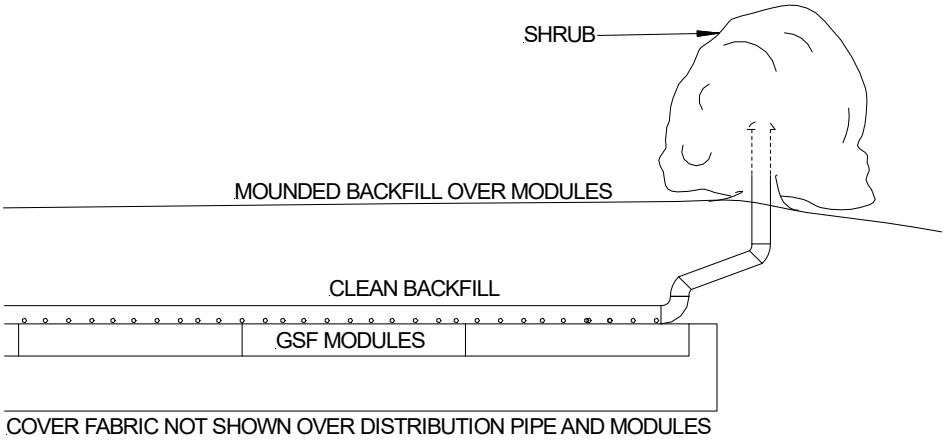
FIGURE 13: AIR BY-PASS LINE PLAN VIEW FOR VENTING OF PUMPED SYSTEMS



7.0 System Ventilation

7.4 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 14: 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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