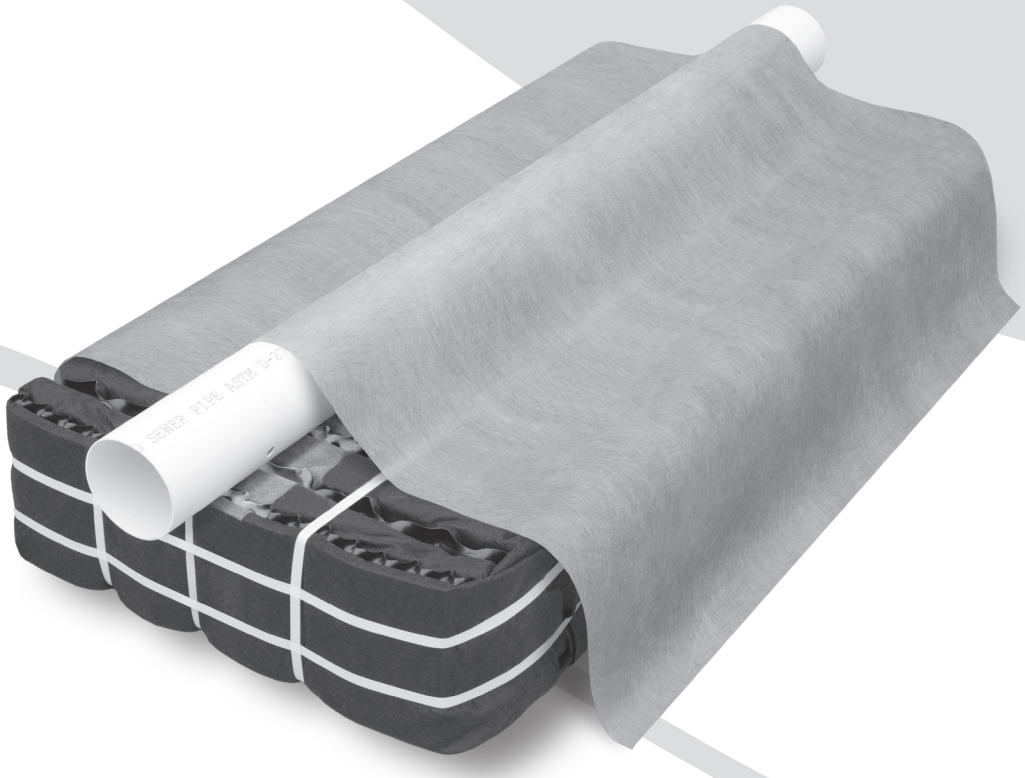
GSF®

Geotextile Sand Filter

ILLINOIS
Design & Installation Manual



eljen CORPORATION

Innovative Onsite Products & Solutions Since 1970

November 2026

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Glossary of Terms

A42 Module	48” x 24” x 7” (L x W x H)
Bio-Matt™ fabric	Proprietary filter fabric within the Geotextile Sand Filter Modules upon which the primary biomat layer forms.
Cover Fabric	The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules.
Cuspated Core	The rigid plastic core of the GSF module. It separates the geotextile fabric and creates downward infiltration channels and upward aeration channels to provide primary filtration and biological treatment of the septic effluent. The curvilinear shape of the cuspations offers increased treatment surface area and greater effluent storage.
Design Flow	The estimated peak flow that is used to size a GSF system is 150 gpd per bedroom for single family homes.
Distribution Box	A plastic or concrete box that receives effluent from a septic tank and splits the flow to pipes placed above the GSF modules. For equal distribution, the outlet pipe orifices are typically set at the same elevation to equalize the flow to each line.
Flow Dial/Equalizer	Special insert placed in the end of distribution pipes within the distribution box to compensate for possible unlevel installation and promote favorable flow to the distribution pipes.
GSF	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 corrugated geotextile fabric.
LTAR	Long Term Acceptance Rate (LTAR) is the average equilibrium absorption rate for effluent in a system, usually expressed in gallons per day per square foot. It should not be confused with the soil loading rate that is used by regulatory officials in their regulations.
SHWT	Seasonal High-Water Table (SHWT), whether perched or regional, determined by direct observation of the water table or indicated by soil mottling where common mottles comprise at least 2% to 20% of the soil, in a progressive downward direction in the soil.

Specified Sand

To ensure proper system operation, the system must be installed using ASTM C33 sand with less than 10% passing a #100 sieve and less than 5% passing a #200 sieve. Listed below is a chart outlining the sieve requirements for the Specified Sand. 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 - 5

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 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

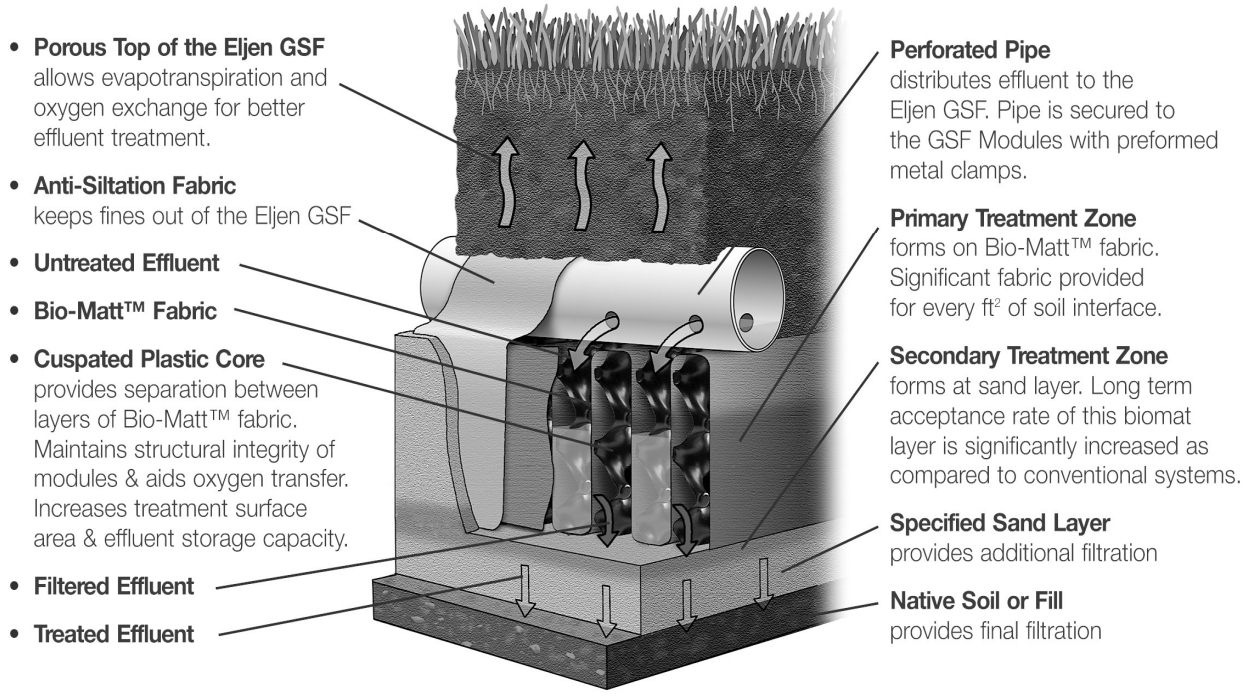
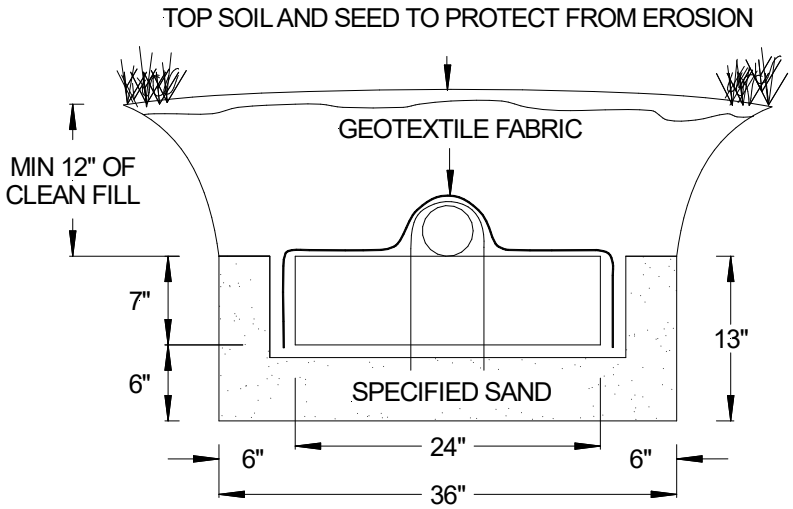


FIGURE 2: TYPICAL A42 GSF CROSS SECTION



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

- 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 Trench.
- 6 inches of Specified Sand is directly below the GSF module.
- Minimum 12 inches of native soil fill above the module.

1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. The Illinois 2003 Private Sewage Disposal Licensing Act and Code, January 2011, and the local regulations will be referred to as the *guidelines* in this manual.

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

1.2 DESIGN FLOW: The Eljen GSF is sized using 150 gpd per bedroom.

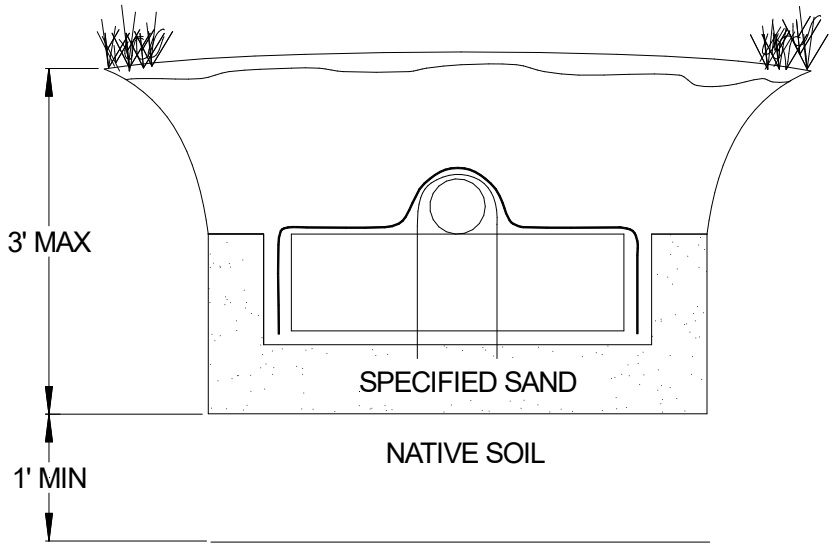
1.3 SIZING GSF SYSTEM FOR TRENCHES, BEDS & SAND MOUNDS:

The absorption capacity of the soil shall be determined by a soil investigation and Illustration M of the Private Sewage Disposal Code. Procedures for the soil investigation are outlined in Section 90.55 a) of the regulations. Illustration M is attached below for your convenience.

1.4 SPECIFIED SAND SPECIFICATION FOR TRENCH SYSTEMS: The first 6 inches of sand immediately under and the 6 inches of sand 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.

1.5 SEPARATION DISTANCE TO LIMITING LAYER: Measure from the bottom of the GSF unit to the limiting layer. The figure below depicts proper placement of the GSF with the limiting layer. A minimum one-foot separation is required. Measure from the bottom of the sand to the restrictive layer.

FIGURE 3: SEPARATION DISTANCE TO THE LIMITING LAYER



1.6 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.

1.7 PLACING GSF MODULES: The “White 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 white 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.

1.8 DISTRIBUTION PIPE: SDR-35 or equivalent is required. 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. All piping must meet state and local regulations.

1.9 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 trench. 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 settled soil. Flow Dials may be used in either Gravity or Dosed installations.

1.10 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.

1.11 BACKFILL & FINISH GRADING: Complete backfill with 12-18 inches of clean porous fill measured from the top of modules. Backfill exceeding 18 inches requires venting at the far end of the trench or 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 the 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.

1.12 ADDITIONAL FACTORS EFFECTING 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.

1.13 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, follow the guidance from the guidelines, Section 905.20, paragraph o: When garbage grinders are used in residential property, solids shall be retained by one of the following methods:

- A solids retention tank constructed in accordance with Section 905.40 (of the guidelines) shall be placed between the wastewater source and the septic tank to intercept solids from the garbage grinder. This tank shall receive waste from the garbage grinders or the kitchen wastes only. No other fixtures shall discharge into this tank. The solids retention tank shall be at least 50% in liquid volume of the septic tank sized for the waste from the rest of the property; however, the minimum size tank to be used shall be 500 gallons.
- A septic tank receiving all flows from the property sized in accordance with Appendix A, Illustration F of the guidelines.

1.14 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.

1.15 SEPTIC TANKS: Many designers are now specifying dual compartment tanks for all their 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 are also recommended.

1.16 SEPTIC TANK FILTERS: Wastewater filters are required as a means of preventing solids from leaving the tank and entering your system. 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.

1.17 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 such as patios. See Section 8.0 for a more detailed explanation of venting GSF products.

1.18 NUMBER OF GSF MODULES REQUIRED: Residential systems use a minimum of six (6) A42 modules per bedroom.

TABLE 2: ILLUSTRATION M – SOIL SUITABILITY FOR ON-SITE SEWAGE DESIGN

Design Group	Soil Group (Most Limiting Layer)	Permeability Range	Size of System		Units per Bedroom in Bed Applications
			Residential Reg. Absorption (ft^2/bedroom)	Institutional/Commercial Allowable Application Rate (GPD/ft^2)	
I	IA	Very Rapid	N/A	N/A	N/A
II	2A; 28; 2K	Rapid	100	2.00	6
III	3B; 3K	High Moderately Rapid	110	1.82	6
IV	3A; 3L, 4D; 4K	Low Moderately Rapid	120	1.68	7
V	4A; 4B; 4H, 4L; 5D	Very High Moderate	133	1.50	8
VI	4F; 4M; 5B	High Moderate	145	1.38	9
VII	4N, 5A; 5C: 5H, 5K, 6D	Moderate	163	1.24	10
VIII	4O; 5E; 5I; 5L; 6A; 6B; 6E, 6H; 6K	Low Moderate	193	1.04	10
IX[2]	5F; 5M; 6C, 6L; 7E; 7F	High Moderately Slow	223	0.90	11
X[2]	5G; 6G; 6I; 7E; 7C; 7H	Low Moderately Slow	250	0.80	11
XI [2]	5N, 6G, 6J; 6M, 7F; 7I	Slow	370	0.54	12
XII[2]	7G; 7J; 7L: 8E, 8I	Very Slow	500	0.40	13
XII[2]	5O; 6N, 6O; 7M, 7N; 7O; 8J, 8M; 8O	NR	N/A	N/A	N/A
XIII	9	SUBSURFACE DISPOSAL NOT RECOMMENDED			

The chart above reflects a 50% reduction for residential and a 2:1 increase for institutional/commercial applications and gives the required field size for a system in relation to the design group. It also shows the required units per bedroom for bed designs in relation to the design group. To calculate the number of modules required in a trench, use the required absorption area from this table divided by the square foot per module from Table 3. Section 2.0 gives more information on trench sizing and Section 3.0 gives more information on bed sizing. Soils in Design groups IX through XII should be designed with additional care.

TABLE 3: GSF A42 TRENCH SIZING CHART

Eljen Module	Sizing (sq ft / Module)	Sizing (sq ft / lf)
A42	12	3

For bed systems, use a minimum of 6 A42 Modules per bedroom. You can maximize out at 13 A42 Modules per bedroom.

For trench systems, divide your total Eljen Drain Field Size by 12 ft^2 for A42 Modules to determine the minimum number of modules needed. Use a center to center spacing of 9 ft between trench distribution lines.

Trench Example:

House size	4 Bedrooms
Size of System (determined from Table 2) Group V	133 Square Feet/Bedroom
Conventional Field Size = Size of System x Bedrooms =	
133 ft^2/Bedroom x 4 Bedrooms	532 ft^2
Modules Required = Conventional Field Size ÷ Eljen Sizing	
A42: 532 ft^2 ÷ 12 ft^2/Module = 44.3, round to	45 Modules
For this example, assume the number of trenches equals two:	
Trench Width: Module width (2 ft) + Sand Sidewalls (6” + 6”) =	3 ft
Trench per Row: 45 modules ÷ 2 trenches = 22.3 round up	23 A42 modules per
Modules (23) x 4 lf/module + 1 ft (6” sand at each end of trench) =	93 ft
Trench area (width x length x trenches) – 3 ft x 93 ft x 2 trenches =	558 ft^2

A42 Trench Dimensions:	
Length =	93 ft/trench
Width =	3 ft
Trenches =	2
Modules =	45 A42
Total Area =	558 ft^2

FIGURE 4: PLAN VIEW – 800 GPD – A42 TRENCH SYSTEM – LEVEL SITE

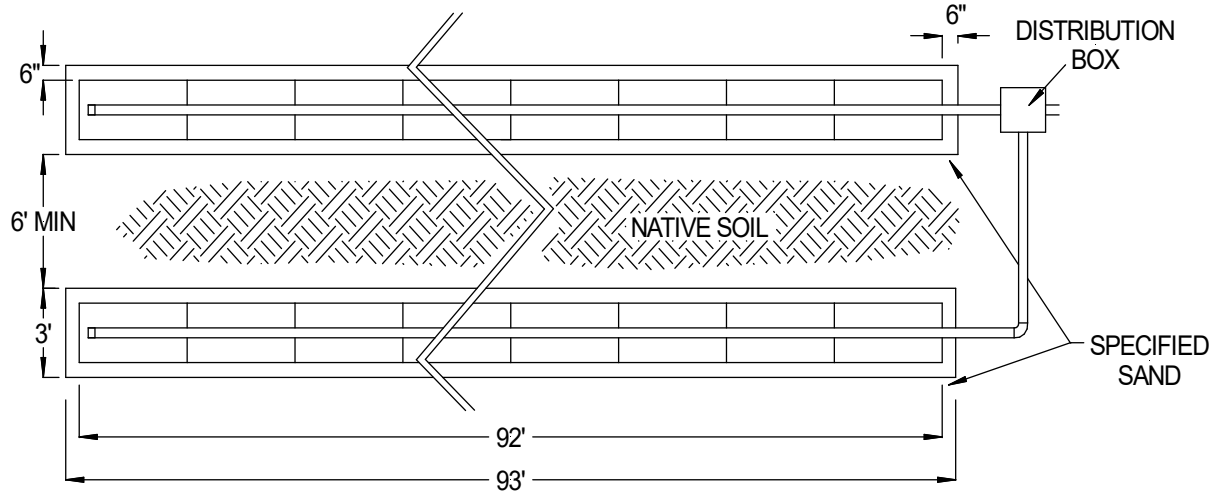


FIGURE 5: SECTION VIEW – 800 GPD – A42 TRENCH SYSTEM – LEVEL SITE

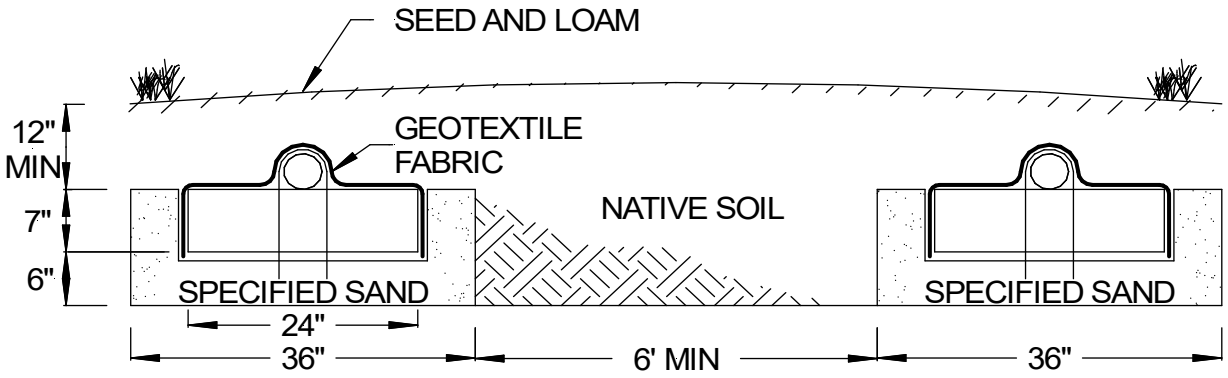
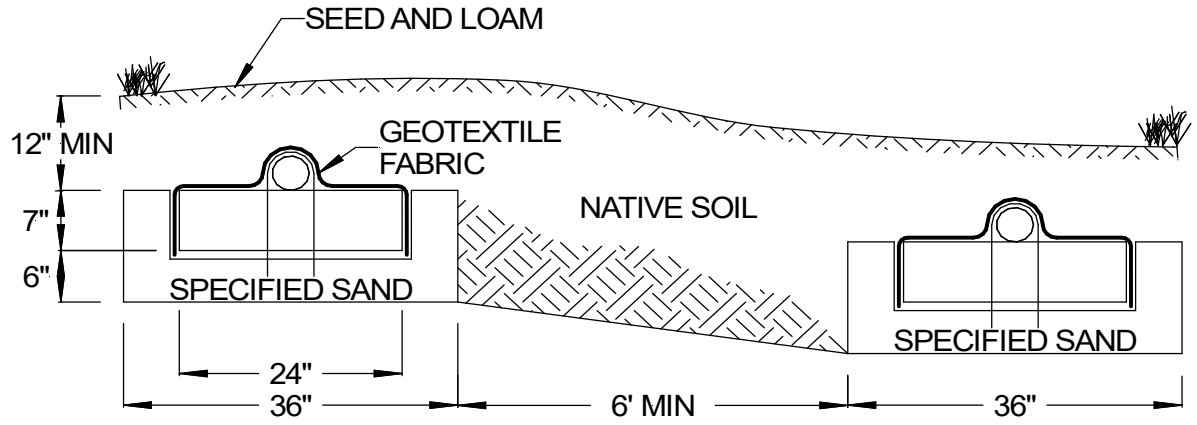


FIGURE 6: SECTION VIEW – 800 GPD – A42 TRENCH SYSTEM – SLOPING SITE



2.0 Trench Installation Sizing and 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 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 Only) 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 15. 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.

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 12 inches of clean porous fill measured from the top of the modules. 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.

3.0 Bed Installation Sizing and Guidelines

Bed Example:

House size	3 bedrooms
Size of System (determined from Table 2) Group VI	145 Square Feet/Bedroom
Conventional Field Size = Size of System x Bedrooms:	
145 ft^2/Bedroom x 3 Bedrooms = 435ft^2	435 ft^2

Refer to Table 2 to determine the number of units needed for this installation.

A42 Units per Bedroom	9 A42 Units
Total Units	27 A42 Units

For this example, assume the number of rows in the bed equals two:

A42: Modules per Row: 27 modules ÷ 2 rows = 13.5 (round up)	14 A42 modules per row
Bed Length: Modules (14) x 4 lf/module + 1 ft (6" sand at each end of bed) =	57 ft
Min Bed Width: Disposal Field ÷ Bed Length = 435 ft^2 ÷ 57 ft = 7.63 (round up)	8ft
Bed area (width x length) – 8 ft x 57 ft =	456 ft^2
Lateral to Lateral Spacing: 8 ft ÷ 2 rows =	4 ft
Edge to Lateral Spacing: 2 ft ÷ 2 =	2 ft

A42 Bed Dimensions:	
Length =	57 ft
Width =	8 ft
Rows =	2
Modules =	28 A42
Total Area =	456 ft^2
Lateral to Lateral Spacing =	4 ft
Edge to Lateral Spacing =	2 ft

FIGURE 7: PLAN VIEW – 450 GPD – A42 BED SYSTEM – SLOPING SITE

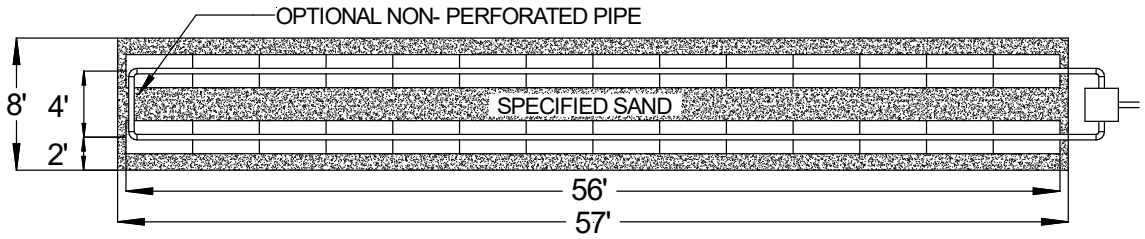


FIGURE 8: SECTION VIEW – 450 GPD – A42 BED SYSTEM – LEVEL SITE

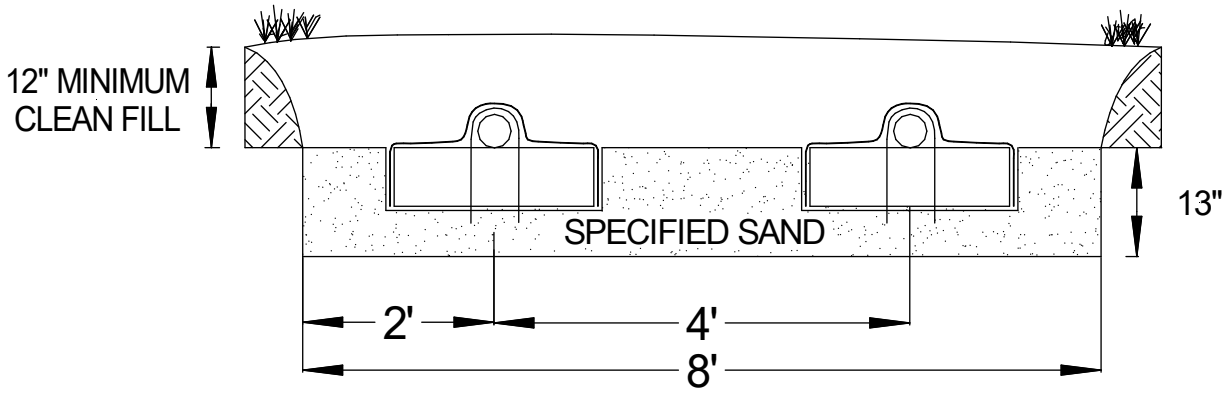
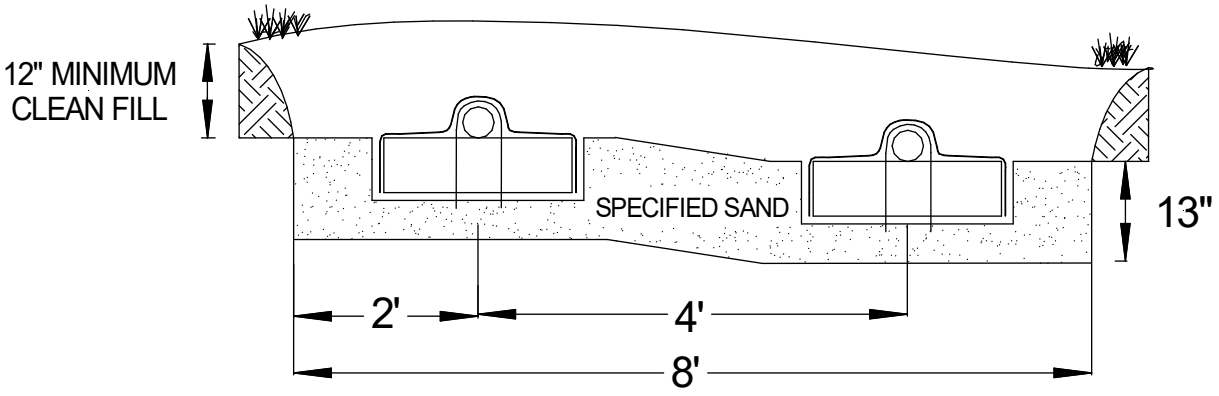


FIGURE 9: SECTION VIEW – 450 GPD – A42 BED SYSTEM – SLOPING SITE



3.0 Bed Installation Sizing and 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 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 Only) 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 15. 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 each module row.

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 12 inches of clean porous fill measured from the top of the modules. Backfill exceeding 18 inches 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.

4.0 Mound Installation Sizing and Guidelines

4.1 PRESSURE MOUND REFERENCE: The following sizing and guidelines provide the dimensions of the distribution cell for your mound. Consult Title 77: Public Health, Chapter 1: Department of Public Health, Subchapter: Wastewater and Sewage, Part 906: Private Sewage Mound Code for more information on the construction of a mound system.

4.2 MOUND EXAMPLE:

House size	3 bedrooms
Slope of site	4%
Soil Group/Design Group	Group V
Design Flow – 150 gpd x 3 bedrooms =	450 gpd

4.3 IMPROVE THE HYDRAULIC LINEAR LOADING RATE: The linear loading rate is defined as the amount of effluent (gallons) applied per day per linear foot of the system (gpd/lf). Scientific studies show that longer and thinner systems are often the best design for maximizing the life of a system. The design linear loading rate is a function of effluent movement rate away from the system and the direction of movement away from the system. If the movement is primarily vertical, then the linear loading rate is not as critical as if the flow is primarily horizontal. Other factors such as gas transfer from beneath the absorption area suggests that the absorption area width be relatively small (Tyler et al, 1986). Design long and thin systems to improve the hydraulic linear loading rate.

FIGURE 10: CROSS SECTION – PRESSURE MOUND SYSTEM

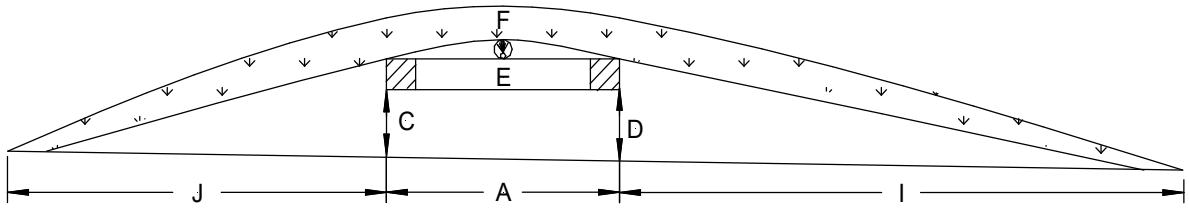
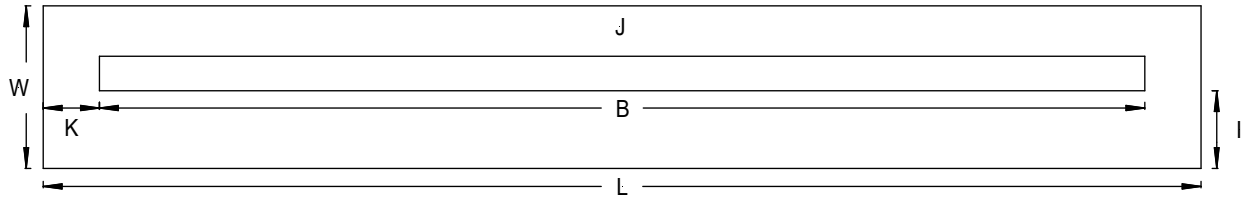


FIGURE 11: PLAN VIEW – PRESSURE MOUND SYSTEM



A – Distribution cell width (accounts for sand) –**Minimum 3 ft for A42**
B – Distribution cell length
C – Up slope fill depth under distribution cell – **Minimum 1 ft**
D – Down slope fill depth under distribution cell – **Minimum 1 ft**
E – Distribution cell depth – **Constant 7 in**
F – Depth of final cover – **Minimum 1 ft**
I – Distance from edge of distribution cell to down slope edge of fill
J – Distance from edge of distribution cell to up slope edge of fill
K– Distance from end of distribution cell to edge of fill
L – Overall mound fill length
W – Overall mound fill width

4.4 CALCULATE VARIABLES: The following equations are used to design a basic mound. This is just one example on how to construct a mound and other sound engineering practices may be used.

Distribution cell Area (Absorption Area) = Design Flow ÷ 2.0 gal/ft^2/day (2.0 gal/ft^2/day is the absorption rate for the fill material after passing through the Eljen GSF System

450gpd ÷ 2.0 gal/ft^2/day = **225 ft^2**

A – Distribution cell width
The distribution cell width is determined by the module that is going to be used.
Use 3 ft wide for A42 units. **3 ft**

B – Distribution cell length = Distribution Cell Area ÷ 12 ft^2/module (A42) ÷ Number of Rows
Distribution cell length = 225 ft^2 ÷ 12 ft^2/module ÷ 1 Row = 18.75 Modules (round up) **19 A42s**
Number of Modules x 4 ft / module + 1 foot =
19 Modules x 4 ft/module + 1 foot = **77 ft**

C – Up slope fill depth under distribution cell = **Minimum 1 ft**
(***NOTE:*** For this example, assume the depth of fill at the up-slope edge of the distribution cell is **1.5 ft**.)

D – Down slope fill depth under distribution cell = **Minimum 1 ft**
C + (Slope of site x Distribution cell width)
1.5 ft + (0.04 x 3 ft) = **1.62 ft**

E – Distribution cell depth – Constant 7 in., convert to feet = **0.583 ft**

F – Depth of final cover = **We are using 1 ft in this example.** **1 ft**
(***NOTE:*** For the slope of the mound, we are using a **recommended 3:1 slope)**

I – Distance from edge of distribution cell to down slope edge of fill:
Down slope correction factor = 906. Appendix A. Exhibit C = 1.14
3 x (D + E + F) x Down slope correction factor
3 x (1.62 + 0.583 + 1) x 1.14 = **10.95 ft**

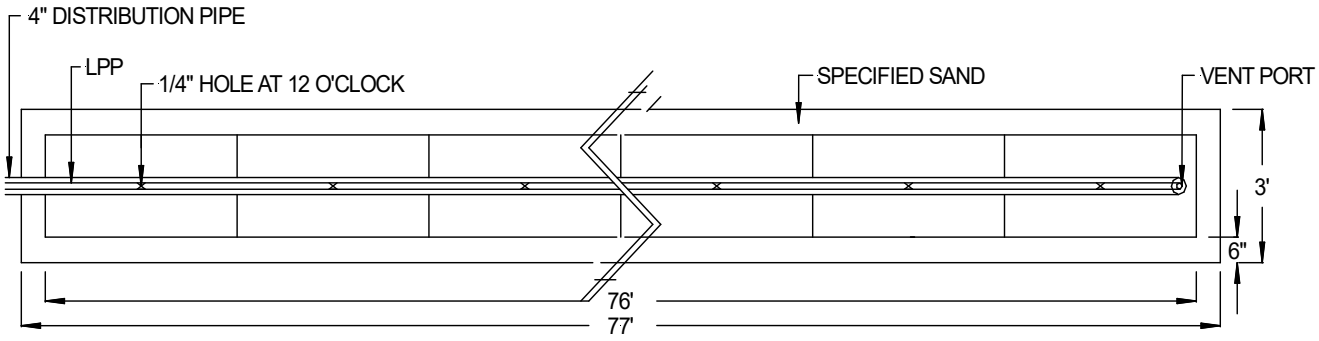
J – Distance from edge of distribution cell to up slope edge of fill
Up slope correction factor = 906.Appendix A. Exhibit C = 0.89
3 x (C + E + F) x Up slope correction factor
3 x (1.5 + 0.583 + 1) x 0.89 = **8.23 ft**

K – Distance from end of distribution cell to edge of fill
3 x [{(C + D)/2} + E +F]
3 x [(1.5 + 1.62)/2 + 0.583 + 1] = **9.42 ft**

L – Overall mound fill length
B + 2(K)
77 + 2(9.42) = **95.84 ft**

W – Overall mound fill width
A + I + J
3 + 10.95 + 8.23 = **22.18 ft**

FIGURE 12: PLAN VIEW – 450 GPD – DISTRIBUTION CELL MOUND SYSTEM



4.5 MOUND CONSTRUCTION–
Overall Width (with slopes) – 28.6 ft
Overall Length (with slopes) – 95.84 ft

FIGURE 13: SECTION VIEW – 450 GPD – MOUND SYSTEM

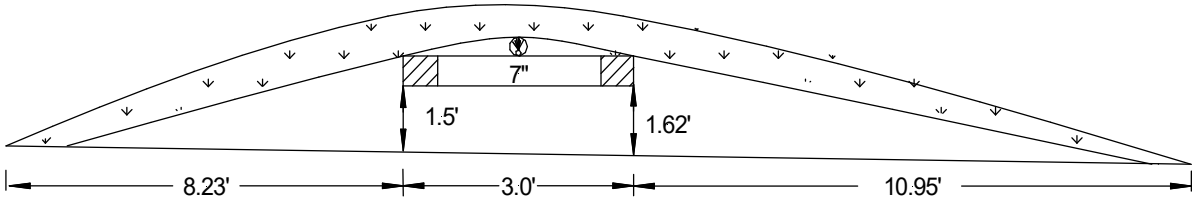
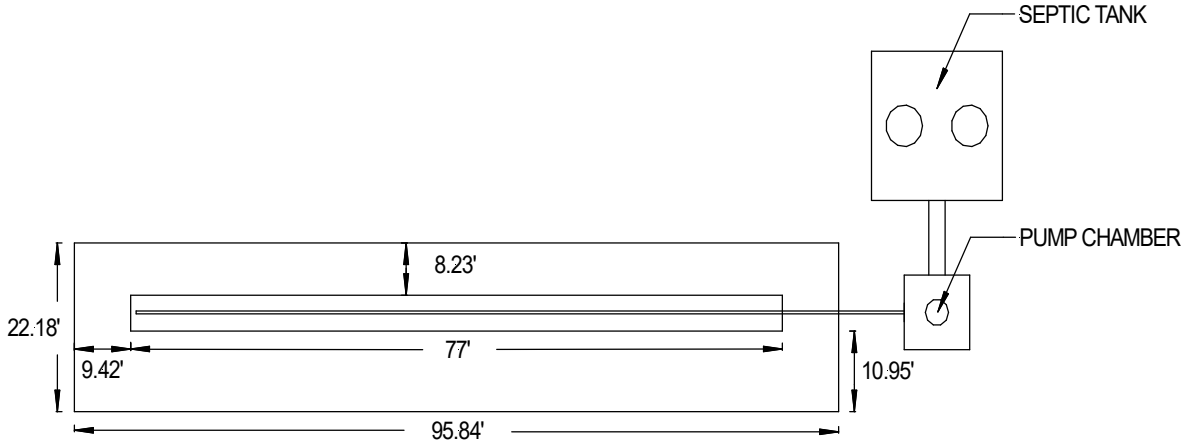


FIGURE 14: SECTION VIEW – 450 GPD – MOUND SYSTEM



4.1 Mound Installation Sizing and 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 mound dimensions using the design 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. Scarify the receiving layer to maximize the interface between the native soil and Specified Sand. Minimize walking in the bed prior to placement of the Specified Sand to avoid soil compaction.

6. Place Specified Sand in two 6-inch lifts, stabilize each lift at a time. The stabilized height below the GSF module must be level at 12 inches. A hand tamping tool or vibrating compactor is both acceptable.

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 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.

9. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.

10. (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 15. 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 each module row.

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. 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.

13. Complete backfill with a minimum of 12 inches of clean porous fill measured from the top of the module. Backfill exceeding 18 inches 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.

14. 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 Guidance

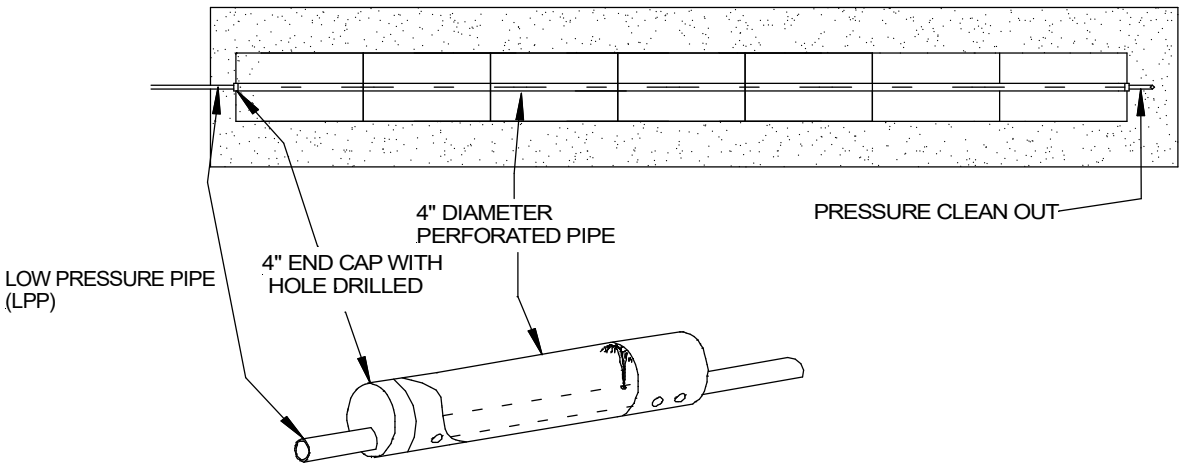
5.1 PUMP DISTRIBUTION BOX: Specify an oversized distribution box for pumped systems. Provide velocity reduction in the D-box with a tee or baffle. Set D-box invert 2 inches higher than invert of perforated pipe over GSF modules. If the absorption area is installed deeper than 18 inches, the system must be vented. See section 7.0 of this manual for detailed information on venting of systems.

5.2 DOSING DESIGN CRITERIA: Dosing volume must be set to deliver a maximum of 3 gallons per A42 Module per dosing cycle with low head high volume pumps preferred. 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 orifices on the outlet pipes are submerged and the d-box does not overflow. Adjustment of the flow rate is likely needed if a row of modules are rested thus changing the number or outlets. Fewer outlets in the d-box force more effluent down each line and improve linear loading. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

6.0 Pressure Distribution Guidance

Standard procedures for design of pressure distribution networks apply to the GSF filter. Orifices shall be a minimum of 4-foot on center spacing so the orifices fall in the center of each module. A minimum orifice size of ¼ inch shall be maintained. A ¼ inch diameter drain hole is required at the 6 o'clock position of each pressure lateral for drainage purposes. The lateral pipe network *(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.

FIGURE 15: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

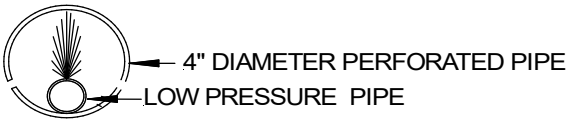


FIGURE 16: PRESSURE CLEAN OUT

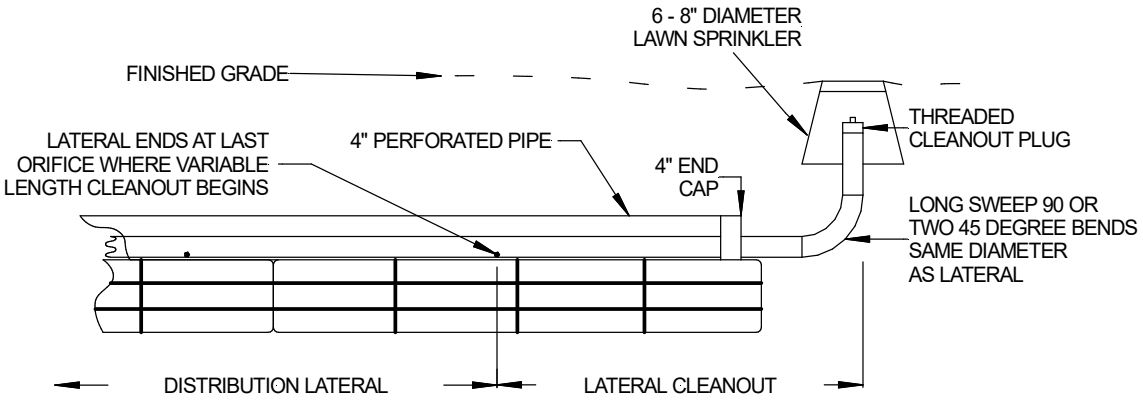
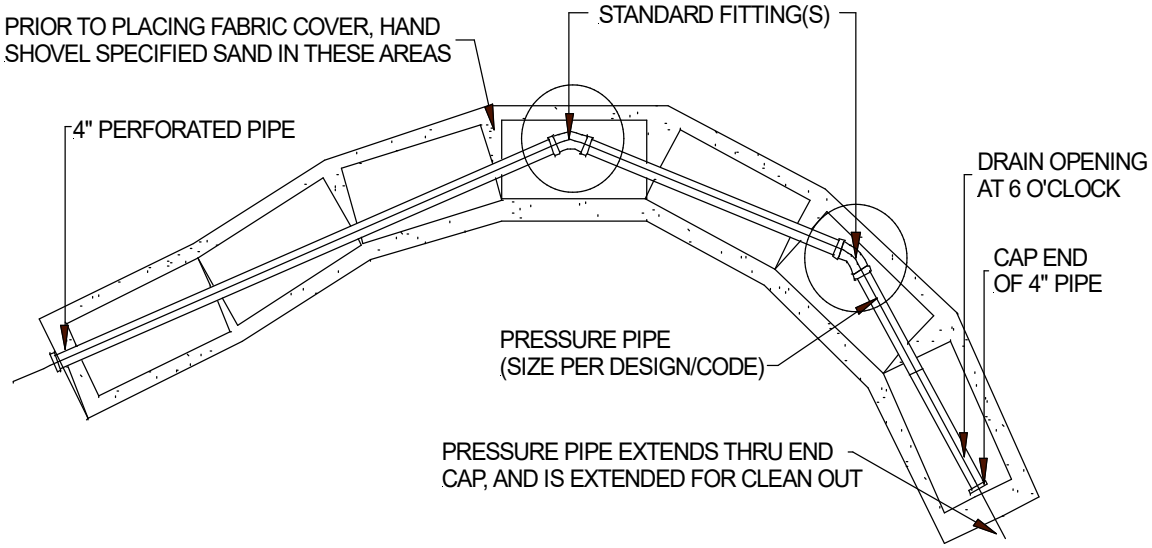


FIGURE 17: CONTOURED TRENCH PRESSURE DISTRIBUTION



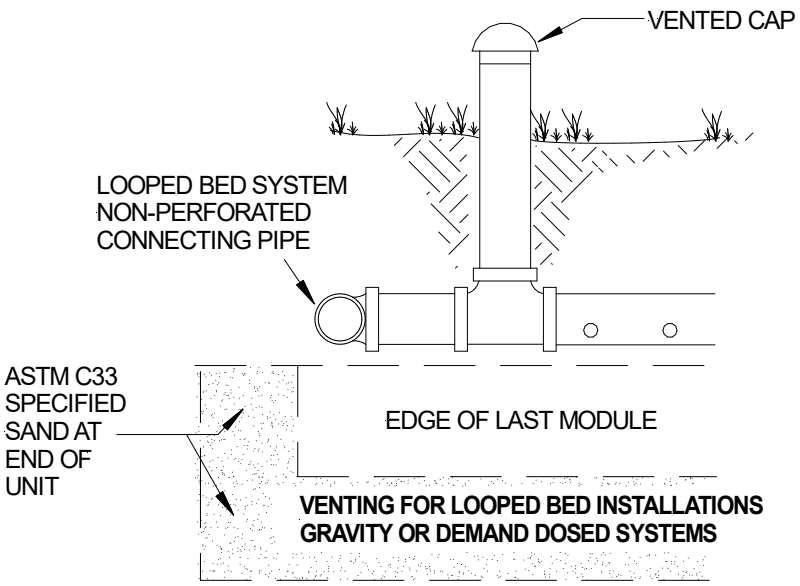
GSF Pressure Distribution trench placed in contour or winding trenches to maintain horizontal separation distances may also be used in Dosed or Gravity system by removing the pressure pipe and using the 4-inch diameter perforated distribution pipe.

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. 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. The extension of the distribution pipe to the vent provides adequate delivery of air into the GSF system, as shown in Figure 20.

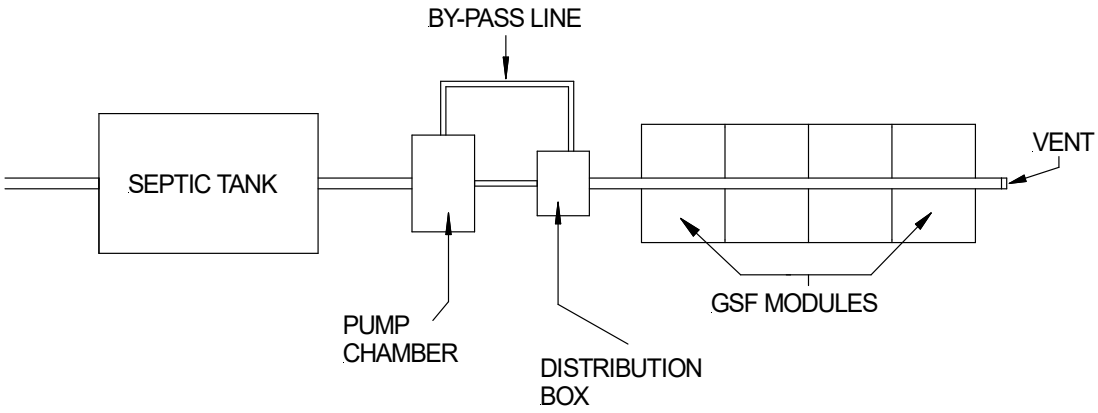
Home plumbing operates under negative pressure due to hot water heating the pipes and reducing the density of air in the house vent. As hot air rises and exits the home, it must be replaced by air from the GSF. To maintain this airflow and fully aerate the GSF system, it is important that air vents are located only on the distal end of the GSF pipe network.

FIGURE 18: VENT FOR GRAVITY AND DEMAND DOSED BED SYSTEMS



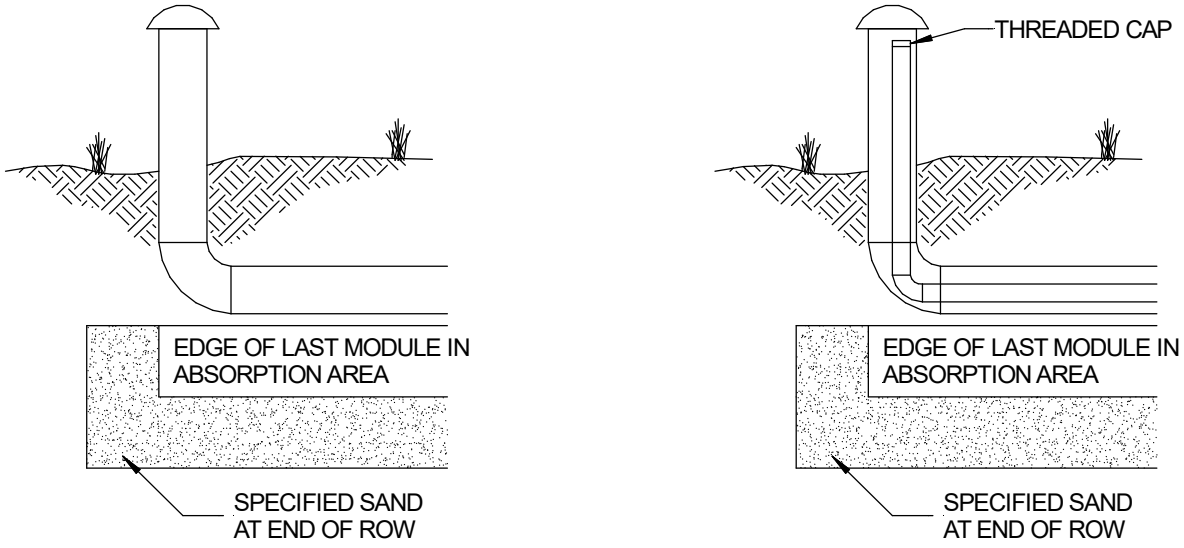
7.2 VENTILATION FOR PRESSURE AND DEMAND DOSED SYSTEMS: If a pressure or demand dosed system is specified with greater than 18 inches of cover, an additional 2-inch minimum airline must be extended from the GSF D-box back to a knockout or riser on the septic tank or pump chamber. This maintains the continuity of airflow from the field into the house plumbing.

FIGURE 19: AIR BY-PASS LINE PLAN VIEW FOR VENTING OF PUMPED SYSTEMS



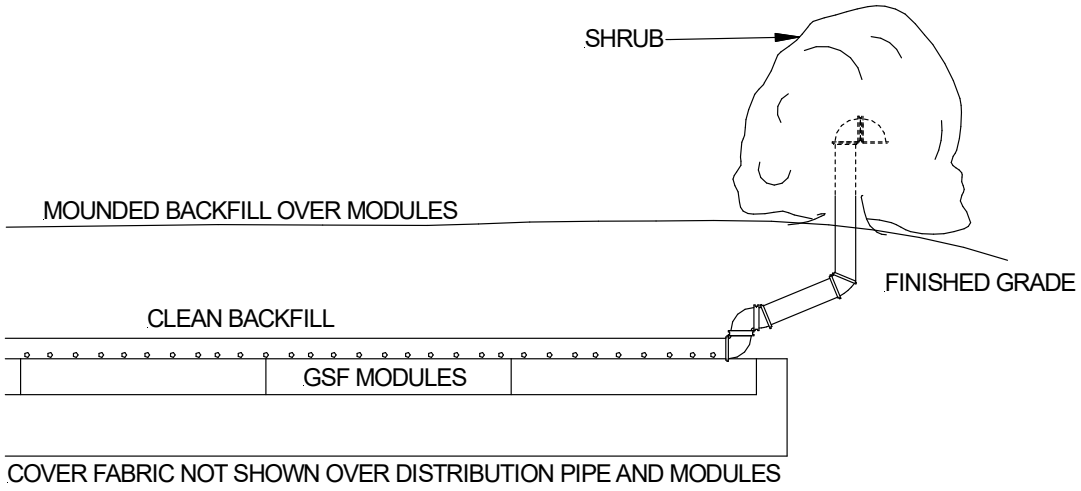
7.3 VENT PIPE FOR LOW PRESSURE DISTRIBUTION SYSTEMS: If the system is a low-pressure distribution system with greater than 18 inches of cover, ensure that the LPP clean outs are located in the vent for easy access.

FIGURE 20: VENT LAYOUT FOR GRAVITY AND LOW-PRESSURE SYSTEMS



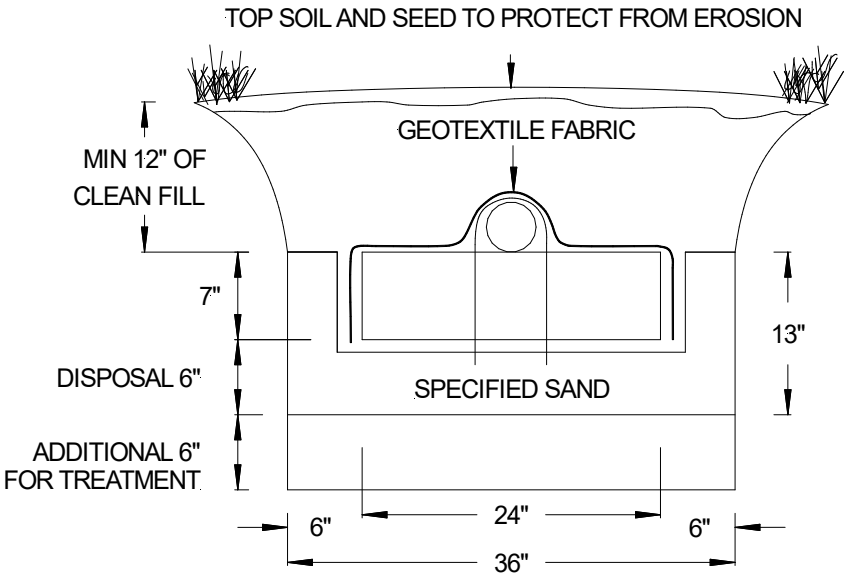
7.4 VENTILATION PLACEMENT: In a GSF system, the vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs, as shown in Figure 21. Corrugated pipe may be used. If using corrugated pipe, ensure that the pipe does not have any bends that will allow condensation to pond in the 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 21: GSF WITH 4" VENT EXTENDED TO CONVENIENT LOCATION



8.1 TREATMENT APPLICATIONS: Some applications may require specific treatment levels. The Eljen GSF system can meet industry standards by adding an additional 6 inches of specified sand under the GSF modules. For these types of applications, the total Specified Sand height below the A42 modules will be 12 inches. Please contact the Eljen Technical department for more information on treatment at 800-444-1359. Additional information on treatment applications is available on our website at: http://eljen.com/Pages/GSF/GSFoverview.html. This application is for use in trench, beds and mound installations.

FIGURE 22: TYPICAL A42 GSF TREATMENT CROSS SECTION



- 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 Trench.
- 6 inches of Specified Sand is directly below the GSF module.
- 6 inches of Additional Specified Sand for Higher level Treatment.
- Minimum 12 inches of native soil fill above the module.

NOTES

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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