GSF®

Geotextile Sand Filter

Missouri
Design & Installation Manual

eljen CORPORATION

Innovative Onsite Products & Solutions Since 1970

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DRAWINGS

TABLES

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.

Design Flow The estimated peak flow that is used to size a GSF system is 120 gallons per day per Bedroom with a minimum of 240 gallons per dwelling. The minimum design flow for any establishment shall be 100 gallons per day. When the occupancy of a single-family dwelling exceeds two persons per bedroom, the volume of sewage shall be determined by the maximum occupancy at a rate of 60 gallons per person per day.

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.

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 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	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

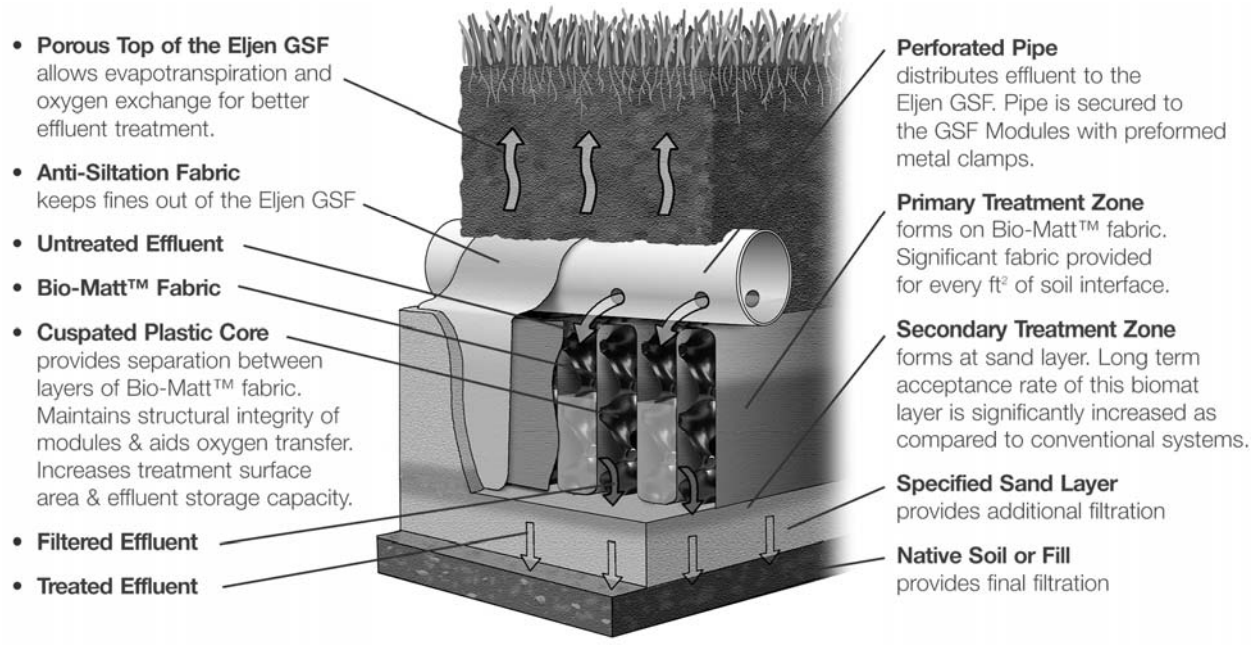
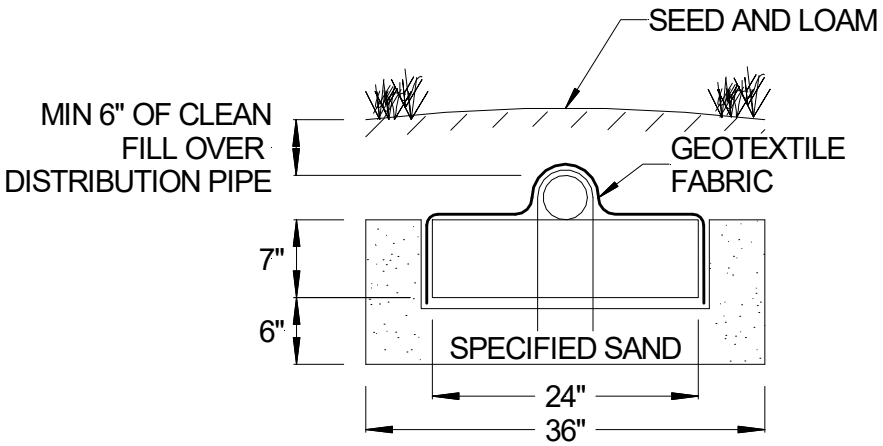


FIGURE 2: TYPICAL A42 GSF CROSS SECTION



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

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 6 inches of native soil fill above the module.

1.0 Design and Installation

1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. The Missouri Rules of Department of Health and Senior Services, Division 20 – Division of Community and Public Health, Chapter 3 – General Sanitation and the local regulations will be referred to as the *guidelines*.

The sizing charts apply to residential systems only and are found in section 1.16. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems. Commercial systems must comply with local and state regulations, specifically Missouri Laws Accompanied by Department of Health and Senior Services Rules for Governing Onsite Wastewater Treatment Systems.

1.2 SPECIFIED SAND SPECIFICATION FOR GSF SYSTEMS: The sand immediately under, between rows and around the perimeter of the GSF system must meet ***ASTM C33 SPECIFICATIONS, WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 5% PASSING A #200 SIEVE.*** Please place a prominent note to this effect on each design drawing. See Table 1 for more information on the sand and sieve specifications.

1.3 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.

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

1.5 DISTRIBUTION: Gravity, pump to gravity or pressure distribution are acceptable when using the GSF System. All piping must meet the guidelines. A pressure manifold is placed inside the distribution pipe when using pressure distribution.

Maximum trench length is 100 ft and all trench and bed designs require a minimum of two rows.

1.6 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.

1.7 BACKFILL & FINISH GRADING: Complete backfill with a minimum of 6 inches of clean porous fill measured from the top of the distribution pipe. 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.

1.8 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.

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

However, if such units are proposed to be used, other measures should be taken to mitigate the increased nutrients to the field. Consult your local and state code for garbage disposal requirements. Eljen recommends a dual compartment tank or tanks in series. Consider upsizing the field for the additional biological load.

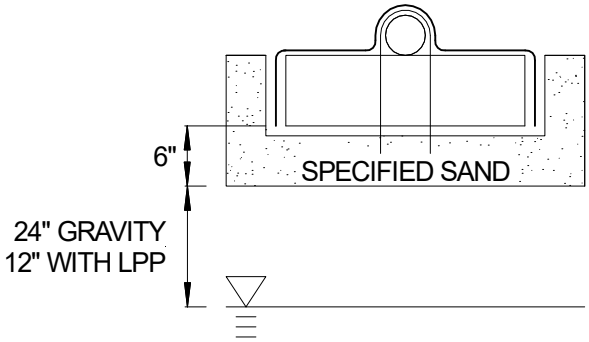
NOTE: Eljen requires the use of septic tank outlet effluent filters on all systems. Filters with higher filtration are recommended for systems with garbage disposals.

1.10 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 and/or effluent filters are also required.

1.11 SEPTIC TANK FILTERS: Septic tank effluent filters with a minimum 1/32" to 1/8" opening 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.

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

FIGURE 3: VERTICAL SEPARATION TO RESTRICTIVE LAYER



1.13 BED GUIDANCE: Bed systems shall be longer than wider and have their distribution rows orientated along the length of the bed.

Maximum bed row length is 100 ft and designs require a minimum of two rows.

1.14 SYSTEM CONFIGURATION GUIDANCE: Trenches shall be used on sites with greater than 15% slope, shall take care to follow the contour of the site and follow the local and state regulations. For sites with less than 15% slope with an excavation greater than 6 inches, beds and trenches are available. For sites with excavations less than 6 inches, mounds are appropriate.

Depth of Excavation	Depth of Sand Under Product	Max Natural Slope	Percolation Rate (mpi)	System Type
< 6"	12"	12%	60	Eljen Mound
		6%	60+	
< 17"	6"	15%		Shallow Placement Trench or Bed
		30%		Shallow Placement Trench
Max 30"	6"	15%		Shallow Placement Trench or Bed
		30%		Shallow Placement Trench

1.15 NUMBER OF GSF MODULES REQUIRED: The minimum number of units in a trench system is equivalent to the system daily design flow divided by the Eljen Trench Application Rate divided by 12 ft^2/unit. Bed systems are derived using the units per bedroom chart in the bed sizing section. Mound systems are based on the distribution bed length divided by 4 ft/unit. All systems are based on a minimum of six (6) modules per 120 gallons per day and the greater result shall be used as the minimum number of units required..

1.16 SIZING GSF SYSTEM FOR TRENCHES, BEDS & MOUNDS: To determine the proper loading rate for your project, take the soil group and conventional loading rate from your soil report and then find the corresponding loading rate for your project. Trenches, beds and mounds are represented in this chart.

TABLE 2: LOADING RATE

Loading Rates (gpd/ft^2)					
Soil Group	Soil Texture	Soil Structure/Color	Conventional Application Rate	Eljen Trench Application Rate	Eljen Bed Application Rate
I	Sand, Loamy Sand	Any striation/Brown (No gray)	1.2	1.60	1.33
I			0.8	1.06	0.89
II	Sandy loam, Loam	Granular, fine and medium subangular blocky	0.9	1.20	1.00
II			0.7	0.93	0.78
II		Prismatic; coarse, subangular, and angular	0.7	0.93	0.78
II			0.5	0.66	0.55
III	Silt loam, Clay loam, Sandy clay loam, Silty clay loam, Silt loam, Clay loam, Sandy clay loam, Silty clay loam	Granular, fine and medium subangular blocky	0.6	0.80	0.66
III			0.4	0.53	0.44
III		Prismatic; coarse, subangular, and angular	0.4	0.53	0.44
III			0.3	0.40	0.33
IVa	Sandy clay, Silty clay, Clay (low to moderate shrink/swell)	Granular, fine and medium subangular blocky	0.4	0.53	0.44
IVa			0.2	0.26	0.22
IVa	Sandy clay, Silty clay (low-moderate shrink/swell)	Prismatic; coarse, subangular, and angular	0.3	0.40	0.33
IVa			0.1	0.13	0.11
IVb	Sandy clay, Clay, Silty clay loam, Silty clay (high shrink/swell potential)	Subangular, Angular blocky, or Prismatic	Not Suitable		
V	Skeletal (less than 50% coarse fragments, Silt loam, Silty clay loam, Clay, Silty clay	Anything but platy or massive	0.4	0.53	0.44
V			0.2	0.26	0.22

Trench Example:

House size:	3 Bedrooms
Design Flow:	360 gpd
Conventional Application Rate:	0.7 gpd/ft^2
Absorption Field Type:	Trench

Look up conventional loading rate from Table 2 and reference the Eljen Trench Application Rate:

Loading Rates (gpd/ft^2)					
Soil Group	Soil Texture	Soil Structure/Color	Conventional Application Rate	Eljen Trench Application Rate	Eljen Bed Application Rate
II	Sandy loam, Loam	Granular, fine and medium subangular blocky	0.9	1.20	1.00
II			0.7 →	0.93	0.78
II		Prismatic; coarse, subangular, and angular	0.7	0.93	0.78
II			0.5	0.66	0.55

Calculate Minimum Absorption Area

Minimum Absorption Area = Design Flow ÷ Eljen Trench Application Rate

360 gpd ÷ 0.93 gpd / ft^2 = 387.1, round to 388 ft^2

Calculate Number of Modules Required

Number of units required = Absorption Area ÷ 12 ft^2 per module

Units required

388 ft^2 ÷ 12 ft^2 / module =	32.33 Modules
Round to:	33 Modules

Calculate Minimum Trench Length

33 Units x 4 ft/unit = 132 linear ft (note maximum trench length is 100 feet per row)

Trench Width

3 ft

Final Dimension Layout

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

Min. Product Length	132 ft
(note: 6 inches sand required at each end of trench which makes the minimum trench length 133 ft)	
Trench Width	3 ft
Minimum Number of Units	33 Modules
Min. System Area	399 ft^2

FIGURE 4: PLAN VIEW –TRENCH SYSTEM

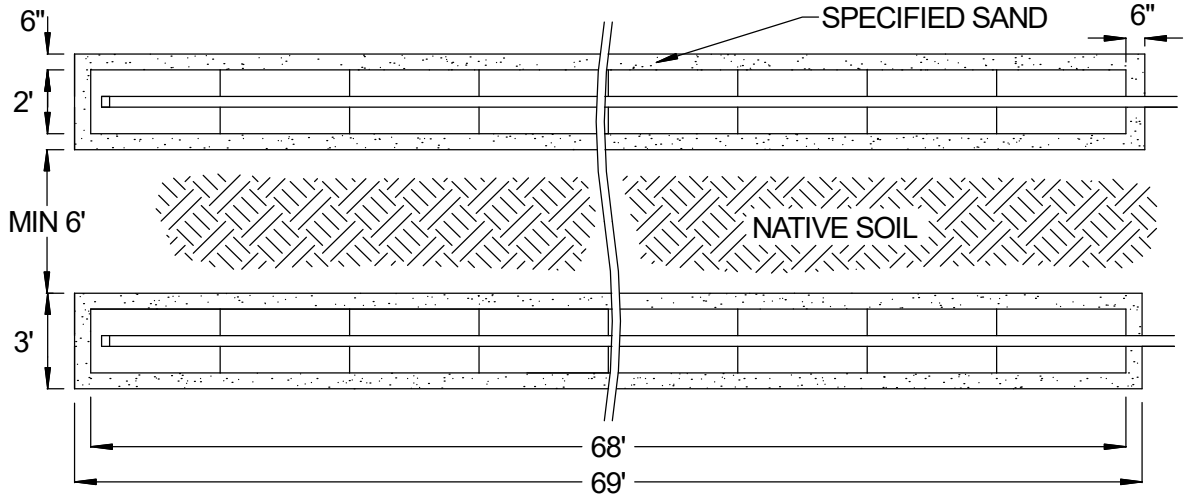


FIGURE 5: SECTION VIEW – TRENCH SYSTEM – LEVEL SITE

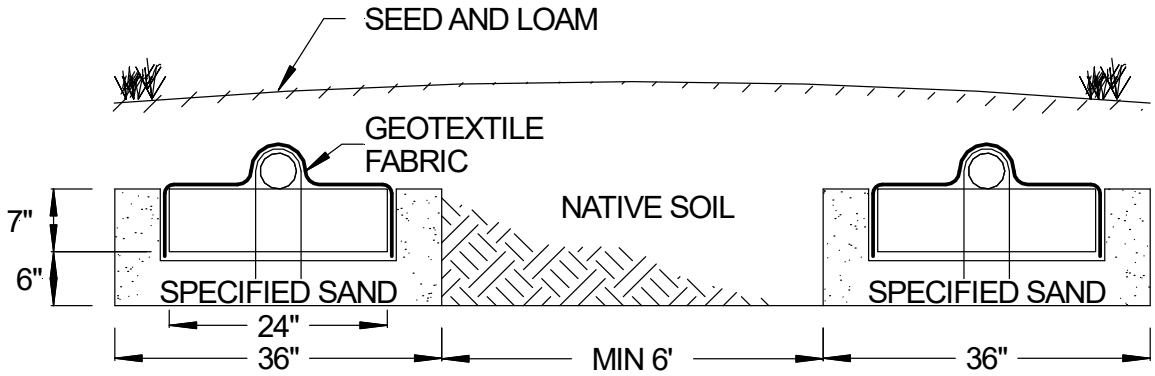
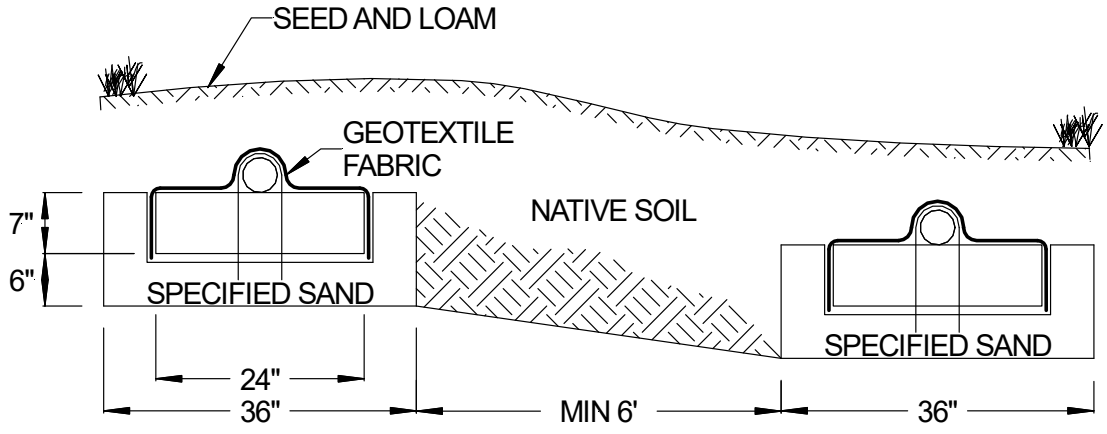


FIGURE 6: SECTION VIEW – TRENCH SYSTEM – SLOPING SITE



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 12. 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 6 inches of clean porous fill measured from the top of the distribution pipe. 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.

Bed Example:

House size:	3 Bedrooms
Design Flow:	360 gpd
Conventional Application Rate:	0.7 gpd/ft^2
Absorption Field Type:	Bed

Look up conventional loading rate from Table 2 and reference the Eljen Bed Application Rate:

Loading Rates (gpd/ft^2)					
Soil Group	Soil Texture	Soil Structure/Color	Conventional Application Rate	Eljen Trench Application Rate	Eljen Bed Application Rate
II	Sandy loam, Loam	Granular, fine and medium subangular blocky	0.9	1.20	1.00
II			0.7	0.93	0.78
II		Prismatic; coarse, subangular, and angular	0.7	0.93	0.78
II			0.5	0.66	0.55

Calculate Minimum Absorption Area

Minimum Absorption Area = Design Flow ÷ Eljen Bed Application Rate

360 gpd ÷ 0.78 gpd / ft^2 = 461.5, round to 462 ft^2

Calculate Number of Modules Required

Minimum Units Required: Number of Bedrooms x 6 A42 Units Required per Bedroom

3 Bedrooms x 6 A42s per Bedroom = 18 A42 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 + 1 ft (6" for beginning and end of trench) = 37 ft per Row

Bed Width

Bed Width = Absorption Area ÷ Bed Length

2 Rows

462 ft^2 ÷ 37 ft = 12.48 ft, round to 12.5 ft

Determine Lateral Spacing

Lateral to Lateral Spacing = Bed Width ÷ Number of Rows

2 Rows

12.5 ft ÷ 2 rows 6.25 ft

Lateral to Edge Spacing = Lateral to Lateral Spacing ÷ 2

6.25 ft ÷ 2 3.125 ft

Final Dimension Layout

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

Bed Length	49 ft
Bed Width	10 ft
Minimum Number of Units	24 Units
Units per Row	12 units per row
Lateral to Lateral Spacing	5 ft
Lateral to Edge Spacing	2.5 ft

3.0 Bed Installation Sizing and Guidelines

FIGURE 7: PLAN VIEW – BED SYSTEM

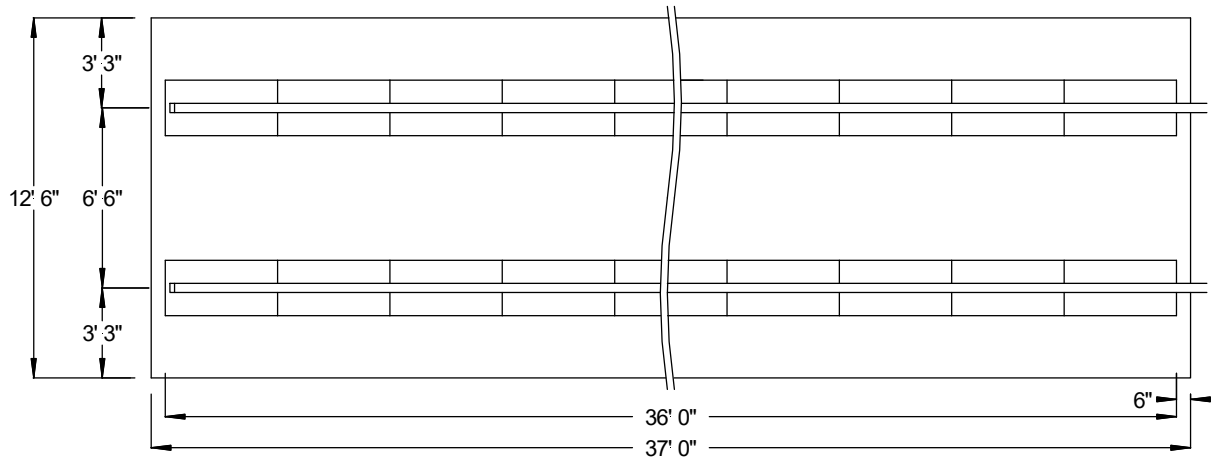
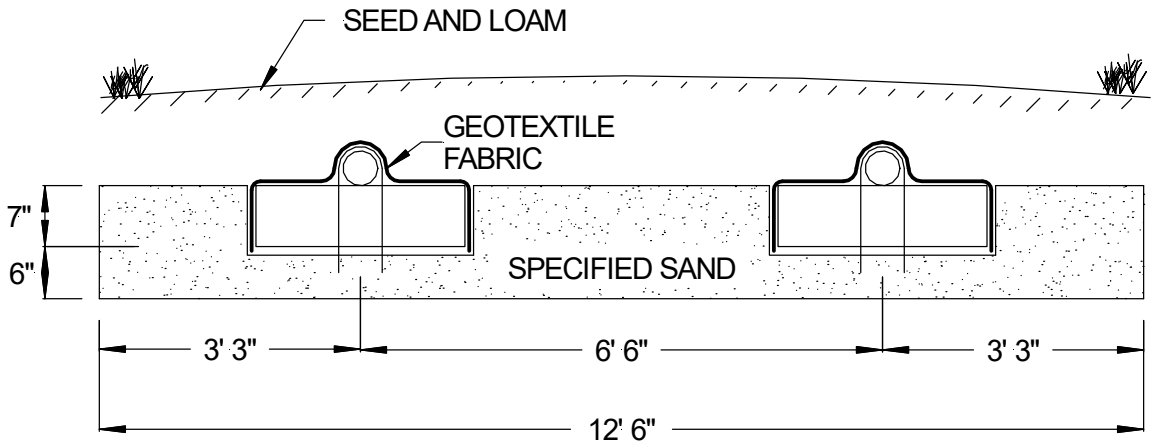


FIGURE 8: SECTION VIEW – BED SYSTEM



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 12. 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 6 inches of clean porous fill measured from the top of the distribution pipe. 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.

4.1 MOUND REFERENCE: The following sizing and guidelines provide the dimensions of the dispersal bed for your mound. Refer to Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, January 2000, https://www.env.nm.gov/wp-content/uploads/2017/08/WisconsinMoundManual-1.pdf for further information on the calculations and construction.

4.2 DISTRIBUTION OF EFFLUENT: A pressure timed dosed units is required for the mound systems.

4.3 MOUND EXAMPLE:

House size:	4 bedrooms
Slope of site:	4%
Daily Design Flow: 120 gpd x 4 bedrooms =	480 gpd
Nature of Limiting Condition:	High water table at 18 inches

FIGURE 9: CROSS SECTION – MOUND SYSTEM

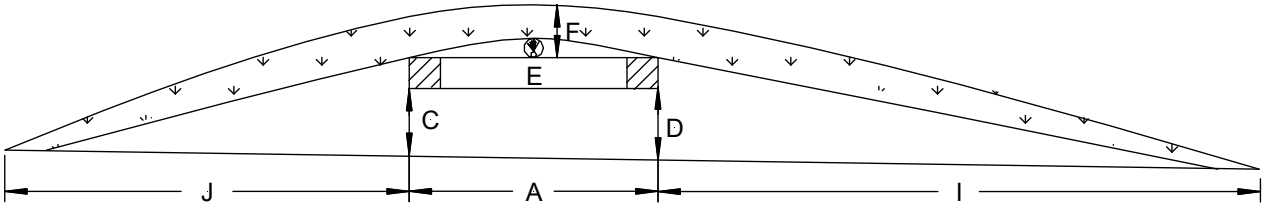
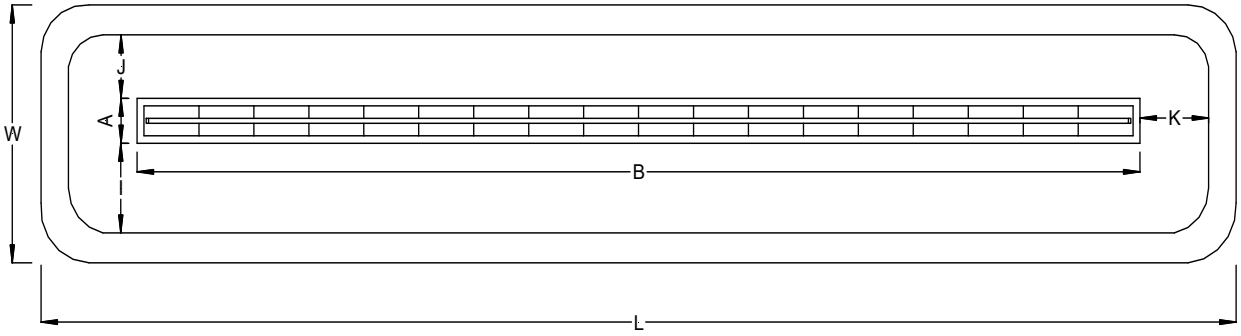


FIGURE 10: PLAN VIEW – MOUND SYSTEM



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

4.4 CALCULATE VARIABLES: The following equations are from the Regulation.

A – Distribution bed width = Linear Loading Rate ÷ Sand Loading Rate

Linear Loading Rate: Linear loading rates range from about 1 - 10 gpd/lf. Using site conditions, the designer will apply an appropriate linear loading rate. For this example, we used 3 gpd/lf.

Distribution Bed Width = Linear Loading Rate ÷ 2.0 gpd/ft^2
Bed Width = 3.0 gpd/lf ÷ 2.0 gpd/ft^2 = **1.5 ft**
(***NOTE:*** For this example, the minimum width of distribution bed is **3 ft** when using A42 Modules.)

B – Distribution bed length = Design Flow ÷ Linear Loading Rate
480 ÷ 3.0 gpd/lf = **160 ft**

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

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

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

F – Depth of final cover = **Minimum 1 ft**
(***NOTE:*** For the slope of the mound, we are using a **4:1**, however the minimum is 3:1 slope**)**

I – Distance from edge of distribution bed to downslope edge:
Downslope correction factor = 100 ÷ [100 – (side slope x % ground slope)]
100÷ [100 – (4 x 4)] = **1.19**
4 x (D + E + F) x Downslope correction factor
4 x (1.62 + 0.583 + 1) x 1.19 = **15.25 ft**

J – Distance from edge of distribution bed to up slope edge
Up slope correction factor – 100 ÷ [100 + (side slope x % ground slope)]
100 ÷ [100 + (4 x 4)] = **0.86**
4 x (C + E + F) x Up slope correction factor
4 x (1.62 + 0.583 + 1) x 0.86 = **11.02 ft**

K – Distance from end of distribution bed to edge
4 x [{(C + D)/2} + E +F]
4 x [(1.5 + 1.62)/2 + 0.583 + 1] = **12.57 ft**

L – Overall mound length
B + 2(K)
160 + 2(12.57) = **185.14 ft**

W – Overall mound width
A + I + J
3 + 15.25 + 11.02 = **29.27 ft**

4.5 BASAL AREA MINIMUM SIZING VERIFICATION –
Basal Area Calculation

Level Sites = Overall Mound Length x Overall Mound Width

Sloping Sites = Dispersal Bed Length x (Dispersal Bed Width + Downslope Width)
160 ft x (3 + 15.25) = 2,968 ft^2

The above calculation must exceed the Basal Area Required = Daily Design Flow ÷ Mound Basal Application Rate

MOUND BASAL APPLICATION RATE: Determined onsite by the designer and approving authority. For this example we used a 0.6 gpd/ft^2.

480 gpd ÷ 0.6 gpd/ft^2 = 800 ft^2

System meets the requirements.

If system does not meet the requirements, extend downslope width to meet basal area required.
Adjusted Downslope Width = (Basal Area Required ÷ Dispersal Bed Length) – Dispersal Bed Width

To meet the basal requirements, extend the downslope extension to the adjusted downslope width.

4.6 DISTRIBUTION BED CONSTRUCTION –
Width – 3 ft
Length – 160 ft

A42 Modules needed for this system: Length ÷ 4

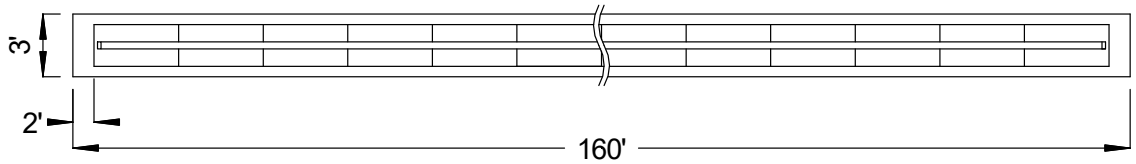
(160 ft – 1) ÷ 4 ft/module = 39.75, round down to 39 A42 Modules

Determine End Spacing of A42s inside the dispersal bed:

(Dispersal Bed Length – Modules x 4) ÷ 2

(160 ft – 39 Modules x 4) ÷ 2 = 2 ft

FIGURE 11: PLAN VIEW – 480 GPD – DISPERSAL BED MOUND SYSTEM



4.0 Mound Installation Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the sizing formula.

3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during preparation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Remove the organic soil layer. Scarify the receiving layer to maximize the interface between the native soil and Specified Sand. Minimize walking in the absorption area prior to placement of the Specified Sand to avoid soil compaction.

6. Place fill material meeting local requirements (or Specified Sand requirements) onto the soil interface as you move down the excavated area. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must shall meet the mound design requirements.

7. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

8. A standard perforated 4-inch distribution pipe is centered along the modules 4-inch length. Orifices are set at the 4 & 8 o'clock position.

9. All distribution pipes are secured with manufacturers supplied wire clamps, one per module.

10. (Pressure Distribution Systems) Insert a 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 12. 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. Refer to Section 6 for guidelines on when to use pressure distribution.

11. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

12. Ensure there is 6 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.

13. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

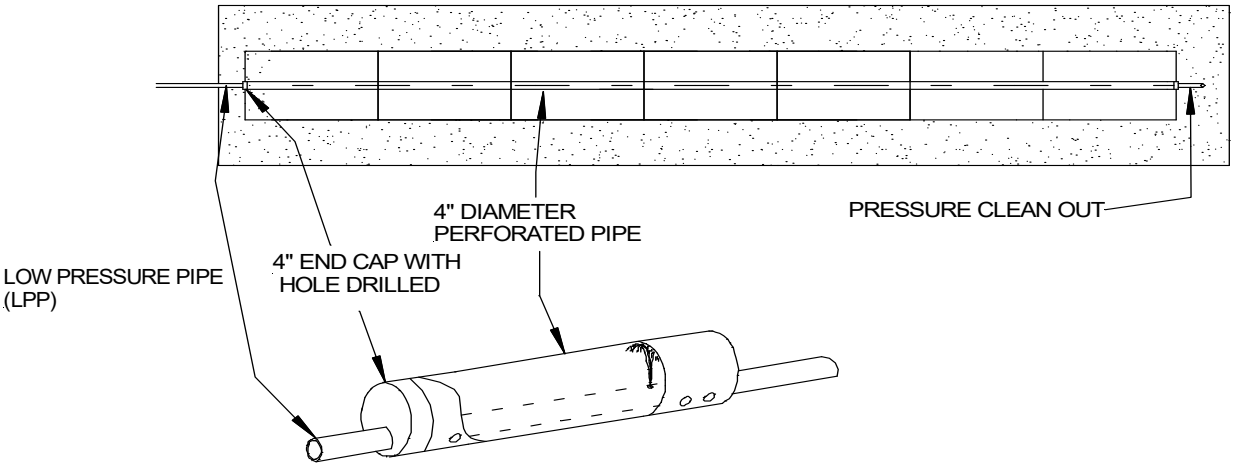
5.0 Dosing Distribution Guidance

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 Guidance (Engineer Guidance)

Standard procedures for design of pressure distribution networks apply to the GSF filter. A minimum orifice size shall be 5/32. A drain hole is required 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.

FIGURE 12: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

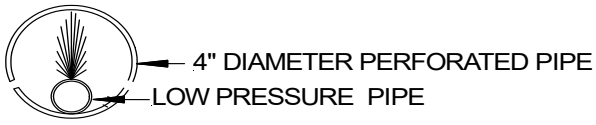


FIGURE 13: PRESSURE CLEAN OUT

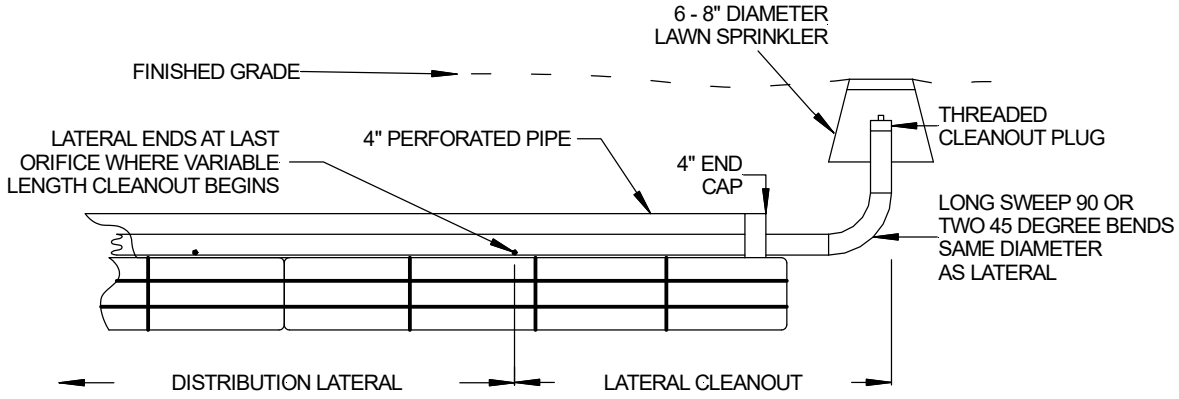
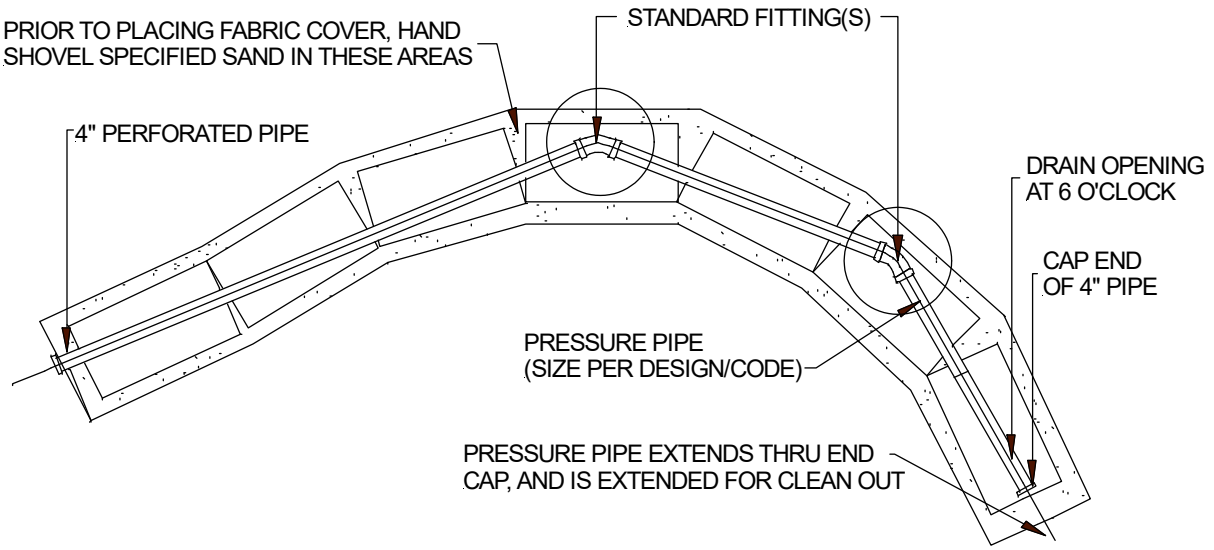


FIGURE 14: CONTOURED TRENCH PRESSURE DISTRIBUTION



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.

Geotextile Sand Filter, (GSF) Checklist				
Facility Owner:				
Facility Address:				
Installation Date: (MDY)				
Previous Inspection Date: (MDY)				
Date of Inspection: (MDY)				
Residential Number of Bedrooms:				
Is this a Commercial Design? If yes what type:	Yes	No		
What is the estimated BOD5 and TSS strength?	BOD5	TSS	Comments	
Observation Port Location(s):	1:	2:	3:	4:
Ponding Level:				
Pass:				

Inspection Data, (complete all fields)							
Is daily flow within the system design flow? If no, explain:	Yes	No	Flow:				
Does the owner verify the system use as described above? If no, explain:	Yes	No					
Septic tank last inspection date:	Date						
Inspected by:							
Septic tank last pumped date:							
Is pumping recommended?	Yes	No					
Condition of the soil absorption system: Wet, Dry, Firm, Soft, Vegetative, or Other. If Other, explain:	W	D	S	F	V		
Is there evidence of storm water flows or erosion over the septic system? If yes, explain:	Yes	No					

Is there evidence of soil slump or compaction by traffic or other means in the vicinity of the soil absorption system? If yes, describe:	Yes	No	Comments
Is effluent visible through the observation port? If yes, describe the condition and the fluid level:	Yes	No	Comments
Is there a garbage disposal in the home?	Yes	No	Comments
Is a water softener connected to the system?	Yes	No	Comments
Are solids visible through the observation port? If yes, describe the condition and depth of solids:	Yes	No	Comments
Is there evidence of surcharging or effluent ponding in the D-Box? If yes, describe and measure:	Yes	No	Comments
Any recent changes in usage?	Yes	No	Comments
Any issues prior to week of inspection such as: Extended outages? Residents on Vacation? Repairs or changes since installation? Other factors or event?			
Describe any other pertinent issues:			

Inspected by:	
Date:	
Time:	
Print Name & Signature of Inspector:	
I certify I have inspected the system at the above address, completed this report, and the information reported is true, accurate, and complete.	

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.

eljen CORPORATION

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