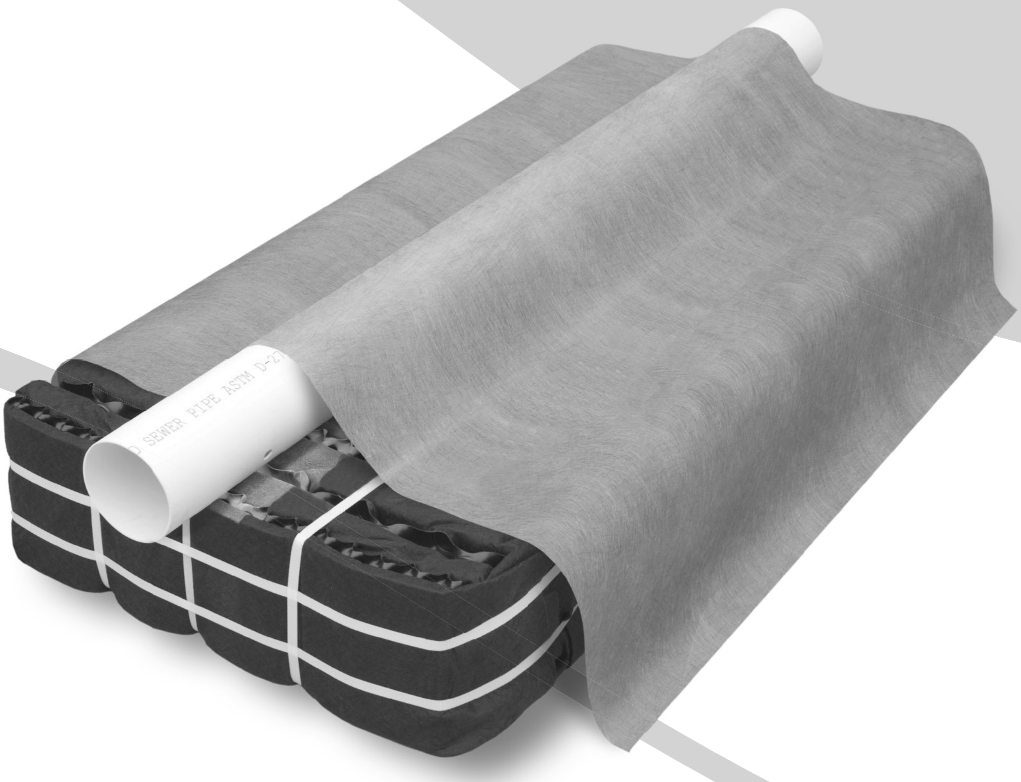
GSF®

Geotextile Sand Filter

Virginia TL-2
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 ***150*** gallons per day per Bedroom.

GSF Unit — The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and 6 – 18 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 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

GSF System Description

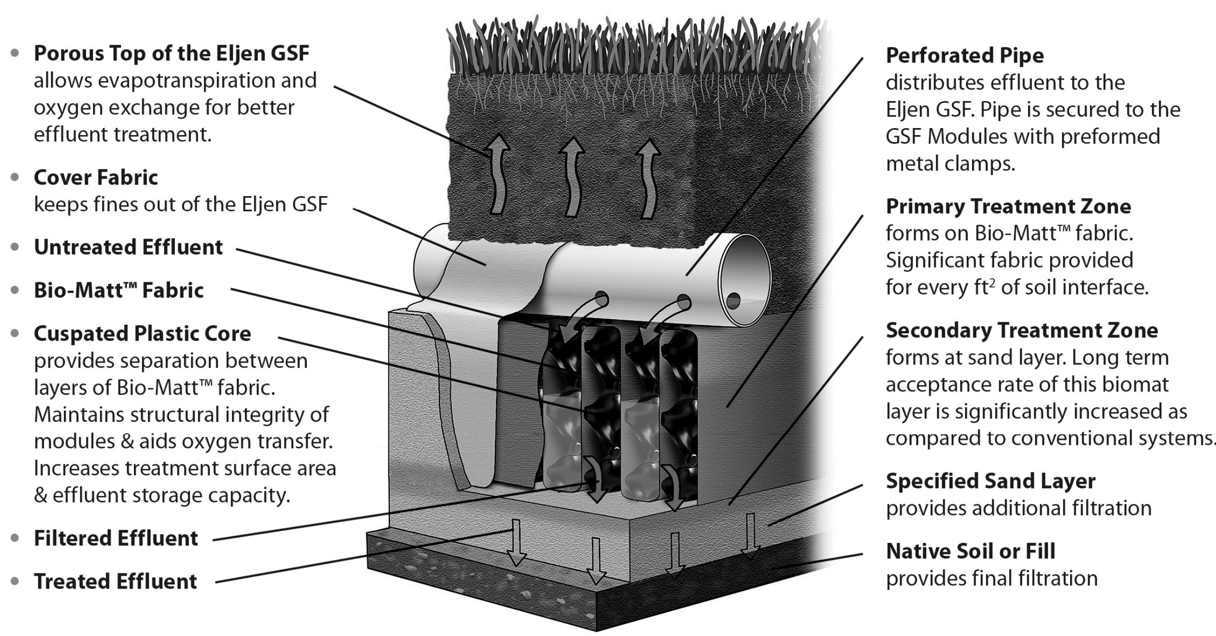
Primary Treatment Zone

- 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.

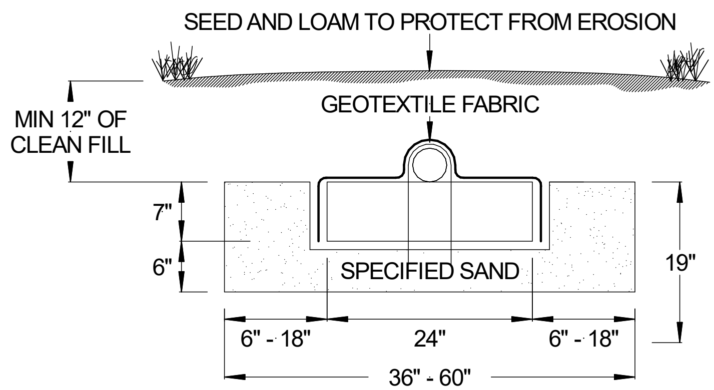
FIGURE 1: GSF SYSTEM OPERATION



GSF System Description

This manual provides design and installation information for the Eljen GSF Geotextile Sand Filter system utilizing the GSF A42 Module.

FIGURE 2: TYPICAL GSF A42 MODULE TRENCH CROSS SECTION



Minimum Vertical Separation Requirements to Limiting Features	
Vertical Separation from Bottom of Sand	Effluent Description
≥ 18” (Must be Naturally Occurring Soil)	Septic, TL-2
< 18” – 12” (Minimum 6” of Naturally Occurring Soil)	TL-2

**Note: The minimum vertical separation distance to a limiting feature must be maintained across the entire modified trench/pad area.*

Design layouts and installation instructions for sequential, equal, or dosed distribution systems are included. Details on unique design and construction procedures are also provided. To receive design standards for specially engineered dosing systems or commercial systems, contact Eljen’s Technical Resource Department at 1-800-444-1359.

Third-party independent testing data based on NSF/ANSI Standard 40 Protocol has shown that the Eljen GSF provides advanced treatment of septic tank effluent to better than secondary levels.

1.0 Conditions for Use

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

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

1.0.3 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.

1.0.4 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

1.0.5 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.

1.0.6 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.

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

1.1 System Design

1.1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. GSF systems must be designed and constructed according to this Design & Installation Manual and the State of Virginia Sewage Handling and Disposal Regulations, including Chapter 613, Regulations for Alternative Onsite Sewage Systems (hereinafter the Regulations). The Virginia State regulations and applicable component manuals will be referred to as the *guidelines*.

The sizing charts apply to residential systems only and are found in Table 2. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems.

1.1.2 NUMBER OF GSF MODULES REQUIRED: Calculations in this manual will show how to arrive at the minimum number of modules required for the system. Systems can always be designed beyond the minimum required number of modules. The minimum design requirements per 150 gpd is 6 A42 modules.

1.1.3 SUITABLE SITE AND SOIL CONDITIONS: The Eljen Modules may be designed for all sites that meet the criteria of the local approving authority.

1.1.4 SIZING GSF SYSTEMS:

TABLE 2: APPLICATION RATES BASED ON PERCOLATION RATES

Percolation Rate (Minutes/Inch)	TL-2 Hydraulic Loading Rate Pressure Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Gravity Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Bed/Mound (GPD/ft²)
5	1.80	1.80	1.20
10	1.67	1.67	1.11
15	1.53	1.53	1.02
20	1.40	1.40	0.93
25	1.30	1.30	0.86
30	1.20	1.13	0.80
35	1.10	0.98	0.73
40	1.00	0.84	0.66
45	0.90	0.73	0.60
50	0.80	0.62	0.53
55	0.76	0.57	0.50
60	0.71	0.51	0.47
65	0.67	0.46	0.44
70	0.62	0.41	0.41
75	0.58	0.36	0.38
80	0.53	0.32	0.35
85	0.49	0.28	0.33
90	0.44	0.25	0.30
95	0.40	0.20	0.27
100	0.37	0.19	0.25
105	0.34	0.17	0.23
110	0.31	0.16	0.21
115	0.28	0.14	0.19
120	0.25	0.13	0.17

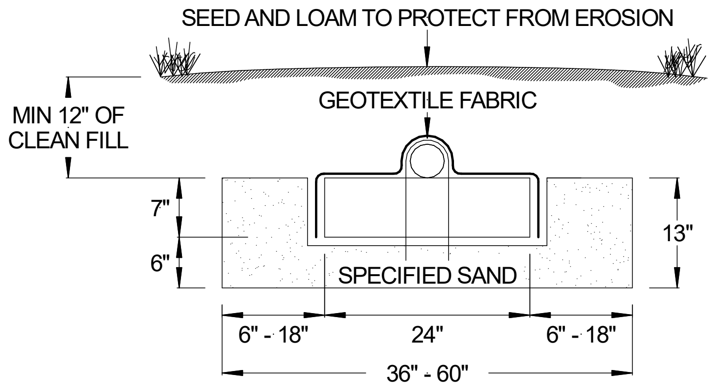
2.0 Trench Design and Installation

2.0.1 ACCEPTABLE METHODS OF DISTRIBUTION: Gravity, dosed and pressure distribution are acceptable.

2.0.2 DEPTH FROM ORIGINAL GRADE: There is no maximum bury depth, however venting is required once the unit has 18 inches of cover place on top of it.

2.0.3 GENERAL CROSS SECTIONS

FIGURE 3: A42 TRENCH CROSS SECTION



All trenches are required to have a minimum of:

- 6 - 18 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.
- 12 inches of cover soil material above the unit.

2.0.4 VERTICAL SEPARATION TO SEASONAL HIGH-WATER TABLE OR LIMITING LAYER: As required by state regulations; the bottom of the GSF system requires a 12-inch minimum separation distance from the maximum seasonal high groundwater table. Of the 12 inches required, 6 inches of soil must be naturally occurring. See Figure 2 of this manual for the separation distances required based on effluent type. **Note: The minimum vertical separation distance to a limiting feature must be maintained across the entire modified trench/pad area.*

2.0.5 DISTRIBUTION BOX: Parallel distribution is preferred.

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

2.0.7 TRENCH WIDTH: The minimum trench width is 3 feet, with a maximum trench width of 5 feet.

TABLE 3: TRENCH CONFIGURATIONS

Unit	Sand at the Edge of the Unit	Trench Width	ft^2/module
A42	6"	3'	12 ft^2
A42	12"	4'	16 ft^2
A42	18"	5'	20 ft^2

2.0 Trench Design and Installation

2.0.8 TRENCH LENGTH: Eljen recommends that the maximum gravity lateral run not exceed 100 feet. If a lateral is supplied from the center, the total length should not exceed 200 feet (100 feet to each side).

2.0.9 EQUAL LENGTH: Eljen recommends trenches are of equal length in order to provide equal distribution.

2.0.10 SPACING GUIDANCE BETWEEN TRENCHES: Adjacent trenches should be separated according to local and state regulations.

2.0.11 DISPERSAL AREA: Dispersal area requirements are met by total length and width of each trench added together. Example: 3 trenches x 3 feet wide x 60 feet = 540 square feet of dispersal area.

2.0.12 ROW SPACING: For Modified Trenches, center-to-center spacing must be no less than three times the width of the trench for slopes up to 10%. For slopes over 10%, add one extra foot of separation for every 10% increase in slope.

FIGURE 4: LEVEL SHALLOW PLACEMENT TRENCH SYSTEM

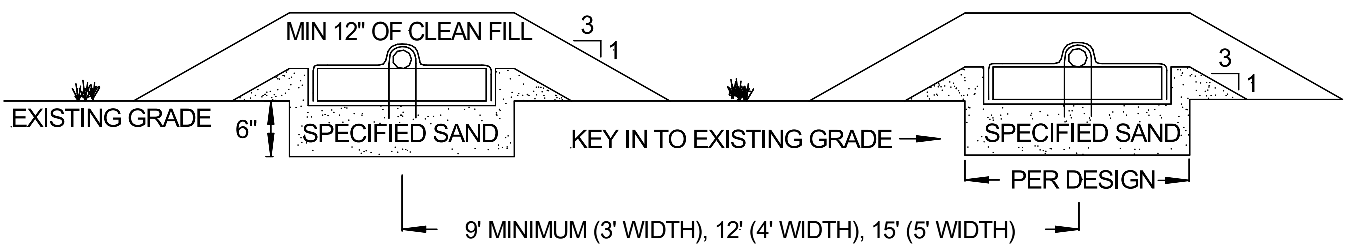
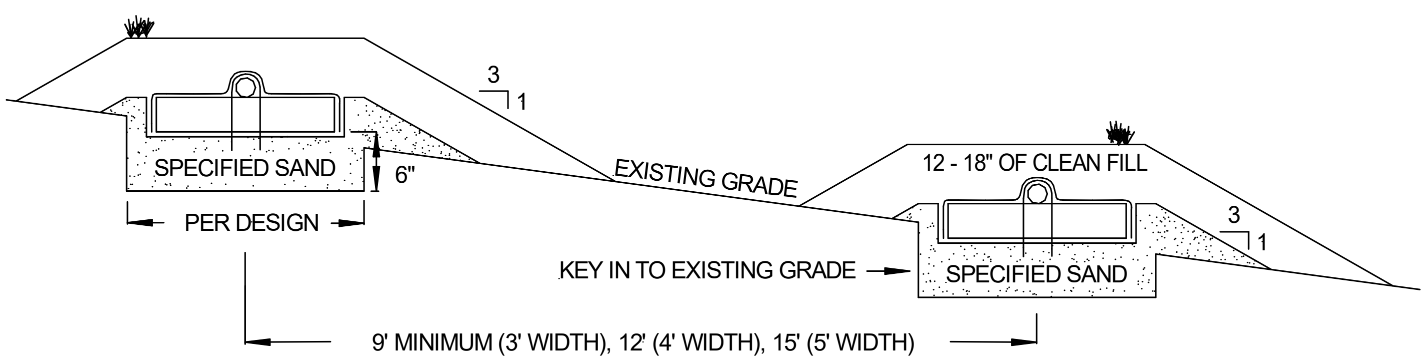


FIGURE 5: SLOPING SHALLOW PLACEMENT TRENCH SYSTEM



2.1 Trench Design Example

Trench Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Percolation Rate:	45 mpi
Method of Distribution:	Gravity
Absorption Field Type:	Trench

Determine the Application Rate
Lookup the application rate from Table 2:

Percolation Rate (Minutes/Inch)	TL-2 Hydraulic Loading Rate Pressure Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Gravity Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Bed/Mound (GPD/ft²)
45	0.90	0.73	0.60

Basal Area = Design Flow ÷ Application Rate

450 gpd ÷ 0.73 g/d/ft^2 = 616.4, round to 617 ft^2

Trench Width
Choose configuration that fits your site constraints from Table 3:

Unit	Sand at the Edge of the Unit	Trench Width	ft^2/module
A42	6"	3'	12 ft^2
A42	12"	4'	16 ft^2
A42	18"	5'	20 ft^2

Calculate Minimum Trench Length

Basal Area ÷ Trench Width = Trench Length

617 ft^2 ÷ 4 ft = 154.25, round to 155 ft

Calculate Minimum Units Required

(Minimum Trench Length -1) ÷ 4 = Units Required

(155 ft – 1) ÷ 4 = 38.5 units, round up to 39 A42 units

Calculate Trench Length

Units x 4 + 1 ft system sand at end of trench = Trench Length

39 units x 4 + 1 = 157 ft

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

Min. Trench Length	157 ft
Trench Width	4 ft
Number of Units	39 A42 Units
Min. System Area	628 ft^2

2.1 Trench Design Example

FIGURE 6: PLAN VIEW –TRENCH SYSTEM

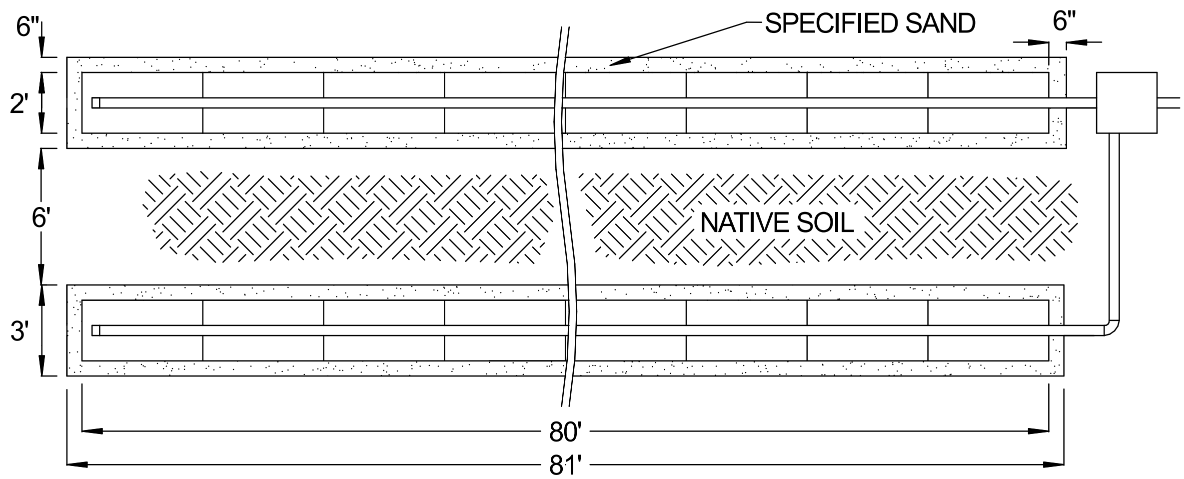


FIGURE 7: SECTION VIEW – TRENCH SYSTEM – LEVEL SITE

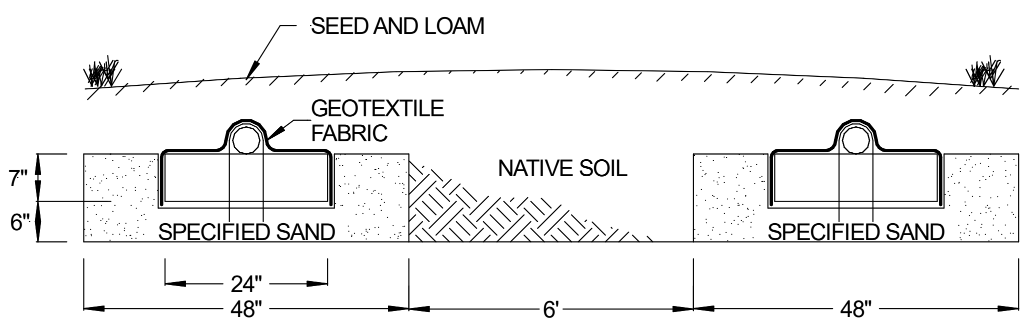
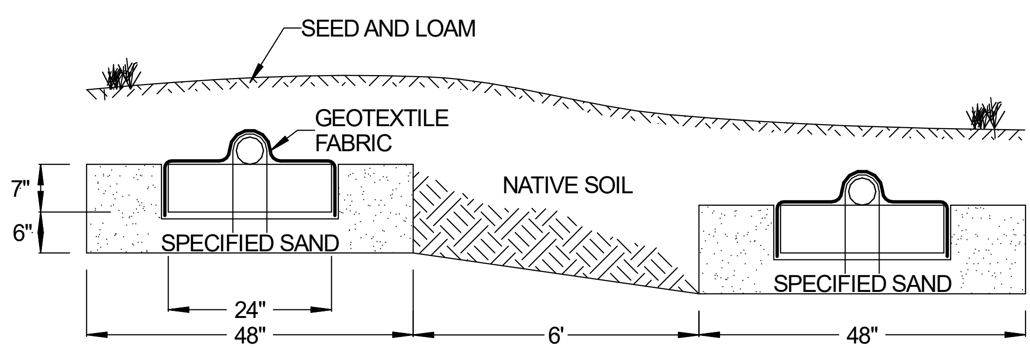


FIGURE 8: SECTION VIEW – TRENCH SYSTEM – SLOPING SITE



2.2 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 minimum stabilized height below the GSF module must be level at 6".

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

9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.

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

11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 17. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall include sweeping cleanouts at the terminal ends and be accessible from grade.

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

13. Place 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 approved cover material measured from the top of the module. 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.

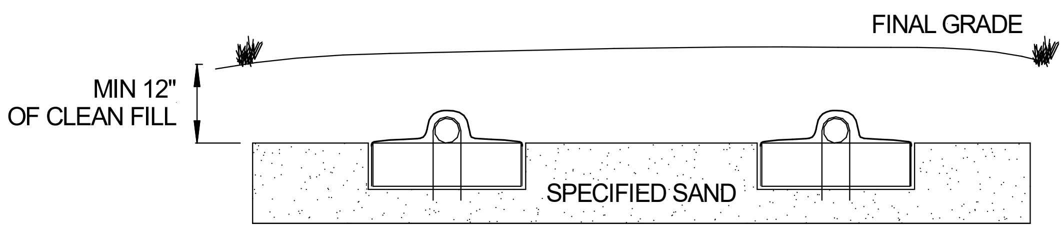
3.0 Bed Design and Installation

3.0.1 ACCEPTABLE METHODS OF DISTRIBUTION: Gravity, dosed and pressure distribution are acceptable.

3.0.2 MINIMUM DEPTH FROM ORIGINAL GRADE: There is no maximum bury depth, however venting is required once the unit has 18 inches of cover place on top of it.

3.0.3 GENERAL CROSS SECTION

FIGURE 9: BED CROSS SECTION



<u>All bed systems are required to have a minimum of:</u>

- 6 inches of Specified Sand at the beginning and end of each GSF Row.
- 6 inches of Specified Sand directly below the GSF module.
- 12 inches of cover soil material above the unit

3.0.4 VERTICAL SEPARATION TO SEASONAL HIGH-WATER TABLE OR LIMITING LAYER: As required by state regulations; the bottom of the GSF system requires a 12-inch minimum separation distance from the maximum seasonal high groundwater table. Of the 12 inches required, 6 inches of soil must be naturally occurring. See Figure 2 of this manual for the separation distances required based on effluent type. **Note: The minimum vertical separation distance to a limiting feature must be maintained across the entire modified trench/pad area.*

3.0.5 DISTRIBUTION BOX: Parallel distribution is preferred. Sequential distribution may be utilized for sloping sites.

3.0.6 PARALLEL DISTRIBUTION: Parallel distribution is the preferred method of application 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 bed systems.

3.0.7 UNITS PER BEDROOM: Bed systems are sized with an application rate and a minimum number of units per bedroom.

TABLE 4: MINIMUM UNITS PER BEDROOM (BED DESIGN ONLY)

Percolation Rate (Minutes/Inch)	Minimum Number of A42s per Bedroom
15 or less	6
15 to 25	7
>25 to 45	9
>45 to 90	11
>90	13

3.0.8 ROW LENGTH: Eljen recommends that the maximum gravity lateral run not exceed 100 feet. If a lateral is supplied from the center, the total length should not exceed 200 feet (100 feet to each side).

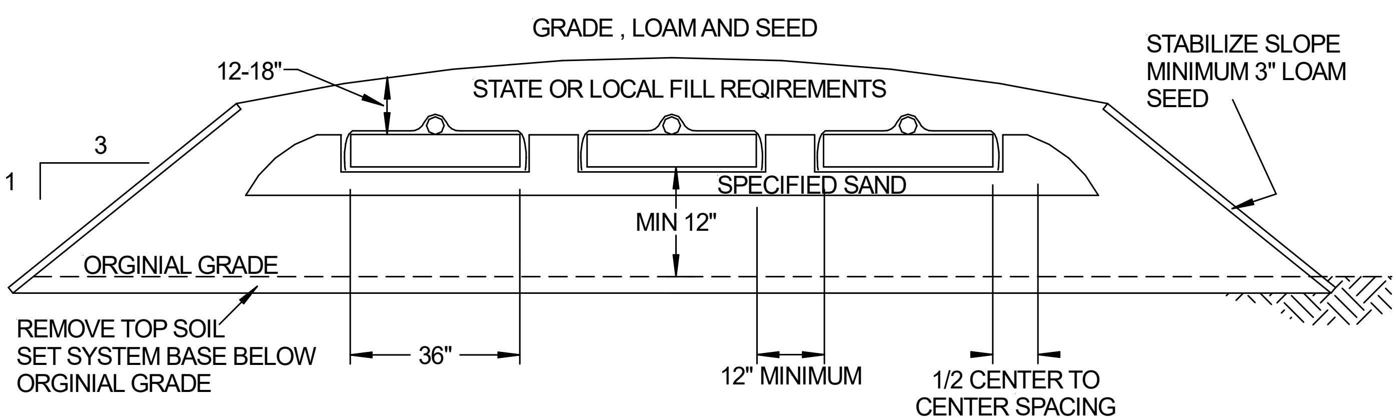
3.0.9 EQUAL LENGTH: Eljen recommends rows are of equal length in order to provide equal distribution.

3.0.10 DISPERSAL AREA: Dispersal area requirements are met by total length and width of the bed. Example: 10 feet wide x 60 feet = 600 square feet of dispersal area.

3.0.11 BED DESIGN: Evenly distribute the bed laterals in the basal area for level bed installations. A minimum separation distance between laterals for A42's is 3 feet.

3.0.12 ROW SPACING: For PAD Systems, center-to-center and center-to-edge spacing will vary per design. For slopes up to 15% a minimum of 1 foot edge to edge module spacing is required. For slopes over 15% a minimum 2-foot edge to edge module spacing is required. The edge of module to toe of downhill slope spacing is based on the Regulations or a minimum 3:1 slope requirement.

FIGURE 10: RAISED OR FILL PAD SYSTEM CROSS SECTION



3.1 Level Bed Design Example

Bed Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Percolation Rate:	45 mpi
Method of Distribution:	Pressure
Absorption Field Type:	Bed

Determine the Application Rate
Lookup the application rate from Table 2:

Percolation Rate (Minutes/Inch)	TL-2 Hydraulic Loading Rate Pressure (GPD/ft^2)	TL-2 Hydraulic Loading Rate Gravity (GPD/ft^2)	TL-2 Hydraulic Loading Rate Mound (GPD/ft^2)
45	0.90	0.73	0.60

Basal Area = Design Flow ÷ Application Rate

450 gpd ÷ 0.6 $g/d/ft^2$ = 750.0, round to 750 ft^2

Units Required
Lookup the minimum units required from Table 4:

Percolation Rate (Minutes/Inch)	Minimum Number of A42s per Bedroom
>45 to 90	11

Minimum A42s per Bedroom x Number of Bedrooms = Minimum A42s required in the system

11 A42s/Bedroom x 3 Bedrooms = 33 A42s

Calculate Units per Row (this example uses two rows)

Units ÷ Rows = Units per Row

33 A42s ÷ 2 Rows = 16.5, round to 17 A42s per Row

Calculate Row Length (this example uses two rows)

Units x 4 + 1 ft system sand at end of row = Bed (Row) Length

17 units x 4 + 1 = 69 ft

Calculate Minimum Bed Length

Basal Area ÷ Bed Width = Bed Length

750 ft^2 ÷ 69 ft = 10.9, Round to 11 ft

Final Dimension Layout

Bed Length	69 ft
Bed Width	11 ft
Number of per Row	17 A42 Units
Number of Rows	2 Rows
Min. System Area	759 ft^2

3.1 Level Bed Design Example

FIGURE 11: PLAN VIEW – BED SYSTEM

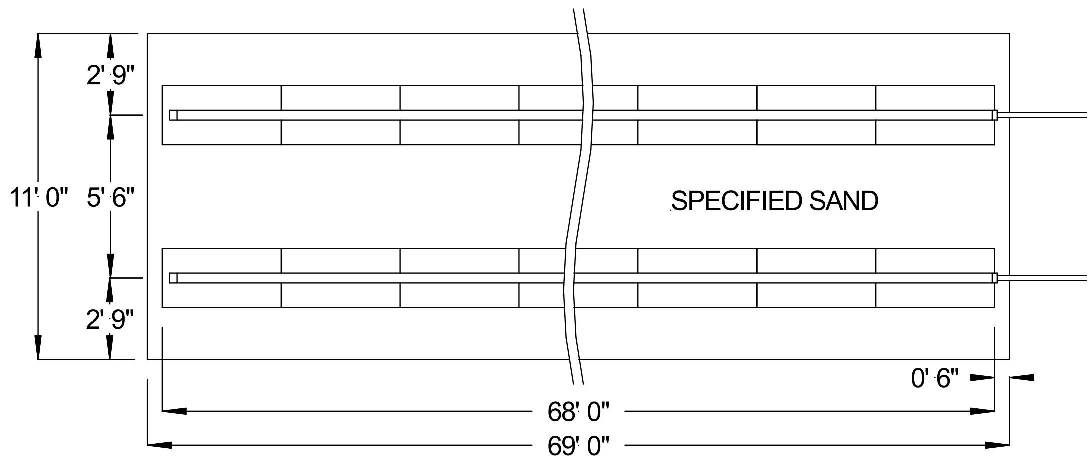


FIGURE 12: SECTION VIEW – 2 LATERAL BED SYSTEM

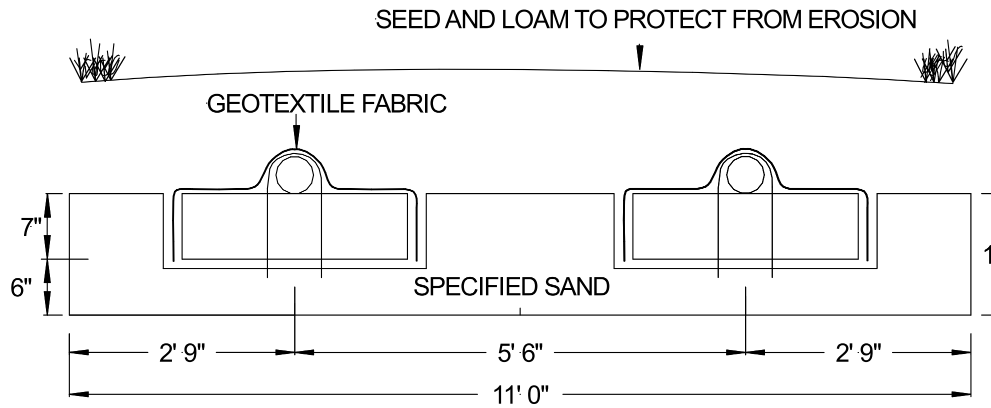
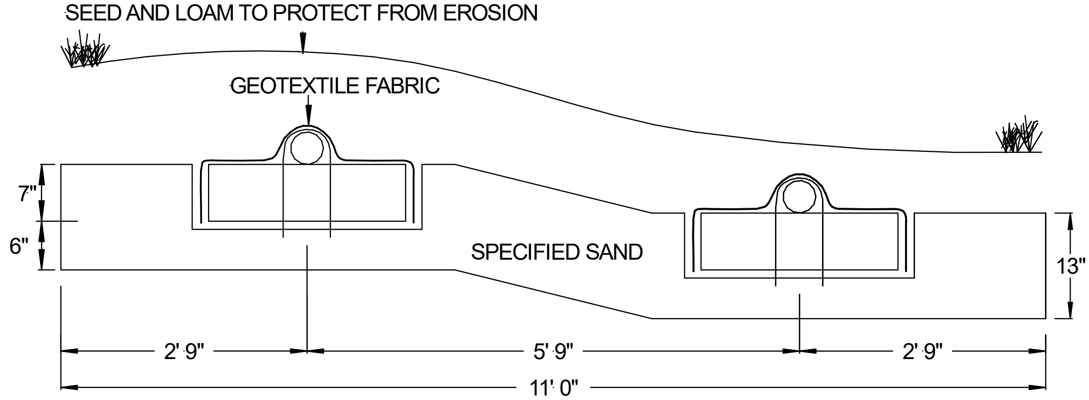


FIGURE 13: SECTION VIEW – 2 LATERAL BED SYSTEM; SLOPING SITE



3.2 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) 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 17. Each pressure lateral will have a drain hole at the 6 o’clock position. Each pressure lateral shall include sweeping cleanouts at the terminal ends and be accessible from grade.

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

13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each module row. A minimum of 12 inches of Specified Sand is placed in between module rows.

14. Complete backfill with a minimum of 12 inches of approved cover material measured from the top of the unit. 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.

4.0 Mound Installation Sizing and Guidelines

4.0.1 MOUND REFERENCE: The following sizing and guidelines provide the dimensions of the dispersal bed for your mound. Consult the local regulations for more information on the construction of the mound system.

4.0.2 MOUND EXAMPLE:

House size:	3 bedrooms
Slope of site:	6%
Horizontal Gradient of Side Slope	3:1
Depth to Limiting Factor:	12 inches
Percolation Rate:	30 mpi
Method of Distribution:	Pressure
Absorption Field Type:	Mound

FIGURE 14: CROSS SECTION – MOUND SYSTEM

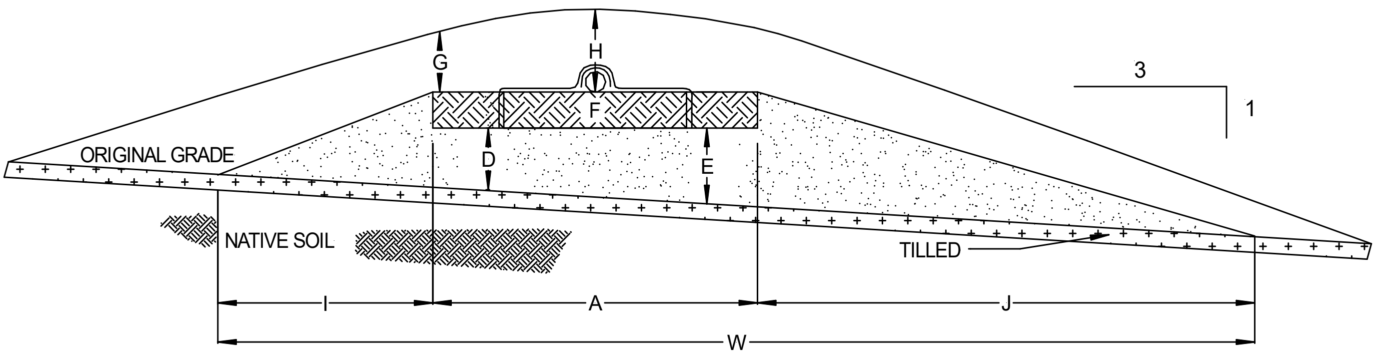
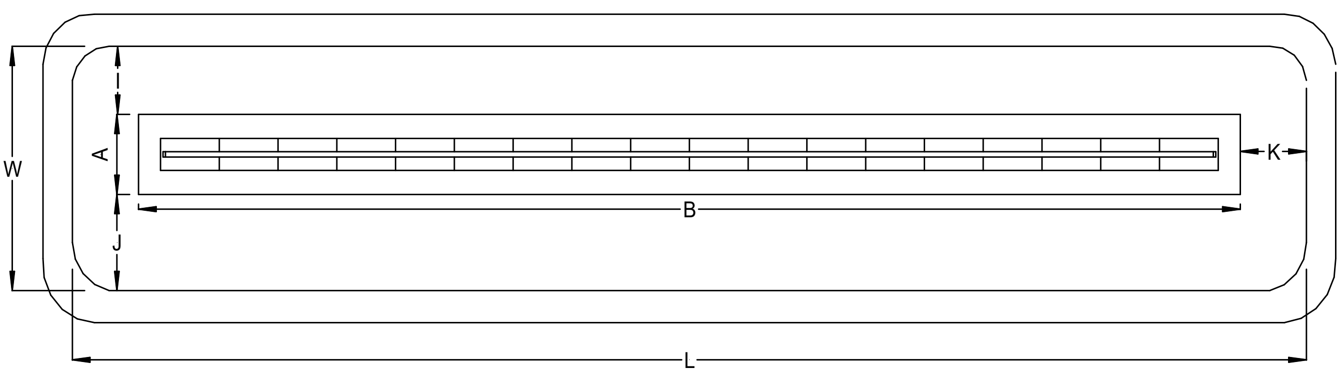


FIGURE 15: PLAN VIEW – MOUND SYSTEM



A – Dispersal bed width (accounts for sand) – **Minimum 3 ft**
B – Dispersal bed length (accounts for sand)
D – Up slope mound fill depth – **Minimum 1 ft**
E – Down slope mound fill depth – **Minimum 1 ft**
F – Cell Height – **Constant 0.583 ft**
G – Height of cover over edge of cell
H – Height of cover over center of cell
I – Up slope measurement from distribution cell
J – Down slope measurement from distribution cell
K – End slope length
L – Length
W – Width

4.0.3 CALCULATE VARIABLES:

Step 1: Determine Daily Design Flow (DDF) 450 gpd

Step 2: Fill Material Loading Rate (FMLR) 2.0 gpd/ft² (constant)

Step 3: Distribution Cell Width (A)

Unit	Sand at the Edge of the Unit	Distribution Cell Width	Product Square Footage per 4 ft Increment
A42	6"	3'	12
A42	12"	4'	16
A42	18"	5'	20
2 rows of A42	6"	6'	24
2 rows of A42	12"	8'	32
3 rows of A42	6"	9'	36
2 rows of A42	18"	10'	40

(A) Distribution Cell Width = 3 ft

Step 3: Distribution Cell Square Footage

DDF ÷ FMLR = Distribution Cell Square Footage

450 gpd ÷ 2.0 gpd/ft² = 225 ft²

Step 4: Required # of 4 ft product increments

(Distribution Cell Square Footage – Sand Header and Footer Square Footage) ÷ Product Square Footage

SAND HEADER AND FOOTER SQUARE FOOTAGE	
Distribution Cell Width	Square Footage
3 feet	3 square feet
4 feet	4 square feet
5 feet	5 square feet
6 feet	6 square feet
8 feet	8 square feet
9 feet	9 square feet

(225 ft² – 3 ft²) ÷ 12 ft² per increment = 18.5 increments of 1 Row of A42s, round up to 19 A42s

Note: Ensure the units meet the minimum requirements of 6 A42s per bedroom.

Step 5: Distribution Cell Length (B)

B = Unit Increments x 4 + 1
= 19 increments x 4 ft per increment + 1 ft
= 77 ft

Note: If the soil application rate is less than 0.3 gal/ft^2/day within 12 inches of fill, the linear loading rate must be less than 4.5 gal/ft/day.

To determine the linear loading rate:

DDF ÷ Distribution Cell Length (B)

Since the loading rate of the basal area is 1 gal/ft^2/day (determined from Table 2) this calculation is not needed in this example.

Step 6: Fill Depth Under Distribution Cell (D) and (E)

D (*Note: Minimum is 12 inches)*
= 12 in ÷ 12 in/ft = 1.0 ft

E = (D) + (% natural slope expressed as a decimal x (A; converted to inches))
= 12 in + (.06 x 36 in)
= 12 in + 2.16 in
= 14.16 in
= 14.16 in ÷ 12 in/ft = 1.18 ft

Step 7: Determine Mound Depths (F), (G) and (H)

F = 0.583 ft (constant)

G = 0.5 ft (typical)

H = 1 ft (typical)

Step 8: Determine the end-slope length (K)

K = Horizontal Gradient of Side Slope x ((D + E) ÷ 2) + F + H)
= 3 x ((1.0 ft + 1.18 ft) ÷ 2) + 0.583 ft + 1 ft)
= 3 x ((2.18 ft) ÷ 2) + 0.583 ft + 1 ft)
= 3 x ((1.09 ft) + 0.583 ft + 1 ft)
= 3 x (2.673 ft)
= 8.02 ft

Step 9: Determine the up-slope width (I)

I = Horizontal Gradient of Side Slope x (D + F +G) x (Up Slope Correction Factor)

Up Slope Correction Factors																										
Slope %	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%
Correction Factor	1.00	0.97	0.94	0.92	0.89	0.88	0.85	0.83	0.80	0.79	0.77	0.75	0.73	0.72	0.71	0.69	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.57

= 3 x (1.0 ft + 0.583 ft + 0.5 ft) x 0.85
= 3 x (2.083 ft) x 0.85
= 5.31 ft

Step 10: Determine the down-slope width (J)

J = Horizontal Gradient of Side Slope x (E + F +G) x (Down Slope Correction Factor)

Down Slope Correction Factors																										
Slope %	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%
Correction Factor	1.00	1.03	1.06	1.10	1.14	1.18	1.22	1.27	1.32	1.38	1.44	1.51	1.57	1.64	1.72	1.82	1.92	2.04	2.17	2.33	2.50	2.70	2.94	3.23	3.57	4.00

= 3 x (1.18 ft + 0.583 ft + 0.5 ft) x 1.22
= 3 x (2.263 ft) x 1.22
= 8.28 ft

Step 11: Determine the end slope length (L + W)

L = B + 2K
= 77 ft + 2 x 8.02 ft
= 77 ft + 16.04 ft
= 93.04 ft

W = I + A + J
= 5.31 ft + 3 ft + 8.28 ft
= 16.6 ft

Step 12: Basal Area Check

Basal Area Required
= DDF ÷ application Rate

Percolation Rate (Minutes/Inch)	TL-2 Hydraulic Loading Rate Pressure Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Gravity Trench (GPD/ft²)	TL-2 Hydraulic Loading Rate Bed/Mound (GPD/ft²)
30	1.20	1.13	0.80

= 450 gpd ÷ 0.8 gpd/ft^2
= 562.5 ft^2

Basal Area Available (level site)
= B x W

Basal Area Available (sloped site)
= B x (A + J)
= 77 ft x (3 ft + 8.28 ft)
= 77 ft x 11.28 ft
= 868.56 ft

If Basal Area Available is greater than Basal Area Required, system is ok. If not, extend (J) so that Basal Area Provided equals or exceeds Basal Area Required.

4.0.4 ACCEPTABLE METHODS OF DISTRIBUTION: Pressure distribution is acceptable.

4.0 Mound Installation Sizing and Guidelines

4.0.5 MOUND CONSTRUCTION–
Overall Width (with slopes) – 16.6 ft
Overall Length (with slopes) – 93.04 ft

FIGURE 16: SECTION VIEW – MOUND SYSTEM

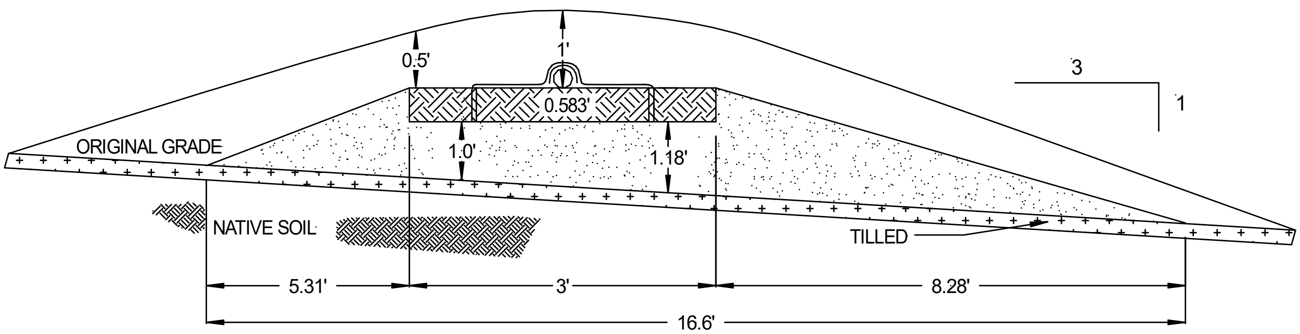
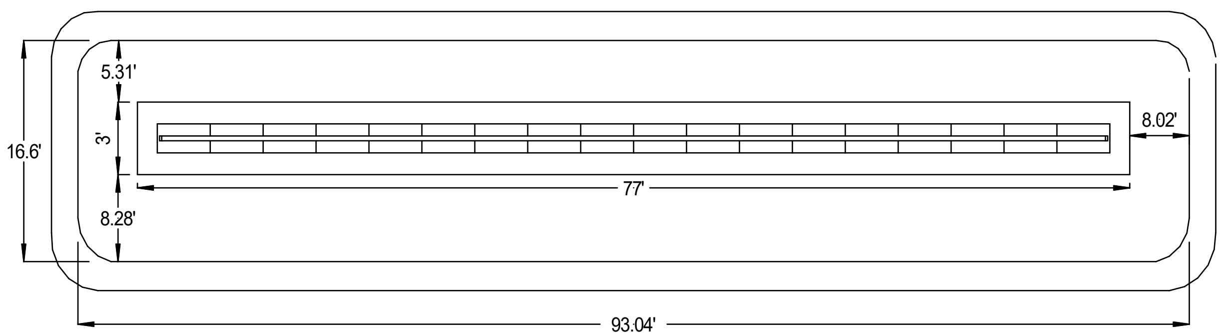


FIGURE 17: PLAN VIEW – MOUND SYSTEM



4.1 Mound Design Installation

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 6” lifts, stabilize by foot, a hand-held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must meet the mound design requirements.
7. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.
8. A standard perforated 4-inch distribution pipe is centered along the modules 4-inch length. Orifices are set at the 4 & 8 o’clock position.
9. All distribution pipes are secured with manufacturers supplied wire clamps, one per module.
10. (Pressure Distribution Systems) Insert a PVC Sch. 40 pressure pipe (size per design and code) into the standard perforated distribution pipe. The pressure pipe orifices are set at the 12 o’clock position as shown in Figure 17. Each pressure lateral will have a drain hole at the 6 o’clock position. Each pressure lateral shall include sweeping cleanouts at the terminal ends and be accessible from grade.

    It is strongly recommended to install a 4-inch vent onto the distribution pipe. Distribution pipes can be connected to one vent or use one vent per distribution line.
11. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.
12. Ensure there is 6 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.
13. Complete backfill with a minimum of 12 inches of cover material measured from the top of the module. Use well graded native soil fill that is clean, porous, and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing, or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.
14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

5.0 Dosing Distribution Requirements

5.0.1 DOSING DESIGN CRITERIA: Dosing volume must be set to deliver a maximum of 3 gallons per A42 Module per dosing cycle. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

The maximum dose for an A42 module is 25 gallons per day.

5.0.2 PUMP SYSTEM DESIGNS:

- The *Regulations* do not specifically address pumps used for purposes other than conveying effluent to a dispersal system. 12 VAC 5-610-880 is waived in its entirety for pumps, pump chambers, and appurtenances integral to treatment systems.
- Conveyance Pumps. The pump requirements contained in 12 VAC 5-610-880 subsections A.1, B.6, and B.7 are waived. Pump systems designed in accordance with these sections of the *Regulations* are not appropriate for systems dispersing treated effluent to a reduced size absorption area.

6.0 Pressure Distribution Requirements

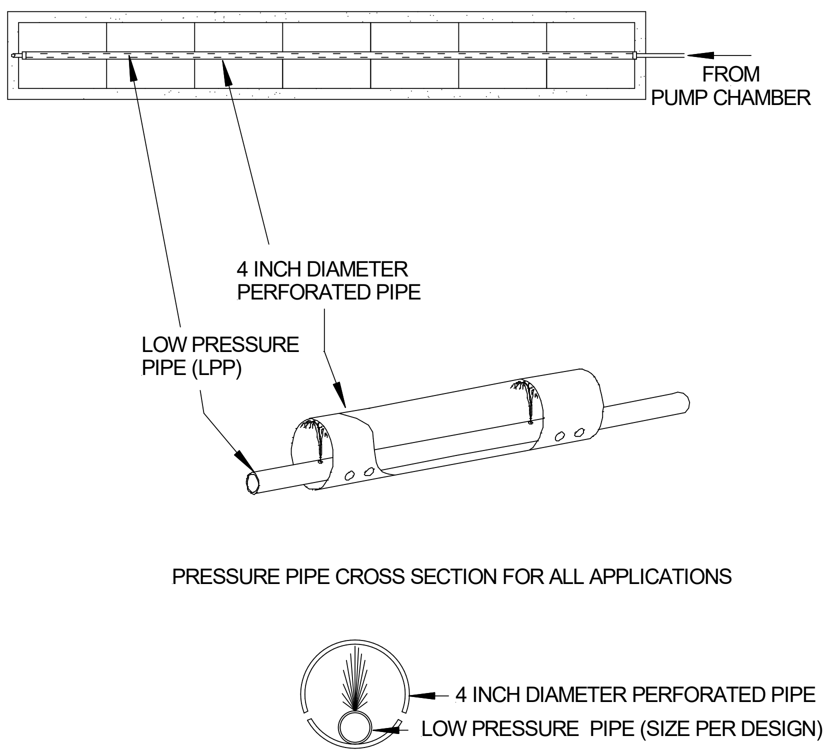
6.0.1 PRESSURE DISTRIBUTION: Dosing with small diameter pressurized laterals is acceptable for GSF systems. The pipe networks must be engineered and follow principles established for pressure distribution. Flushing ports are required to maintain the free flow of effluent from orifices at the distal ends 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 pipes 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.

6.0.2 DOSING DESIGN CRITERIA: For all pump systems; use a maximum of 3 gallons per A42 Module per dosing cycle. 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 18: PRESSURE PIPE PLACEMENT



6.0 Pressure Distribution Requirements

FIGURE 19: PRESSURE CLEAN OUT

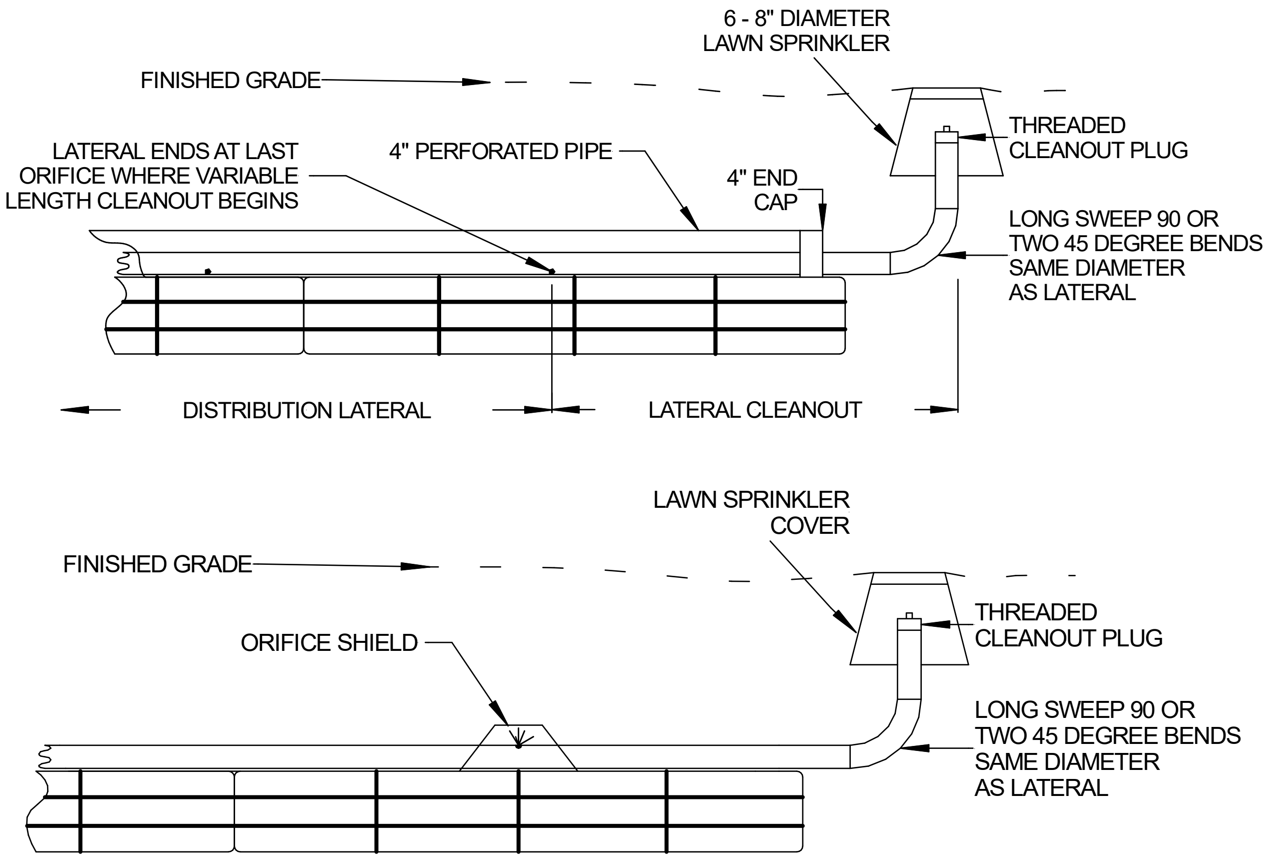
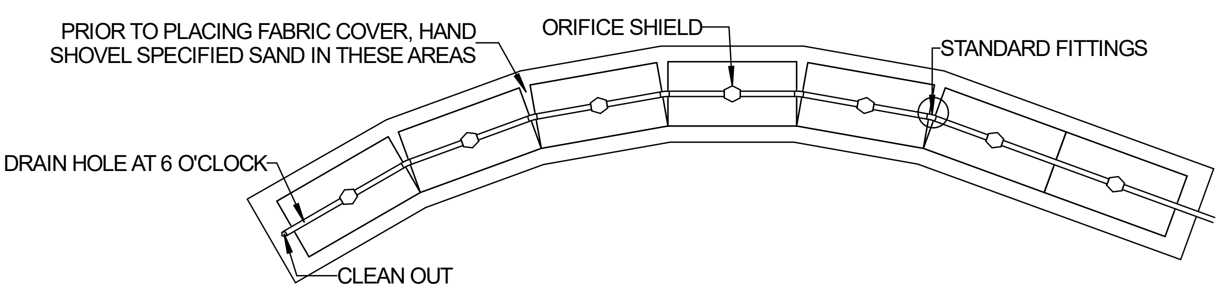


FIGURE 20: CONTOURED TRENCH PRESSURE DISTRIBUTION USING ORIFICE SHIELDS



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

7.0 Pump Controls

Pump controlled systems will include an electrical control system that has the alarm circuit independent of the pump circuit controls and components that are listed by UL or equivalent, is located outside, within line of sight of the dosing tank and is secure from tampering and resistant to weather (minimum of NEMA4X).

The control panel shall be equipped with both audible and visual high liquid level alarms installed in a conspicuous location. Float switches shall be mounted independent of the pump and force main so that they can be easily replaced and/or adjusted without removing the pump.

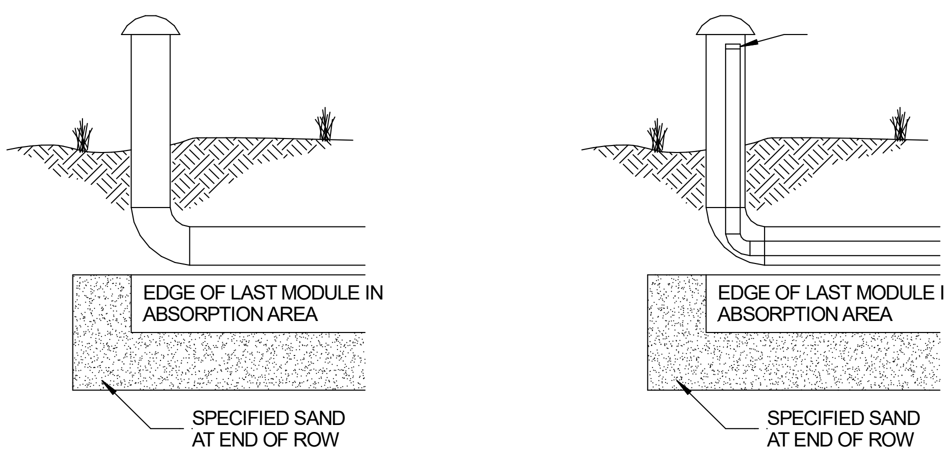
Recommended (data logging control panel (model BP3189) for all commercial systems and systems with 5 bedrooms or more.

8.0 System Ventilation

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

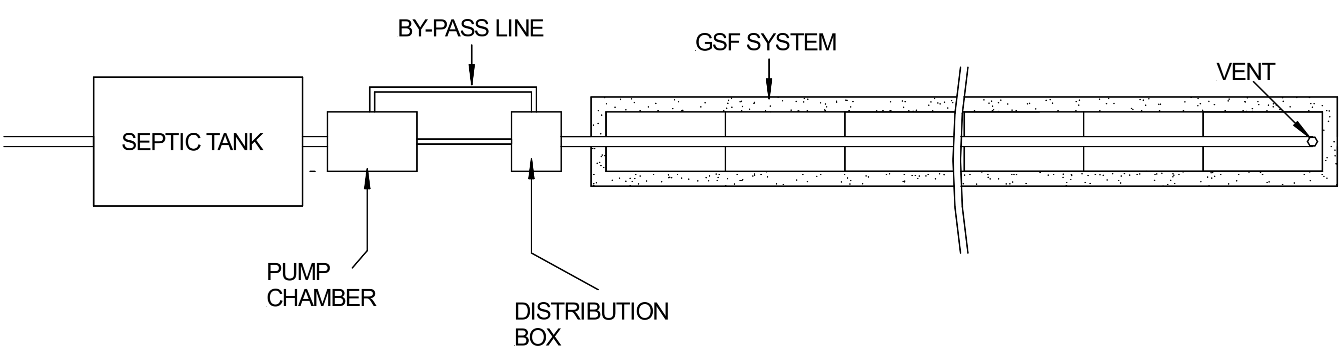
8.0.2 VENT PIPE FOR GRAVITY AND LOW-PRESSURE SYSTEMS: Systems with over 18" of cover over the top of the modules require a vent. If the system is a low-pressure distribution system, ensure that the LPP clean outs are located in the vent for easy access.

FIGURE 21: VENT LAYOUTS FOR GRAVITY AND LOW-PRESSURE SYSTEMS



8.0.3 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.

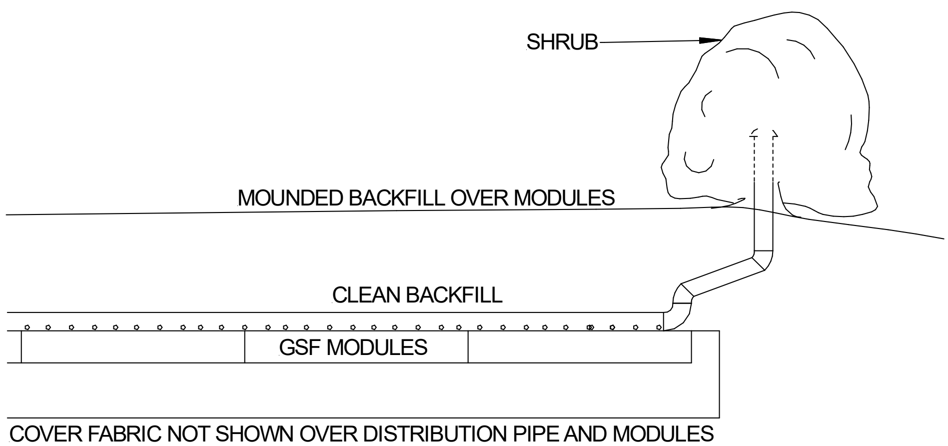
FIGURE 22: AIR BY-PASS LINE PLAN VIEW FOR VENTING OF PUMPED SYSTEMS



8.0 System Ventilation

8.0.4 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.

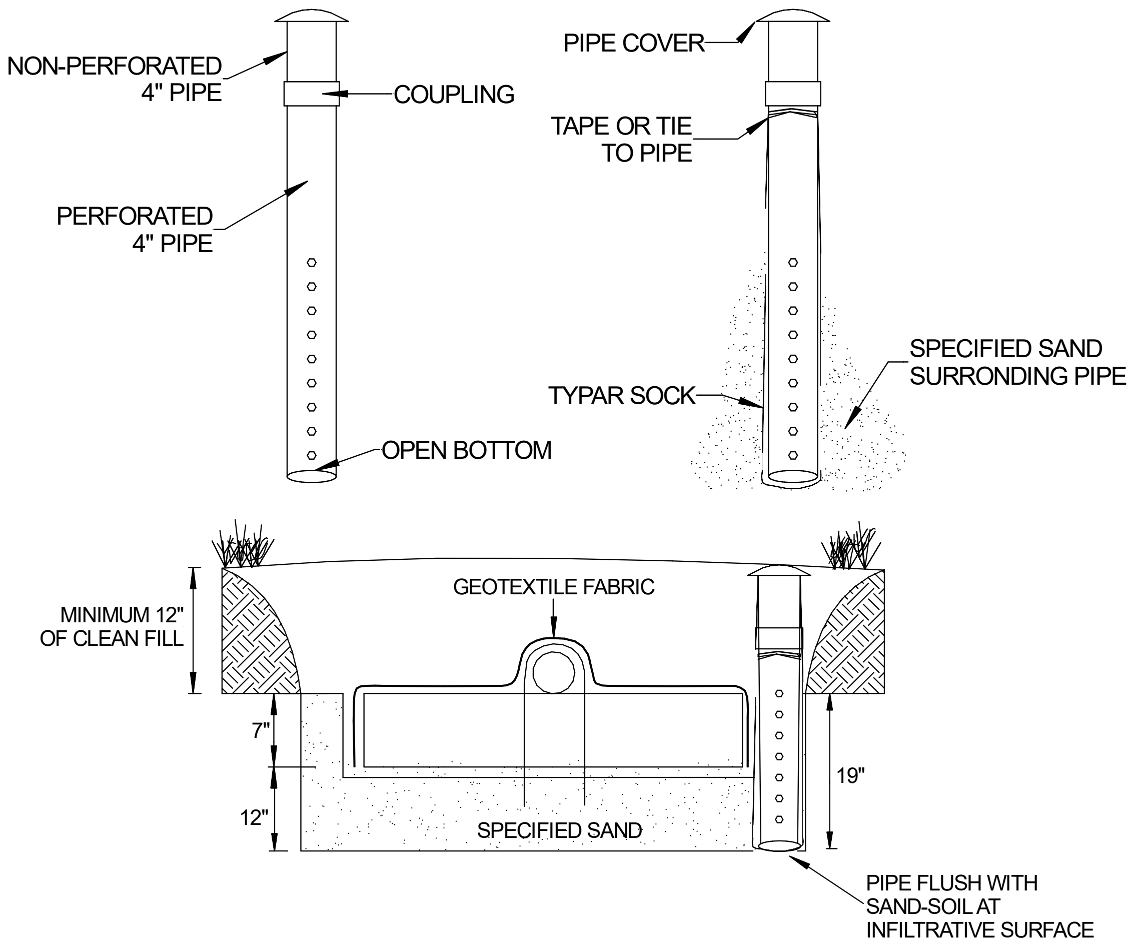
FIGURE 23: GSF WITH 4” VENT EXTENDED TO CONVENIENT LOCATION



9.0 Inspection/Monitoring Port

The system shall include an Inspection/Monitoring Port designed and installed with access from the ground surface. It shall be open and slotted at the bottom and be void of sand or gravel to the infiltrative surface to allow visual monitoring of standing liquid in the absorption field. The figures below depict construction and placement of the Inspection/Monitoring Port. For beds and elevated systems, place two ports per lateral. At least one inspection port should be placed at the midpoint of a row. At the distal ends, use 90-degree elbows and extend to the surface as an additional inspection port, capped and sealed to be watertight. One inspection port should be located downslope in the OSS basal area as well.

FIGURE 24: MONITORING WELL FOR SAND-SOIL INTERFACE



9.0 Inspection/Monitoring Port

FIGURE 25: MONITORING WELL FOR SAND-SOIL INTERFACE

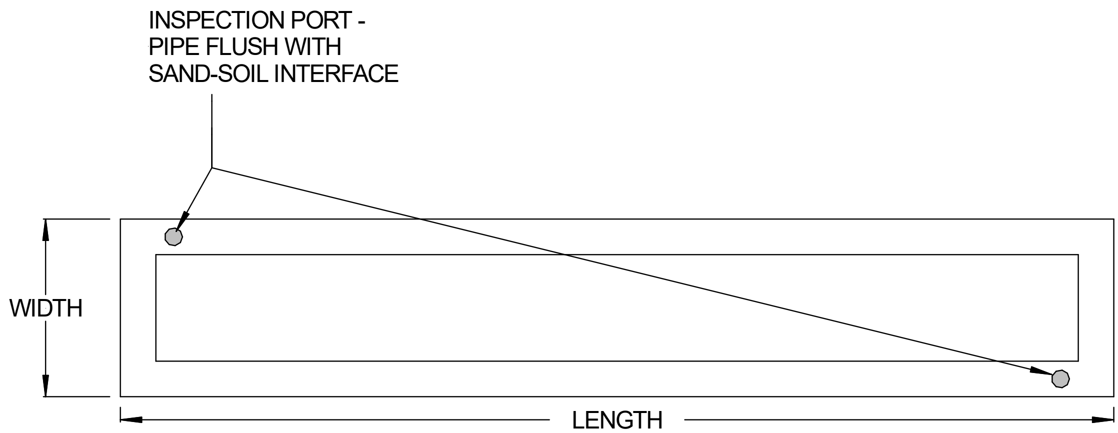
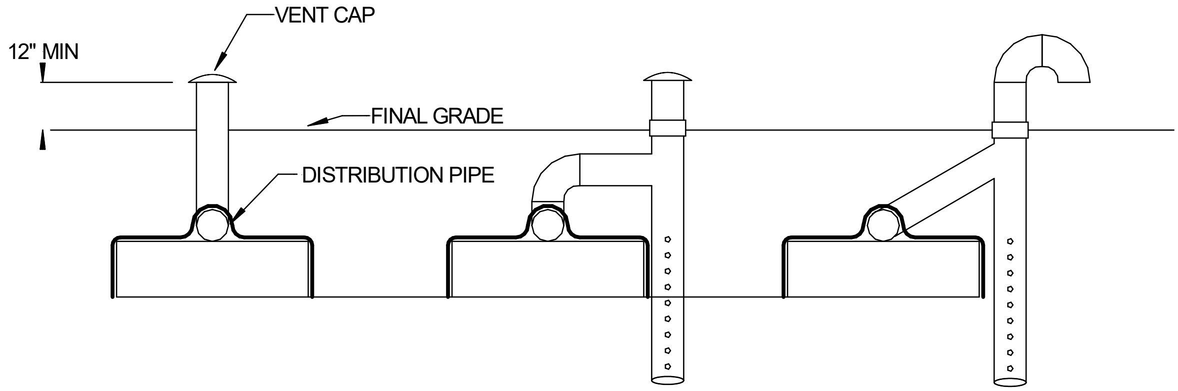


FIGURE 26: COMBINATION VENT/MONITORING WELL FOR SAND-SOIL INTERFACE



9.1 System Maintenance and Sampling Requirements

The purpose of this section is to help provide an easy and effective way to monitor and sample Eljen Alternative Onsite Sewage Systems per Section 12VAC5-613-80 of *Chapter 613, Regulations for Alternative Onsite Sewage Systems.* Installing an Eljen Sampling and Collection Unit will allow you to sample your TL-2 Alternative Onsite Sewage Systems and meet the requirements listed below. If you have any questions pertaining to any part of this document or regarding Eljen products in general, please call our Technical Services Department at 1-800-444-1359.

OWNER RESPONSIBILITIES: The following requirements are in accordance with the *Virginia Chapter 613, Regulations for Alternative Onsite Sewage Systems*.

- Maintain an operator: At all times, a certified service provider should be retained for routine maintenance and inspections for all TL-2 systems.
- Keep a log: A log must be maintained on any services or inspections conducted on the TL-2 system by the owner and operator. Requirements for log entries are in the section below, *Operators Responsibilities*.
- Keep operators manual on the premises for transfer to next owner.
- Schedule routine Operator visits.
    - All TL-2 systems require a check 180 days after its initial operation. A grab sample is required to be tested by an EPA certified laboratory and results reported to the Local Health Department.
    - After approval, the system requires inspection once a year by an Operator.
    - Every five years, a grab sample is required to be tested by EPA certified laboratory and results reported to the Local Health Department.

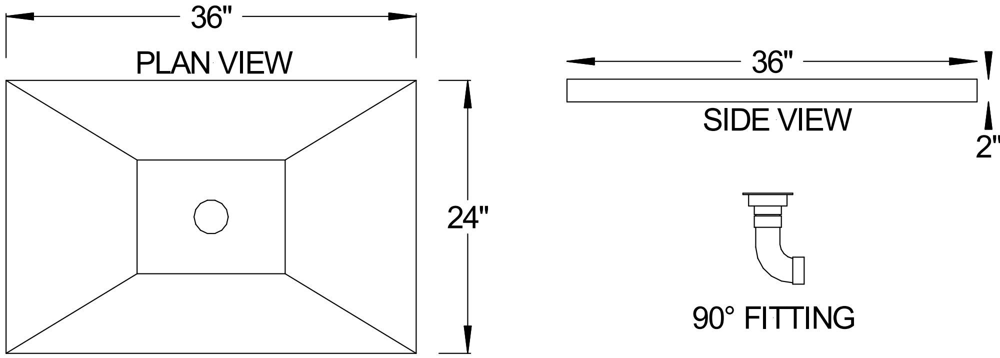
OPERATOR RESPONSIBILITIES: The following requirements are in accordance with *Virginia Chapter 613, Regulations for Alternative Onsite Sewage Systems*. If you have any questions, please contact your Service Operator.

- Keep a log for the TL-2 systems
    - Results of all testing and sampling
    - Reportable incidents
    - Maintenance, corrective actions, and repair of system components
    - Sludge or solids removal
    - Date and time reports were made and delivered to the system owner
- Collect a grab sample for the owner at the 180 day mark, and every 5 years after that date
- Notify the Local Health Department if the relationship with the owner ends

10.0 Sampling Port Parts

FIGURE 27: PARTS AND DEVICES

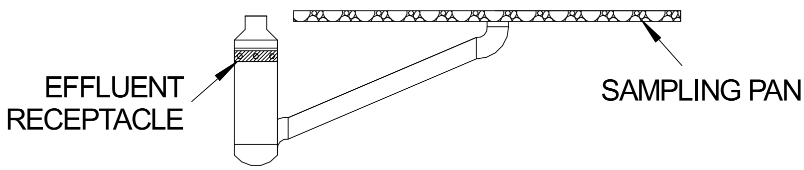
Field Sampling Parts to be installed with system:



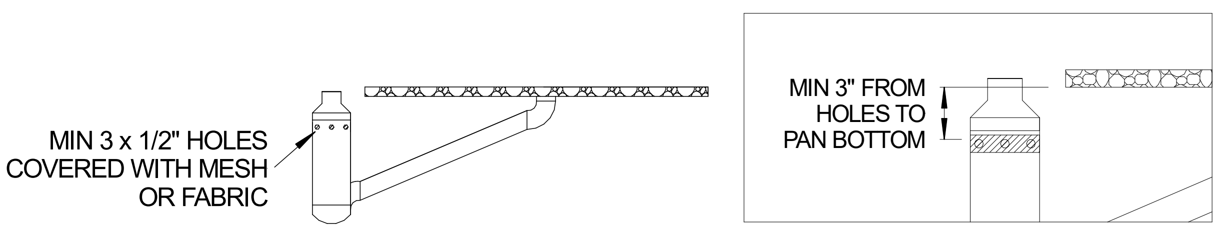
Sampling Pan

Effluent Receptacle:
Multiple configurations are acceptable. Please contact Eljen Corporation with questions.

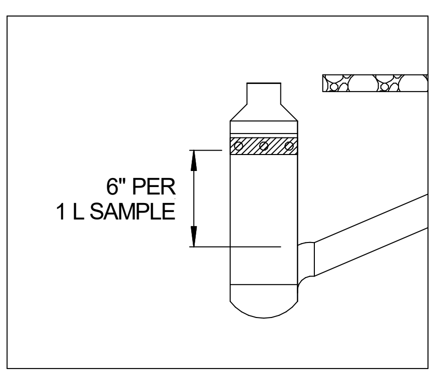
1. The completed assembly will have the effluent receptacle below the sampling pan.



2. A minimum of 3 holes, from ½ inch to 1 inch, are located near the top of the effluent receptacle. The holes must be located a minimum of 3" below sampling pan.



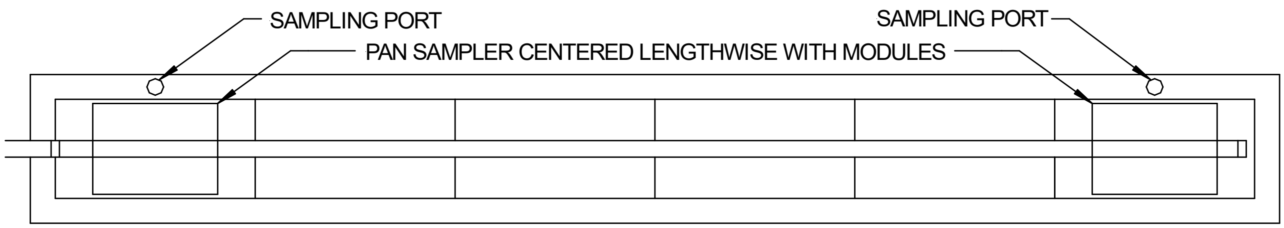
3. For every liter of sample required, ensure there is six inches of 4" pipe between the holes and the incoming effluent from the pan.



11.0 Sampling Port Placement

1. Determine the collection pipe and sampling pan placement in the system. Eljen recommends one sampler in a low-pressure distribution system or a minimum of two samplers used in gravity or pump to gravity distribution systems. In a pressure distribution system, the sampler may be placed under any unit. In gravity systems, one sampler is placed under the first module and a second one is located near the end of the same row.
2. Carefully lay out the system area and boundaries.
3. Prepare the site. Excavate a trench to the design elevation for the system. *Note: this includes the Specified Sand.*

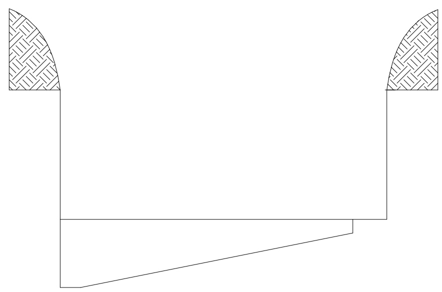
FIGURE 28: OBSERVATION AND SAMPLING PORT PREPARATION PLAN VIEW



12.0 Sampling Port Installation

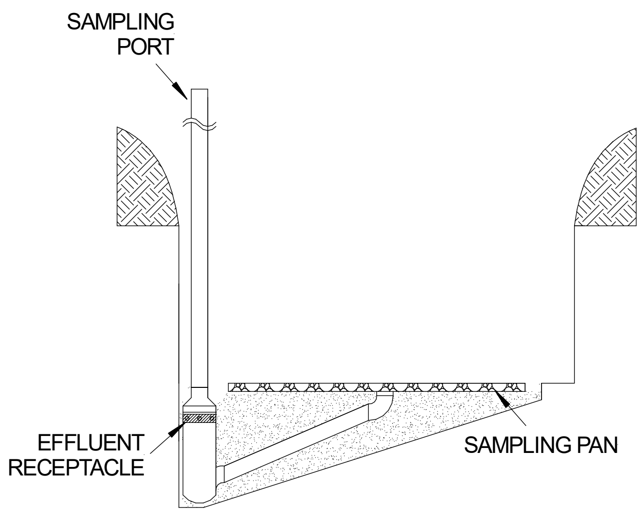
1. At the location where the sampling devices will be installed, create the form to receive the devices in order for the sampling pan to be under the Eljen GSF module and specified sand. Cut out the area for the sampling port.

FIGURE 29: PLACE BASE SAND



2. Place the sampling pans level in the excavation. The pan should be set perfectly level and centered underneath where the Eljen GSF modules will be placed. The sampling port and receptacle are placed beside the module. Use Specified sand to keep the apparatus in place.

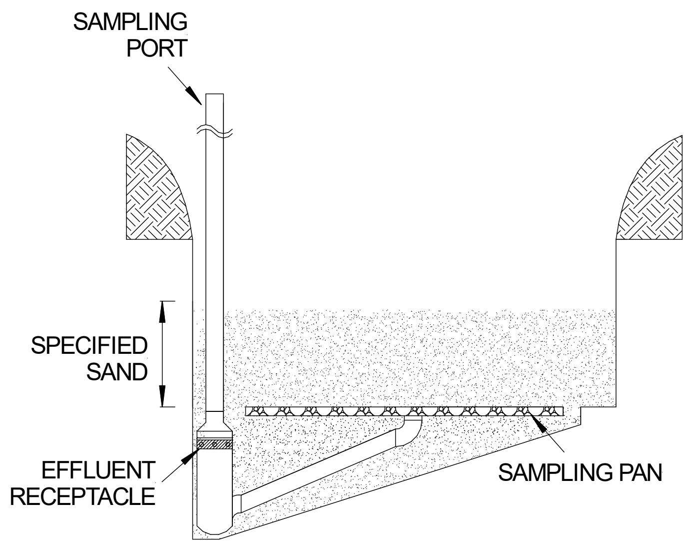
FIGURE 30: PLACE SAMPLERS ON SAND



12.0 Sampling Port Installation

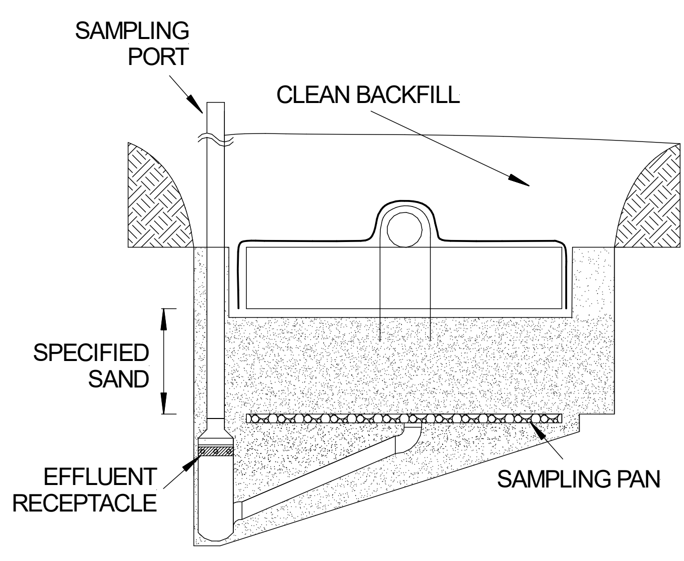
3. Fill Pan with pea gravel or if fitted with fabric, ASTM C-33 sand is acceptable.
4. Place the specified sand to required depth.

FIGURE 31: COMPLETE PLACING SPECIFIED SAND



5. Stabilize the Specified Sand height below the GSF module according to your state or local Design & Installation Manual. A hand tamper or vibratory compactor is sufficient to stabilize the Specified Sand below the GSF modules. Check the zero grade of the top of the Specified Sand using a flat piece of lumber and a carpenter's level and/or a laser before placing the modules.
6. After the GSF modules have been installed, carefully place backfill over the modules, followed by loam to complete a total minimum depth of 12 inches as measured from the top of the module. Backfill material shall be a well graded sandy fill; clean, porous, and devoid of rocks.

FIGURE 32: COMPLETE BACKFILL



12.0 Sampling Port Installation

7. Cap or place irrigation box over top of pipe. Mark so that service provider can find for sampling.
8. Divert surface runoff and finish grade to prevent surface ponding. Seed, loam, and protect from erosion.

13.0 Sampling Port Sampling

1. Sampling can be done in one day.
2. Ensure your sampling beaker or container is clean and ready to receive sample.
3. Uncap or open irrigation box.
4. Retrieve sample with clean suction device. We recommend using the suction device in a PVC tube that has holes in it, typically located a few inches from the bottom of the capped pipe or tube, so that any debris that has settled at the bottom of the sampler is not disturbed.
5. Cap or close irrigation box.
6. Return sample to lab for testing in a cool storage container.

14.0 Denitrification Configuration

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 to the carbon source.
- The Specified Sand supports nitrification of the effluent, which reduces oxygen demand in the soil, thus minimizing clogging from anaerobic bacteria.

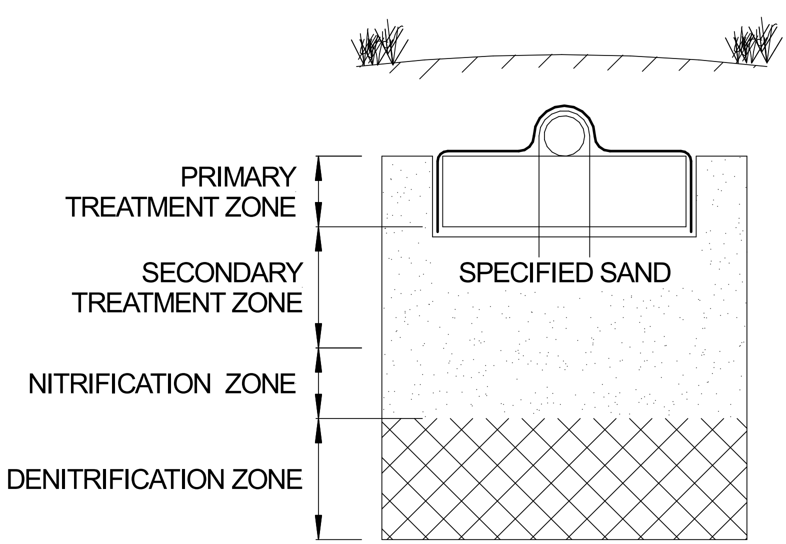
Nitrification Zone

- Nitrification continues from the secondary treatment zone. Additional sand exists in this area to promote 100% nitrification of the effluent.

Denitrification Zone

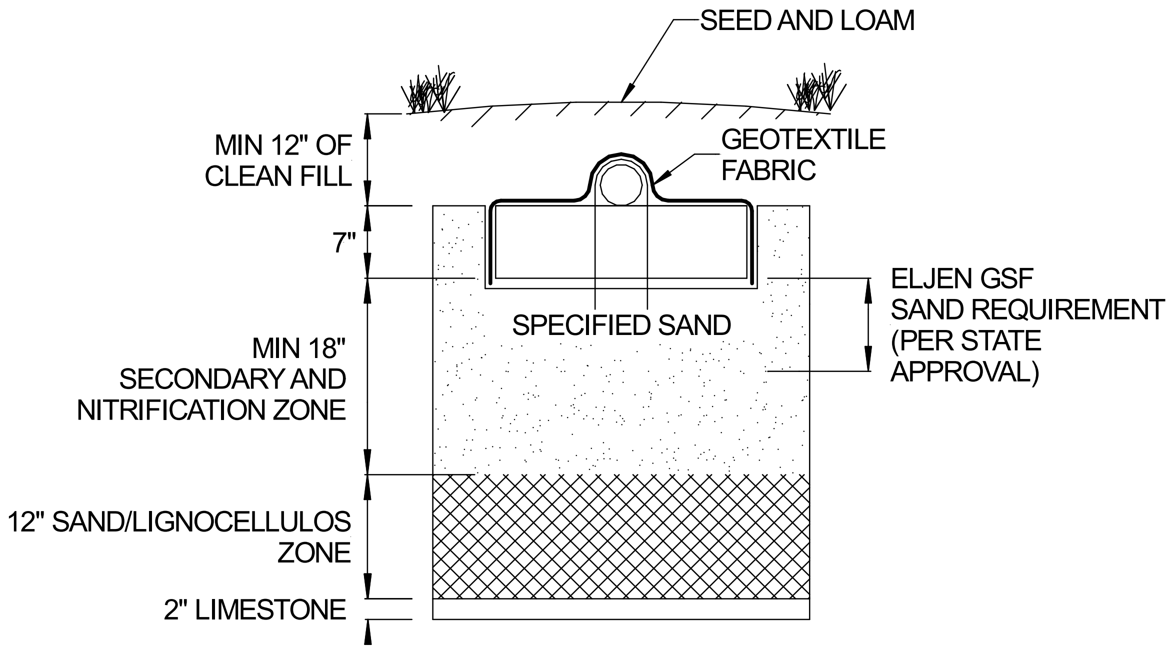
- Effluent infiltrates into the carbon source which has a slower percolation rate than the secondary treatment zone. This creates an anaerobic zone in the carbon rich environment.
- The effluent from the secondary zone is denitrified and passed over limestone rock to balance the pH prior to discharge.

FIGURE 33: GSF DENITRIFICATION SYSTEM OPERATION



14.1 Denitrification System Installation

FIGURE 34: TYPICAL DENITRIFICATION TRENCH CROSS SECTION



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.
- 18 inches of Specified Sand is directly below the GSF module.
- 12 inches of Sand/Lignocellulos Layer.
- 2 inches of Limestone Rock.
- 12 inches of cover above the module.

14.1.1 CONFIGURATIONS: The Denitrification system is installed in the same configurations as the Combined Treatment and Dispersal GSF systems referenced in Sections 1 through 13, but the system construction must comply with this section.

14.1.2 MODEL NUMBERS: The systems in this section reference Eljen's GSF Denitrification System Models, DN450, DN600, DN800, and DN1000. These model numbers reference the GSF in its Denitrification construction.

14.1 Denitrification System Installation

1. Carefully lay out all boundaries defining the location and elevation for all system components.

2. Prepare the site according to state and local regulations.

3. Plan all drainage requirements above (up-slope) the system and set soil grades to insure storm water drainage and surface water is diverted away from the absorption area once the system is complete.

4. Excavate the installation area.

5. Place a 2” level layer of limestone rock along the pea gravel bottom.

6. Mix wood chips (lignocellulos) and equal parts ASTM C33 sand outside of trench.
    a. Using the excavator bucket, take a bucket of wood chips and a bucket sand and place in a new pile.
    b. Mix the two together using the teeth of the bucket.
    c. Repeat until you have enough to build a 12” level layer.

7. Place and compact 12” level layer of wood chip and sand mixture on top of the limestone in 6” lifts. A hand tamper or a vibratory plate compactor is sufficient for compaction of the layer.

8. Place and compact a 18” level layer of ASTM C-33 sand in 6” lifts on top of the wood chip and sand mixture.

9. ASTM C-33 Sand must meet the requirements listed in the component section of this manual. Ask your material supplier for a sieve analysis report to verify that the sand you are going to install meets this specification. A hand tamper or a vibratory plate compactor is sufficient for compaction of the ASTM C-33 Sand layer.

10. Place the GSF modules in their rows with the white stripe up.

11. 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 positions.

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

13. Ensure each row is level.

14. Spread Eljen cover fabric lengthwise over the pipe and drape over the sides of the GSF module rows.

15. Secure in place with Specified Sand between and along the sides of the modules. Avoid blocking holes in perforated pipe by placing the cover fabric over the pipe prior to placing fill over the modules.

16. Place 6 inches minimum of Specified Sand along both sides of the modules. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each row.

17. Install effluent filter on outlet end of septic tank.

18. Complete backfill with topsoil, a minimum of 12 inches of cover over the GSF modules. Backfill exceeding 18 inches requires venting at the distal end of the system. Fill must be clean, porous and devoid of rocks. Do not use wheeled equipment over the system during backfill operation. A light track machine may be used with extreme caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff. Finish grade to prevent surface ponding. Use backfill material that is soil suitable for the growth of vegetation, and be seeded to control erosion.

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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