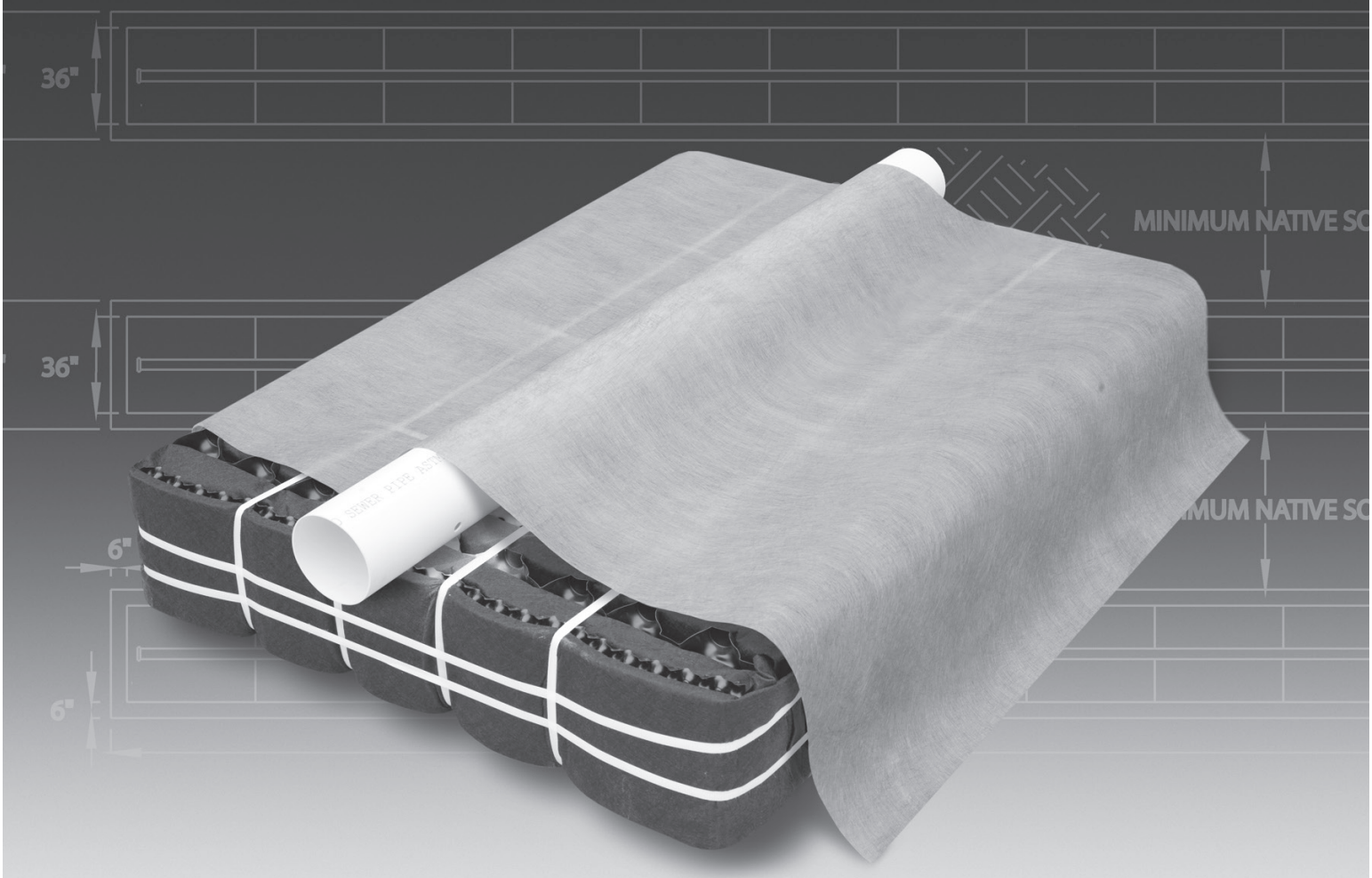
GSF®

Geotextile Sand Filter

Indiana
Design & Installation Manual



eljen CORPORATION

Innovative Environmental Products & Solutions Since 1970

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Glossary of Terms

A42 Module	48” x 24” x 7”(L x W x H)
B43 Module	48” x 36” x 7”(L x W x H)
B23 Module	24” x 36” x 7” (L x W x H) *Note:* B23 Half Modules are half the length of the standard B43 Module and are utilized to round up bed rows to equal length.
Bio-Matt™ fabric	Proprietary filter fabric within the Geotextile Sand Filter Modules upon which the primary biomat layer forms.
Cover Fabric	The geotextile cover fabric, provided by manufacturer, is placed over the GSF modules. This material cannot be substituted.
Cuspated Core	The rigid plastic core of the GSF module. It separates the geotextile fabric and creates downward infiltration channels and upward aeration channels to provide primary filtration and biological treatment of the septic effluent. The curvilinear shape of the cuspations offers increased treatment surface area and greater effluent storage.
Design Flow	The estimated peak flow that is used to size a GSF system is 150 gallons per day per bedroom.
Distribution Box	A plastic or concrete box that receives effluent from a septic tank and splits the flow to pipes placed above the GSF modules.
Flow Dial/Equalizer	Special insert placed in the outlet of the distribution pipes within the distribution box to compensate for possible un-level installation and promote favorable flow to the distribution pipes.
GSF System	The Eljen Geotextile Sand Filter Modules and the 6 to 12 inch sand layer at the base and 6 inches along the sides of the modules.
GSF Module	The individual module of a GSF system. The module is comprised of a cuspated plastic core and geotextile fabric.
LTAR	Long Term Acceptance Rate (LTAR) is the average equilibrium absorption rate for effluent in a system, usually expressed in gallons per day per square foot. It should not be confused with the soil loading rate that is used by regulatory officials in their regulations.
Sequential Distribution	Designs common to sloping sites where GSF lines that are laid on contour and receive effluent from a series of drop boxes at different elevations. Effluent floods up-slope lines and then spills excess effluent to down-slope lines. Non-perforated pipe placed on undisturbed soil connects successive down-slope trenches. Eljen recommends sequential distribution utilizing drop boxes on sloped sites.
SHWT	Seasonal High Water Table (SHWT) is the upper limit of soil saturated with water for periods long enough for anaerobic conditions to affect soil color.

Glossary of Terms

Specified Sand

To ensure proper system operation, the system MUST be installed using Indiana State Highway Specification 23 sand AND must be used in accordance with ISDH Rule 410 IAC 6-8.3 (80)(j). Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

TABLE 1: SPECIFIED SAND SIEVE REQUIREMENTS

INDIANA STATE HIGHWAY SPECIFICATION 23 SAND		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
3/8 inch	9.5 mm	100
No. 4	4.75 mm	95 - 100
No. 8	2.36 mm	80 - 100
No. 16	1.18 mm	50 - 85
No. 30	600 µm	25 - 60
No. 50	300 µm	5 - 30
No. 100	150 µm	0 - 10
No. 200	75 µm	0 - 3

*Note: The fine aggregate shall not have more than forty-five percent (45%) retained between any two (2) consecutive sieves. Aggregate which meets Indiana State Highway Specification 23 meets these criteria.

STE

Septic Tank Effluent (STE)

Width & Length

The system width is the sand dimension perpendicular to the GSF module rows. The system length is measured parallel to the rows of GSF modules.

Wire Clamp

Wire Clamps are used to secure perforated pipe above the GSF modules.

GSF System Description

The Eljen GSF Geotextile Sand Filter system is a cost-effective upgrade from other septic treatment technologies. Comprised of a proprietary two-stage Bio-Matt™ pre-treatment process, the geotextile modules apply filtered septic tank effluent to the soil, increasing the soil's ability to accept the effluent and increase the long term acceptance rate (LTAR). The result is a superior performance in a smaller soil absorption area.

How the GSF System Works

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 slowly 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

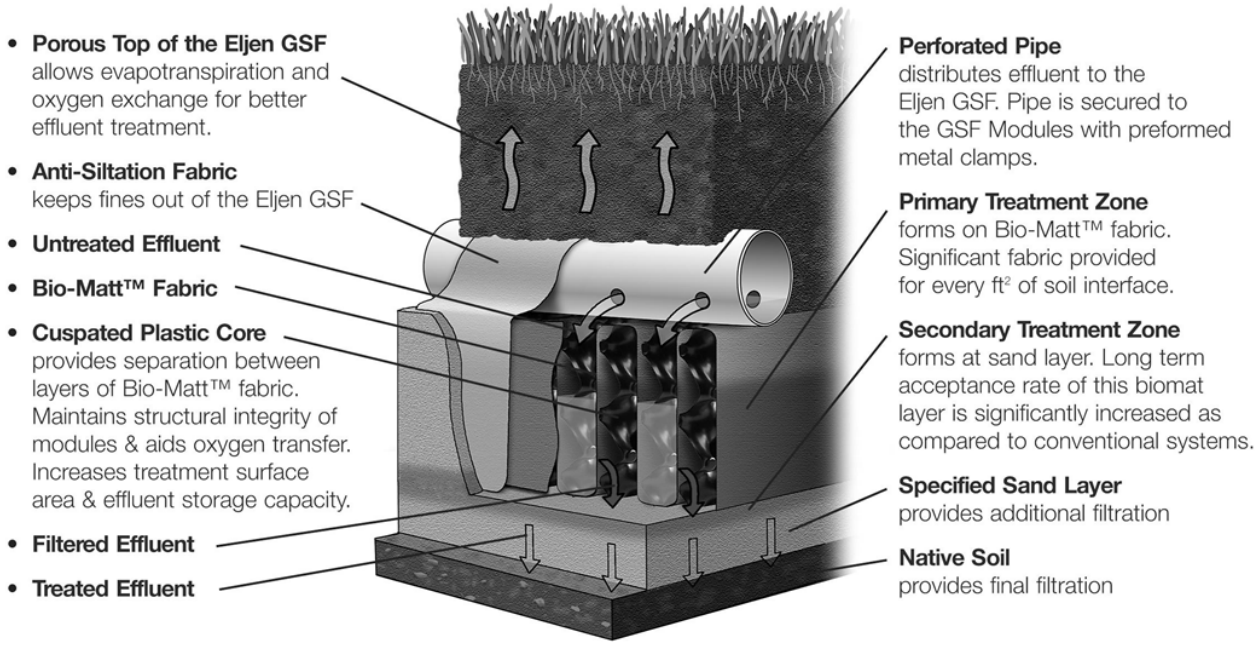


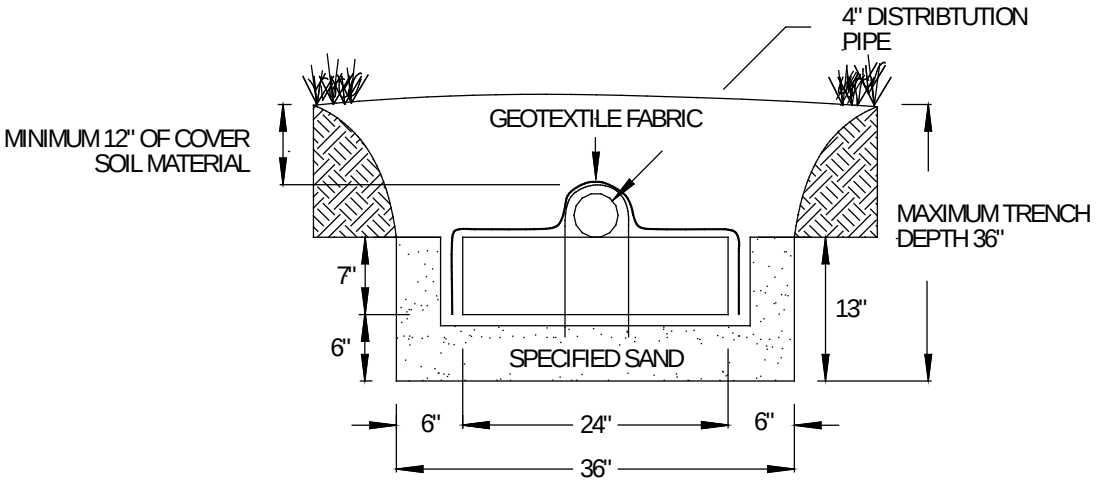
TABLE 2: SUBSURFACE SOIL LOADING RATES

Table IV - Soil Loading Rates for Subsurface Trench and Bed Onsite Sewage Systems (in gpd/ft^2)								
SOIL STRUCTURE CLASSES								
SOIL TEXTURE CLASSES	Single Grain	Granular	Strong: Angular, Sub-Angular Blocky, Prismatic	Moderate: Angular, Sub-Angular Blocky, Prismatic	Weak: Angular, Sub-Angular Blocky, Prismatic; Platy[1]	Fragic Characteristics: Very Coarse Prismatic	Structureless, Massive, Friable, V. Friable	Structureless, Massive, Compact, Firm, V. Firm; Platy[2]
Gravel, Coarse Sand	>1.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Loamy Coarse Sand, Medium Sand	1.20	1.20	N/A	N/A	1.20	N/A	N/A	N/A
Fine Sand, Loamy Sand, Loamy Fine Sand	0.75	0.60	N/A	0.75	0.75	N/A	0.75	N/A
Very Fine Sand, Loamy V. Fine Sand	0.50	0.50	N/A	0.75	0.60	N/A	0.60	N/A
Sandy Loam, Coarse Sandy Loam	N/A	0.75	N/A	0.60	0.60	0.00	0.60	0.00
Fine Sandy Loam, V. Fine Sandy Loam	N/A	0.75	N/A	0.60	0.60	0.00	0.60	0.00
Loam	N/A	0.75	0.75	0.50	0.50	0.00	0.50	0.00
Silt Loam, Silt	N/A	0.75	0.75	0.50	0.30	0.00	0.30	0.00
Sandy Clay Loam	N/A	0.60	0.60	0.50	0.30	0.00	0.30	0.00
Silty Clay Loam, Clay Loam, Sandy Clay	N/A	0.60	0.60	0.30	0.25	0.00	0.25	0.00
Silty Clay, Clay	N/A	0.60	0.50	0.30	0.25	N/A	0.25	0.00
Organic Soil Materials	N/A	N/A	N/A	N/A	N/A	N/A	0.00	N/A
Limnic Soil Materials	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00
Bedrock	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A NOT APPLICABLE								
[1]Naturally occurring platy structure.								
[2]Platy structure caused by mechanical compaction has a soil loading rate of 0.00 gpd/ft^2 unless broken up by methods approved by the department.								

TABLE 3: ABOVE GROUND SOIL LOADING RATES

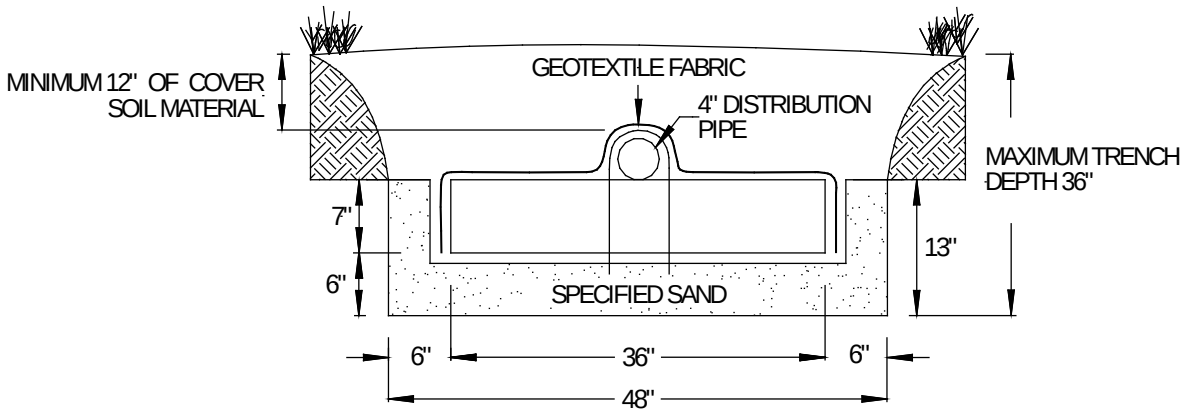
Table V – Soil Loading Rates for Elevated Sand Mound Onsite Sewage Systems (in gpd/ft^2)								
	SOIL STRUCTURE CLASSES							
SOIL TEXTURE CLASSES	Single Grain	Granular	Strong: Angular, Sub-Angular Blocky, Prismatic	Moderate: Angular, Sub-Angular Blocky, Prismatic	Weak: Angular, Sub-Angular Blocky, Prismatic; Platy[1]	Fragic Characteristics: Very Coarse Prismatic	Structureless, Massive, Friable, V. Friable	Structureless, Massive, Compact, Firm, V. Firm; Platy[2]
Gravel, Coarse Sand	>1.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Loamy Coarse Sand, Medium Sand	1.20	1.20	N/A	N/A	1.20	N/A	N/A	N/A
Fine Sand, Loamy Sand, Loamy Fine Sand	0.60	0.60	N/A	0.60	0.60	N/A	0.60	N/A
Very Fine Sand, Loamy V. Fine Sand	0.50	0.50	N/A	0.50	0.50	N/A	0.50	N/A
Sandy Loam, Coarse Sandy Loam	N/A	0.60	N/A	0.60	0.60	0.00	0.60	0.00
Fine Sandy Loam, V. Fine Sandy Loam	N/A	0.60	N/A	0.60	0.60	0.00	0.60	0.00
Loam	N/A	0.50	0.50	0.50	0.50	0.00	0.50	0.00
Silt Loam, Silt	N/A	0.50	0.50	0.50	0.50	0.00	0.50	0.00
Sandy Clay Loam	N/A	0.50	0.50	0.50	0.50	0.00	0.50	0.00
Silty Clay Loam, Clay Loam, Sandy Clay	N/A	0.25	0.25	0.25	0.25	0.00	0.25	0.00
Silty Clay, Clay	N/A	0.25	0.25	0.25	0.25	N/A	0.25	0.00
Organic Soil Materials	N/A	N/A	N/A	N/A	N/A	N/A	0.00	N/A
Limnic Soil Materials	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00
Bedrock	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A NOT APPLICABLE								
[1] Naturally occurring platy structure.								
[2] Platy structure caused by compaction has a soil loading rate of 0.00 gpd/ft^2 unless broken up by methods approved by the department.								

FIGURE 2: A42 TRENCH CROSS SECTION



6 inches of Specified Sand is required at the sides of the GSF module
6 inches of Specified Sand is required at the beginning and end of each GSF Trench.
6 inches of Specified Sand is required directly below the GSF module.
Minimum 12 inches of native soil fill above the 4-inch distribution pipe.

FIGURE 3: B43 SINGLE LATERAL BED CROSS SECTION



6 inches of Specified Sand is required at the sides of the GSF module
6 inches of Specified Sand is required at the beginning and end of each GSF row.
6 inches of Specified Sand is required directly below the GSF module.
Minimum 12 inches of native soil fill above the 4-inch distribution pipe.

1.0 Design and Installation

1.1 REQUIREMENTS: GSF systems must meet ISDH Rule 410 IAC 6-8.3 except as outlined in this manual. The Eljen GSF Indiana Design and Installation Manual and the local regulations will be referred to as the *Code or Regulations* in this manual.

- The sizing tables in this manual (Table 5 and 6) applies to residential systems of any size and
- Commercial systems with daily design flows less than or equal to 750 GPD

Sizing examples are found in Sections 2 through 4 of this manual. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems..

1.2 SUITABLE SITE AND SOIL CONDITIONS: The Eljen Modules maybe designed for all sites that meet the criteria described in the Indiana State Department of Health, Residential Onsite Sewage Systems, Rule 410 IAC 6-8.3 (70-73).

1.3 VERTICAL SEPARATION TO SEASONAL HIGH WATER TABLE OR LIMITING LAYER: When measuring to restrictive layers, measure from the bottom of the sand/soil interface to the restrictive layer. Subsurface Systems with design flows less than 450 gpd must be 24 inches from the SHWT or Limiting Layer. Systems with 450 gpd or more design flows shall be at least 30 inches above the SHWT or Limiting Layer. Elevated Mounds require a 20 inch separation distance. All pressure and flood dosed systems require 24 inches of separation regardless of flow.

1.4 MINIMUM DEPTH FROM EXISTING GRADE FOR SUBSURFACE SYSTEMS: The minimum depth from existing grade for subsurface systems is 10 inches. That is the start of the sand/soil interface for the system.

1.5 SPECIFIED SAND REQUIREMENTS FOR SYSTEMS: The first 6 inches of sand immediately under, between rows and around the perimeter of the GSF system must be ***INDIANA DEPARTMENT OF TRANSPORTATION (INDOT) SPECIFICATION 23 SAND.*** Please place a prominent note to this effect on each design drawing. See Table 1 for more information on the sand and sieve specifications.

1.6 CONNECTIONS AND FITTINGS: Connections of lines to tanks and distribution boxes must follow requirements of 410 IAC 6-8.3.

1.7 PLACING GSF MODULES: Each row of modules is laid level, end to end on the Specified Sand layer. No mechanical connection is required between modules. For effective effluent distribution lengthier, leaner systems are recommended. For systems on slopes > 0.5% shift modules upslope in order to effectively utilize entire basal area, see section 1.26 for more details.

1.8 DISTRIBUTION PIPE: Place perforated pipe on top of GSF modules with holes at 4 and 8 o'clock. Secure pipe to GSF modules with provided wire clamps, one clamp per Eljen module. All distribution piping must meet the requirements of ISDH Rule 410 6-8.3 Section 66.

1.9 DISTRIBUTION BOX (D-BOX): Set the gravity system distribution box outlet invert a minimum of 1 inch drop in elevation per 100 linear feet to the top first module in the row. Set a 2-inch minimum drop for flood and pressure dosed systems from the D- box to the modules. Ensure that the distribution box and pipes feeding the system are placed in accordance with 410 IAC 6-8.3. Flow Dials may be used in either gravity or flood dosed installations.

1.10 COVER FABRIC: Geotextile cover fabric is provided by Eljen Corporation for all GSF systems. **Cover fabric substitution is not allowed.** Place the cover fabric over the system after setting the distribution pipes in place and secured with wire clamps. Fabric should drape vertically over the pipe and extend to the bottom of the modules on either side. The fabric must neither block holes nor be stretched from the top of the module. "Tenting" i.e. pulling the fabric tight will cause undue stress on fabric and pipe. Geotextile Cover Fabric prevents fines and backfill material from entering the GSF system.

1.11 SEQUENTIAL DISTRIBUTION: Sequential Distribution using a distribution box will fully utilize the uppermost section of the system prior to spilling effluent into a lower row of modules. Contact the Eljen Technical Resource Department with sequential distribution design information and inquiries.

1.12 BACKFILL & FINISH GRADING: Complete backfill with a minimum of 12 inches of cover soil material measured from the top of the distribution pipe. Ensure backfill does not exceed 19 inches from the top of the module. The maximum depth from the original grade to the bottom of the system sand is 36 inches. If system cover exceeds 18 inches; vent the far end of the system. 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 area. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

1.13 NUMBER OF GSF MODULES REQUIRED: Tables 5 and 6 of this manual indicate the minimum number of A42 or B43 modules allowed. Systems can always be designed with more if needed. The minimum design requirements per 150 gpd are 6 A42 modules or 5 B43 modules. Refer to section 1.28 for more details.

1.14 MAXIMUM TRENCH/ROW LENGTH: Trenches and Rows will have a maximum of 100 ft in length unless pressure dosed per 410 IAC 6-8.3 (74) (r).

1.15 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.

1.16 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

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

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

1.19 EQUAL LENGTH: Trenches must be of equal length in order to provide equal distribution.

1.20 WATER SOFTENER BACKWASH: At no time should water softener backwash be disposed of in the septic system. Water softener backwash should be discharged to a separate soil absorption field meeting all required codes and regulations.

1.21 SPACING GUIDANCE BETWEEN TRENCHES AND SINGLE LATERAL ROWS: Ensure trenches are of equal length throughout the system. If using the B43 in a single lateral bed system, ensure there is center to center distance of 10 feet and 7.5 feet center to center distance for the A42 in a trench.

1.22 SYSTEM LENGTH AND WIDTH: Best engineering practices should be used when construction the bed systems. Rule IAC 6-8.3 (79) (2) states the dimensions of the bed shall be as long and narrow as the site allows.

1.23 DISPERSAL AREA: Refer to IAC 6-8.3 (58) when the soil loading rate used to determine the size of the soil absorption system is five-tenths (0.5) gallons per day per square foot (gpd/ft2) or less; or there is a horizon in the upper sixty (60) inches of the profile description with bedrock; densic material; dense till; layers transitional to dense till (horizons in a soil developed from Wisconsin glacial till that shows effervescence when treated with a ten percent (10%) hydrochloric acid solution); or soil with fragic soil properties.

1.24 SITE PREPARATION: Refer to IAC 6-8.3 for all site preparation requirements prior to site construction.

1.25 SAND EXTENSION: For bed systems on slopes between the grades of 0.5% and 10%, a minimum extension of 3.5 feet of INDOT 23 sand is required after the unit furthest downslope. For slopes greater than 10%, a minimum extension of 5.5 feet is required after the unit furthest downslope.

1.26 BED GUIDANCE: For beds with less than a 0.5% slope, evenly distribute the bed laterals in the absorption area. For all slopes greater than 0.5%, Eljen recommends moving the upper most lateral a distance of 1.5' to 2' from the upper edge of the absorption area while maintain a minimum of 6 inches between the module and the upper edge of the absorption area. For loading rates greater than 0.3 gpd/ft^2, a minimum separation distance between laterals for A42's is 3' and a minimum separation distance between laterals of 4' for B43's. For loading rates of 0.3 gpd/ft^2 and less, you should have a distance between laterals of 3' for A42 and 4' for B43's.

The overall goal is keep the distribution laterals upslope, while maintaining a minimum of one foot in between the units. Designers may extend the lateral separation depending on their design.

TABLE 4: BED GUIDANCE DECISION TABLE

<table>
<tr><th rowspan="2">Slope</th><th rowspan="2">Soil Loading Rate</th><th colspan="2">Upper Edge to Lateral Spacing</th><th colspan="2">Lateral to Lateral Spacing</th><th rowspan="2">Example</th></tr>
<tr><th>A42</th><th>B43</th><th>A42</th><th>B43</th></tr>
<tr><td rowspan="2">Less than or Equal to 0.5%</td><td>Greater than 0.3</td><td colspan="2" rowspan="2">Lateral to Lateral Spacing ÷ 2</td><td colspan="2" rowspan="2">Absorbtion Bed width divided by number of rows</td><td rowspan="2">2</td></tr>
<tr><td>0.3 or less</td></tr>
<tr><td rowspan="2">Greater 0.5%</td><td>Greater than 0.3</td><td rowspan="2">1.5 ft</td><td rowspan="2">2 ft</td><td rowspan="2">3 Ft</td><td rowspan="2">4 ft</td><td>3</td></tr>
<tr><td>0.3 or less</td><td>4</td></tr>
</table>

1.27 ELEVATED BED GUIDANCE: For all elevated beds, a required 12 inches of sand shall be below the units, with 3:1 slopes. Sand shall go to the top edge of the unit. A minimum of 12 inches of cover is required over the pipe. Sloping sites shall meet the guidance in section 1.25 and shall not be place on slopes greater than 6%.

1.0 Design and Installation

1.28 SIZING GSF SYSTEMS:

TABLE 5: GSF TRENCH OF SINGLE LATERAL BED SIZING CHART

Soil Loading Rate (gpd/sf)	Required Area of Absorption Field (Square Feet)			A42 Modules per House			B43 Modules per House		
	Bedrooms per House			Bedrooms per House			Bedrooms per House		
	3	4	5	3	4	5	3	4	5
1.2	216	288	360	18	24	30	15	20	25
0.75	300	400	500	25	34	42	19	25	32
0.6	375	500	625	32	42	53	24	32	40
0.5	450	600	750	38	50	63	29	38	47
0.3	1005	1340	1675	84	112	140	63	84	105
0.25	1206	1608	2010	101	134	168	76	101	126

Notes:

1. Number of GSF Modules have been adjusted to reflect the following:
   - 50% reduction in absorption field area for soil loading rates of 0.5 gpd/ft^2 or greater in accordance with Rule 410 IAC 6-8.3 (52) (h).
   - 33% reduction in absorption field area for soil loading rates less than 0.5 gpd/ft^2 in accordance with Rule 410 IAC 6-8.3 (52) (h).
2. Any jetted bath tub with a capacity greater than 125 gallons will be treated as an extra bedroom for the system sizing requirements per Rule 410 IAC 6-8.3.
3. A42 Modules have an effective area of 12 ft^2/mod. B43 Modules have an effective area of 16 ft^2/mod.

TABLE 6: GSF BED SIZING CHART

Soil Loading Rate (gpd/sf)	Required Area of Bed (Square Feet)			A42 Modules per Room	B43 Modules per Room
	Bedrooms per House				
	3	4	5		
1.2	216	288	360	6	5
0.75	300	400	500	8	7
0.6	375	500	625	9	8
0.5	450	600	750	11	9
0.3	1005	1340	1675	12	10
0.25	1206	1608	2010	13	11

Notes:

1. Number of GSF Modules have been adjusted to reflect the following:
   - 50% reduction in bed area for soil loading rates of 0.5 gpd/ft^2 or greater in accordance with Rule 410 IAC 6-8.3 (52) (h).
   - 33% reduction in bed area for soil loading rates less than 0.5 gpd/ft^2 in accordance with Rule 410 IAC 6-8.3 (52) (h).
2. Any jetted bath tub with a capacity greater than 125 gallons will be treated as an extra bedroom for the system sizing requirements per Rule 410 IAC 6-8.3.

2.0 Trench and Single Lateral Bed Installation Guidelines

Additional guidance located in Rule 410 IAC 6-8.3	
Methods of Distribution	Gravity, flood dosed and pressure dosed are acceptable for distribution in trenches.
Determine the Number Modules	Determine the number of GSF Modules required from Table 5 of this manual.
Plan all Drainage Requirements	Plan all drainage requirements above (up-slope) of the system or on all sides of system if it has a 2% slope or less. Set soil grades to ensure that storm water drainage and surface water is diverted away from the absorption area once the system is complete. All drainage requirements shall be in accordance with 410 IAC 6-8.3 (59).
Excavating the Trench Area	Scarify the receiving layer to maximize interface between the native soil and Specified Sand. Minimize walking in the trench prior to placement of the Specified Sand to avoid soil compaction.
Placing Specified Sand Base	Place a minimum of 6 inches of Specified Sand in the basal area and stabilize.
Place GSF Modules	Place the GSF Modules, ***PAINTED STRIPE FACING UP***, end to end, on top of the Specified Sand along their 4-foot length.
Distribution Pipes for Gravity & Flood Dosed Systems	A standard 4-inch SDR perforated pipe, meeting 410 IAC 6-8.3 (67), is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module. Refer to Section 1.8 of this manual for pipe specifications.
Distribution Pipes for Pressure Systems	A standard 4-inch SDR 35 perforated pipe, which meets 410 IAC 6-8.3 (67), is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position. Insert a 1.5 inch pressure pipe into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 18. Each pressure lateral will have one drain hole at the 6 o'clock position at the distal end of the pipe. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.
Place Geotextile Cover Fabric	***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: • 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. • Place multiple shovel-full 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.
Placing Specified Sand after Cover Fabric is in place	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.
Backfilling the System	Complete backfill with cover soil material to a minimum of 12 – 19 inches measured from the top of the 4-inch distribution pipe. Fill must be clean, porous and able to sustain vegetation. 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. Topsoil and seed to protect from erosion.

2.1 Single Lateral Bed System Design Example

Example 1: Single Lateral Bed System – B43 Modules

House size:	3 bedrooms
Soil Loading Rate:	0.3 gpd/ft^2
Design Flow: 150 gpd x 3 bedrooms =	450 gpd

Refer to Table 2 for the soil loading rate, and then refer to Table 5 for the minimum number of units and minimum sized footprint required for installation.

Modules Needed:	63 B43 Modules
Minimum Footprint:	1005 ft^2

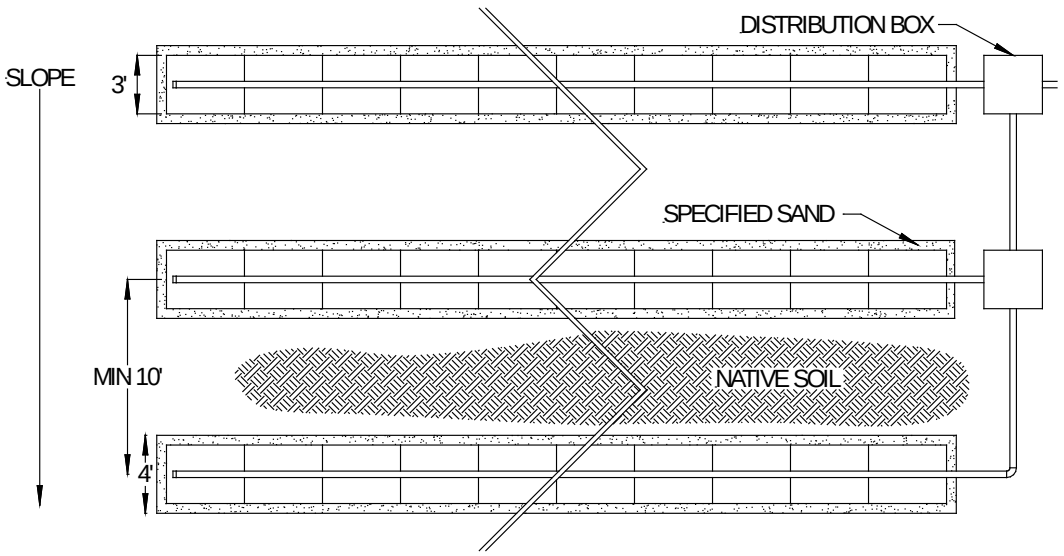
For This Example Assume the Number of Rows Equals Three:

Row Width: Module width (3 ft) + Sand Sidewalls (6" + 6") =	4 ft
Row Length: 63 modules ÷ 3 rows =	21 modules per row
Modules (21) x 4 lf/module + 1 ft (6" sand at each end of row) =	85 ft
System area (width x length): 4 ft x 85 ft x 3 rows =	1020 ft^2

Bed Dimensions:

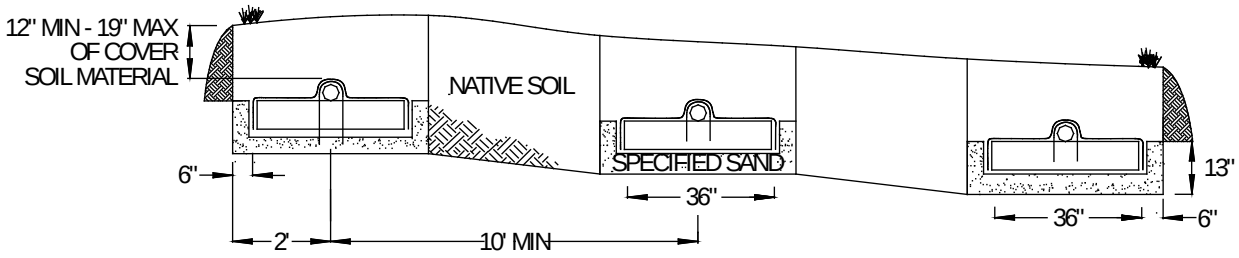
Length =	85 ft/row
Width =	4 ft
Rows =	3
Modules =	63 B43
Total Area =	1020 ft^2

FIGURE 4: PLAN VIEW – 450 GPD – B43 –SINGLE LATERAL BED SYSTEM – SLOPING SITE



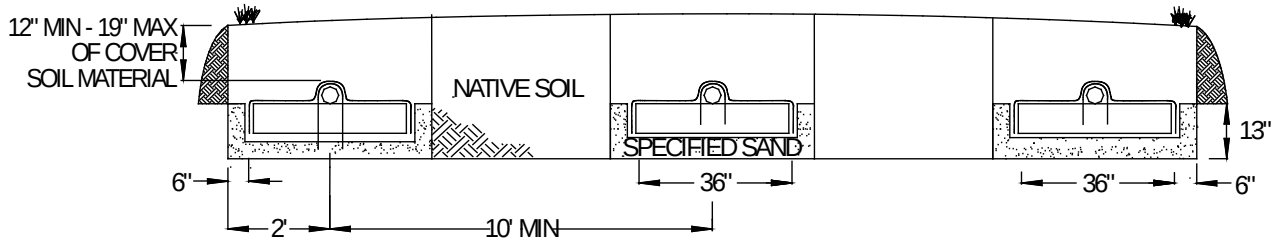
2.1 Single Lateral Bed System Design Example

FIGURE 5: SECTION VIEW – B43 – SINGLE LATERAL BED SYSTEM – SLOPING SITE



Loading Rate 0.3 gpd/ft^2, Design Flow 150 gpd x 3 Bedrooms = 450 gallons per day.
(21 Modules per Row)

FIGURE 6: SECTION VIEW – B43 – SINGLE LATERAL BED SYSTEM – LEVEL SITE



Loading Rate 0.3 gpd/ft^2, Design Flow 150 gpd x 3 Bedrooms = 450 gallons per day.
(21 Modules per Row)

3.0 Subsurface Bed Installation Guidelines

Additional guidance Rule 410 IAC 6-8.3	
Method of Distribution	Gravity, flood dosed and pressure distribution are acceptable for distribution in beds.
Determine the Number Modules	Determine the number of GSF Modules required from Table 6 of this manual.
Plan all Drainage Requirements	Set soil grades to ensure that storm water drainage and surface water is diverted away from the absorption area once the system is complete. All drainage requirements should be in accordance with 410 IAC 6-8.3 (59).
Excavating the Bed Area	Scarify the receiving layer to maximize interface between the native soil and Specified Sand. Minimize walking in the bed prior to placement of the Specified Sand to avoid soil compaction.
Placing Specified Sand Base	Place 6 inches of Specified Sand in the basal area. The sand height below the GSF module must be level at 6 inches.
Place GSF Modules	***PAINTED STRIPE FACING UP***, end to end on top of the Specified Sand along their 4-foot length.
Distribution Pipes for Gravity & Flood Dosed Systems	A standard 4-inch perforated pipe, SDR 35 or equivalent which meets 410 IAC 6-8.3 (67), is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module. Section 1.8 of this manual has more information on pipe selection.
Distribution Pipes for Pressure Systems	A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8o'clock position. Insert a 1.5 inch pressure pipe which meets 410 IAC 6-8.3 (67), into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 18. Each pressure lateral will have a drain hole at the distal end of the pipe at the 6 o'clock position. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module. Section 1.8 of this manual has more information on pipe selection.
Place Geotextile Cover Fabric	***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: • 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. • Place shovel full 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.
Placing Specified Sand after Cover Fabric is in place	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.
Backfilling the System	Complete backfill with cover soil material to a minimum of 12 - 19 inches measured from the top of the 4-inch distribution pipe. Fill must be clean, porous and able to sustain vegetation. 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. Topsoil and seed to protect from erosion.

3.1 Subsurface Bed Design Examples

Example 2: Bed System – A42 Modules – 0.0 – 0.5% Slope

House size:	4 bedrooms
Soil Loading Rate:	0.3 gpd/ft^2
Design Flow – 150 gpd x 4 bedrooms =	600 gpd

Refer to Table 3 for the soil loading rate, and then refer to Table 6 for the minimum number of units and minimum sized footprint required for installation.

Minimum Number of Units per Bedroom Required –	12 A42 Modules
Minimum Number of Units: Bedrooms x Min Number: 4 x 12 A42	48 A42 Modules
Minimum Footprint:	1340 ft^2

For This Example Assume the Number of Bed Rows Equals Two:

Required Bed Length:

Modules per Row: Modules Needed ÷ Rows = 48 Modules ÷ 2 Rows	24 Modules per Row
Length of System: Number of Modules x 4 ft +1 ft (6 inches of sand on the ends)	
24 Modules x 4 ft + 1 ft =	97 ft

Required Bed Width:

Minimum Bed Width: 2 Rows x 3 ft (3ft for the unit + 6 inches of sand on the sides)	6 ft
Proposed Bed Width: Minimum Footprint ÷ Length of System: 1340 ft^2 ÷ 97 ft	13.8 ft, round to 14 ft
The Proposed Bed Width was less than the Minimum Bed Width, use the	14 ft

Determine Module Spacing:

Bed Width ÷ Rows = 14 ft ÷ 2 = Center to Center Row Spacing	7 ft
Center to Center Row Spacing ÷ 2 = 7 ÷ 2 = Edge to Center Row Spacing	3.5 ft

Determine Bed Area:

Bed Length x Bed Width = 97 ft x 14 ft	1358 ft^2

Bed Dimensions:

Bed Length =	97 ft
Bed Width =	14 ft
Center to Center Spacing =	7 ft
Edge to Center Spacing =	3.5 ft
Total Area =	1358 ft^2

FIGURE 7: PLAN VIEW – 600GPD – A42 – BED SYSTEM – LEVEL SITE

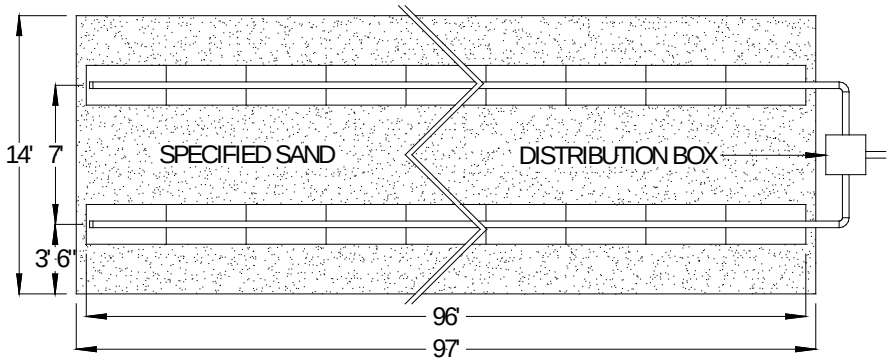
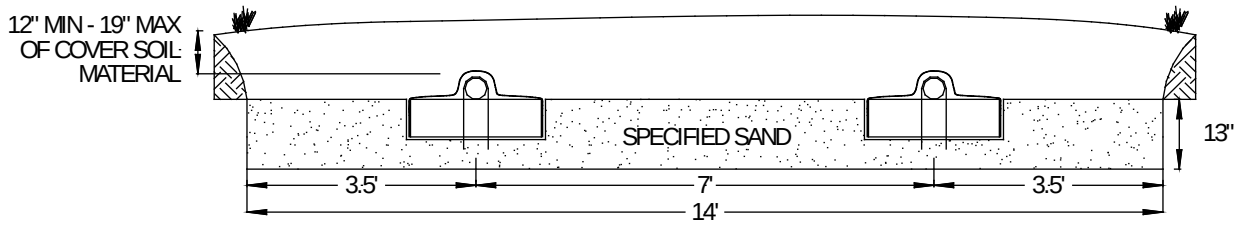


FIGURE 8: CROSS SECTION VIEW – 600 GPD – A42 – BED SYSTEM – LEVEL SITE



3.1 Subsurface Bed Design Examples

Example 3: Bed System – A42 Modules – Greater than 0.5% slope – Greater than 0.3 gpd/sf loading rate

House size –	3 bedrooms
Soil Loading Rate –	0.75 gpd/ft^2
Design Flow – 150 gpd x 3 bedrooms =	450 gpd
Slope -	11%

Refer to Table 3 for the soil loading rate, and then refer to Table 6 for the minimum number of units and minimum sized footprint required for installation.

Minimum Number of Units per Bedroom Required –	8 A42 Modules
Minimum Number of Units: Bedrooms x Min Number: 3 x 8 A42	24 A42 Modules
Minimum Footprint –	300 ft^2

For This Example Assume the Number of Bed Rows Equals Two:

Required Bed Length:

Modules per Row = Modules Needed ÷ Rows = 24 Modules ÷ 2 Rows	12 Modules
Length of System = Number of Modules x 4 ft +1 ft (6 inches of sand on the ends)	
12 Modules x 4 ft + 1 ft =	49 ft

Required Bed Width:

Minimum Bed Width: 2 Rows x 3 ft (2 ft for the unit + 6 inches of sand on the sides)	6 ft
Proposed Bed Width: Minimum Footprint ÷ Length of System: 300 ft^2 ÷ 49 ft	6.1 ft, round to 6.5 ft
In this case, use the proposed bed width to achieve a full sized basal area	6.5 ft

Determine Module Spacing:

Refer to section 1.26 for lateral spacing on sloping sites	
Upper edge to Lateral spacing A42	1.5 ft
Lateral to Lateral spacing A42	3 ft
Lateral to Lower Edge = Bed Width – Upper edge to Lateral Spacing – Lateral to Lateral Spacing	
6.5 ft – 1.5 ft – 3 ft =	2 ft

Determine Bed Area:

Bed Length x Bed Width = 49 ft x 6.5 ft	318.5 ft^2

Bed Dimensions:

Bed Length =	49 ft
Bed Width =	6.5 ft
Upper edge to Lateral Spacing	1.5 ft
Lateral to Lateral Spacing	3 ft
Lateral to Lower Edge Spacing	2 ft
Total Area	318.5 ft^2

Note: For systems with 0.5% to 10% slope, the system shall have a minimum 3.5 feet of INDOT 23 sand downslope from the last module row, measured from the edge of the unit. For slopes 10% to 15%, a minimum of 5.5 feet of sand is required from the edge of the unit in the downslope row.

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

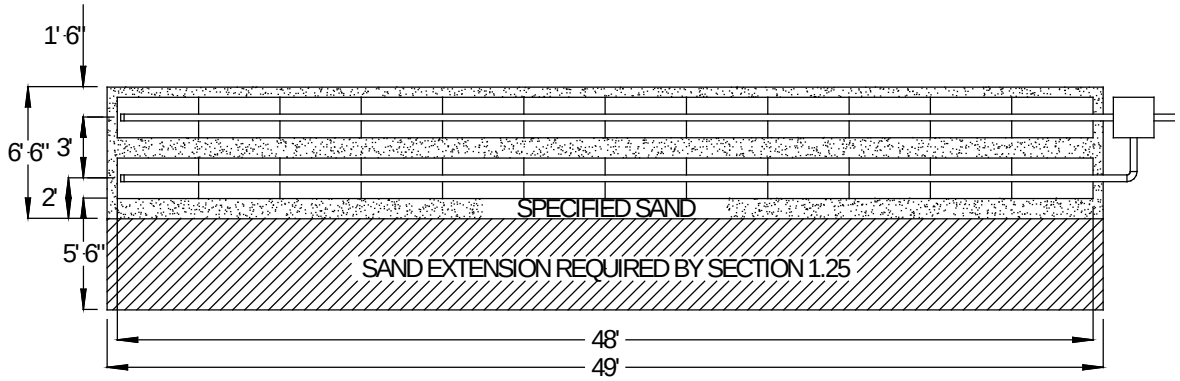
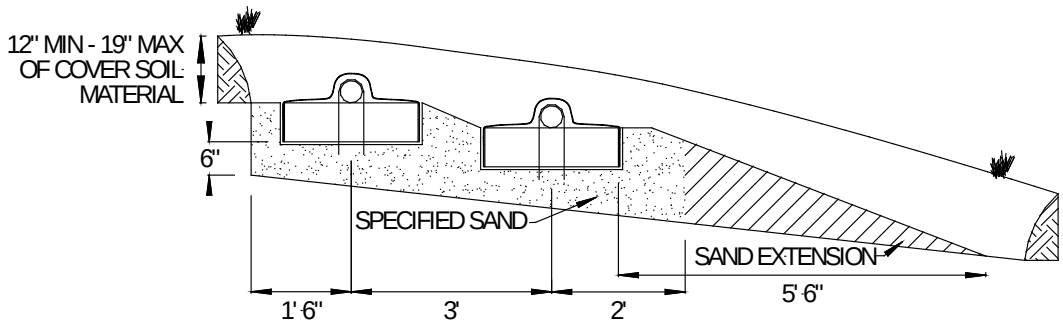


FIGURE 10: CROSS SECTION VIEW – 450 GPD – A42 – BED SYSTEM – SLOPING SITE



3.1 Subsurface Bed Design Examples

Example 4: Bed System – B43 Modules – Greater than 0.5% slope – Less than or equal to 0.3 gpd/sf loading rate

House size –	3 bedrooms
Soil Loading Rate –	0.3 gpd/ft^2
Design Flow – 150 gpd x 3 bedrooms =	450 gpd
Slope –	7%

Refer to Table 3 for the soil loading rate, and then refer to Table 6 for the minimum number of units and minimum sized footprint required for installation.

Minimum Number of Units per Bedroom Required –	10 B43 Modules
Minimum Number of Units: Bedrooms x Min Number: 3 x 10 B43	30 B43 Modules
Minimum Footprint –	1005 ft^2

For This Example Assume the Number of Bed Rows Equals Two:

Required Bed Length:

Modules per Row = Modules Needed ÷ Rows = 30 Modules ÷ 2 Rows	15 Modules
Length of System = Number of Modules x 4 ft +1 ft (6 inches of sand on the ends)	
15 Modules x 4 ft + 1 ft =	61 ft

Required Bed Width:

Minimum Bed Width: 2 Rows x 4 ft (3 ft for the unit + 6 inches of sand on the sides)	8 ft
Proposed Bed Width: Minimum Footprint ÷ Length of System: 1005 ft^2 ÷ 61 ft	16.5 ft
In this case, use the proposed bed width to achieve a full sized basal area	16.5 ft

Determine Module Spacing:

Refer to section 1.26 for lateral spacing on sloping sites	
Upper edge to Lateral spacing B43	2 ft
Lateral to Lateral spacing B43	4 ft
Lateral to Lower Edge = Bed Width – Upper edge to Lateral Spacing – Lateral to Lateral Spacing	
16.5 ft – 2 ft – 4 ft =	10.5 ft

Determine Bed Area:

Bed Length x Bed Width = 61 ft x 16.5 ft	1006.5 f

Bed Dimensions:

Bed Length =	61 ft
Bed Width =	16.5 ft
Upper edge to Lateral Spacing	2 ft
Lateral to Lateral Spacing	4 ft
Lateral to Lower Edge Spacing	10.5 ft
Total Area	1006.5 ft^2

Note: For systems with 0.5% to 10% slope, the system shall have a minimum 3.5 feet of INDOT 23 sand downslope from the last module row, measured from the edge of the unit. For slopes 10% to 15%, a minimum of 5.5 feet of sand is required from the edge of the unit in the downslope row.

FIGURE 11: PLAN VIEW – 450 GPD – B43 – BED SYSTEM – SLOPING SITE

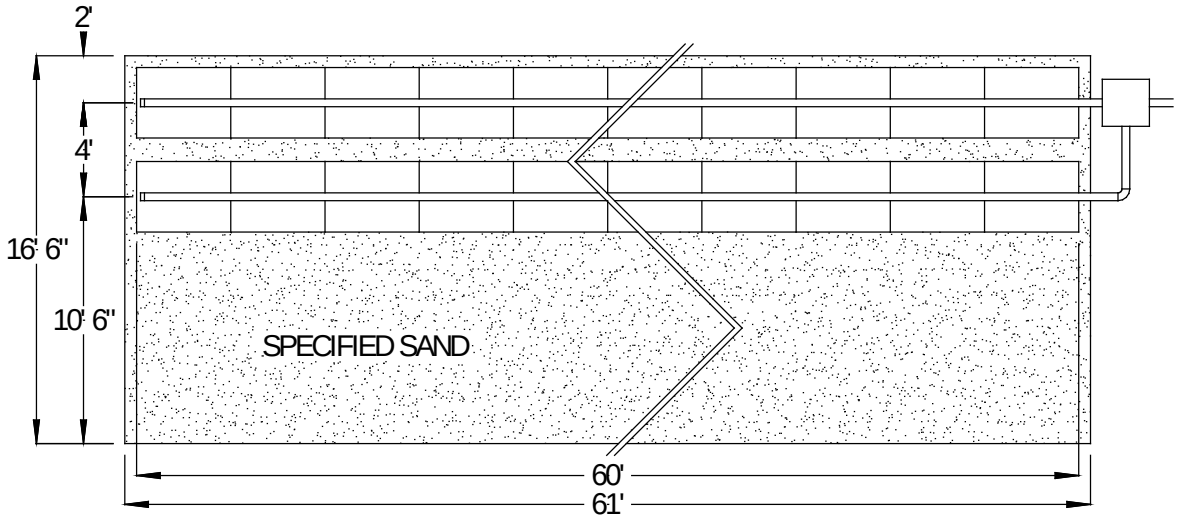
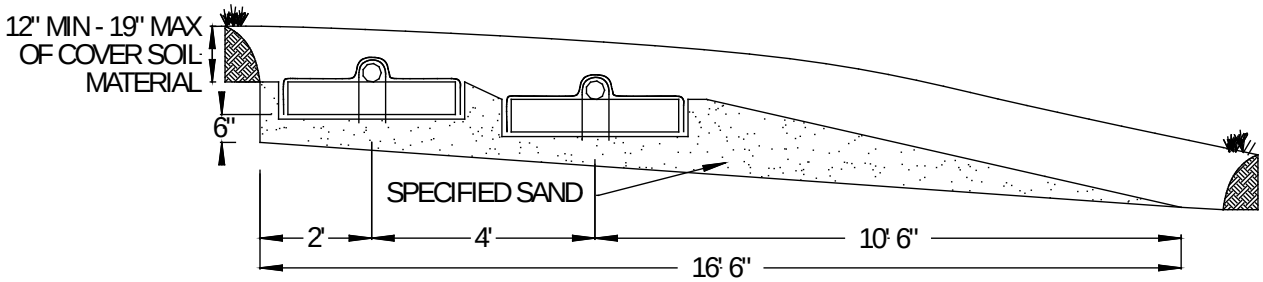


FIGURE 12: CROSS SECTION VIEW – 450 GPD – B43 – BED SYSTEM – SLOPING SITE



4.0 Elevated Mound Installation Guidelines

Additional guidance Rule 410 IAC 6-8.3	
Method of Distribution	Pressure distribution is required for elevated mounds.
Determine the Number Modules	Determine the number of GSF Modules required from Table 6 of this manual.
Excavating the Bed Area	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.
Placing Specified Sand Base	Place 6 inches of Specified Sand in the lateral basal area. The sand height below the GSF module must be level at 12 inches. **For Mound sloping systems between 0.5% and 6% a minimum three foot sand extension is required.**
Place GSF Modules	Place the GSF Modules, ***PAINTED STRIPE FACING UP***, end to end on top of the Specified Sand along their 4-foot length.
Distribution Pipes for Pressure Systems	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. Insert a 1.5 inch pressure pipe which meets 410 IAC 6-8.3 (67), into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 18. Each pressure lateral will have a drain hole at the distal end of the pipe at the 6 o'clock position. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module. Section 1.8 of this manual has more information on pipe selection
Pump Chamber to the GSF System	Refer to local regulations for guidance • Pressure Distribution Guidance • Pump Controls
Place Geotextile Cover Fabric	***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: • 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. • 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.
Backfilling the System	Complete backfill with cover soil material to a minimum of 12 - 19 inches measured from the top of the 4-inch distribution pipe. Fill must be clean, porous and able to sustain vegetation. 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. Topsoil and seed to protect from erosion.
Drainage	All drainage requirements shall be in accordance with 410 IAC 6-8.3 (59)

4.1 Elevated Mound Design Examples

FIGURE 13: CROSS SECTION – PRESSURE ELEVATED MOUND SYSTEM

EXISTING GRADE 0% - 0.5%

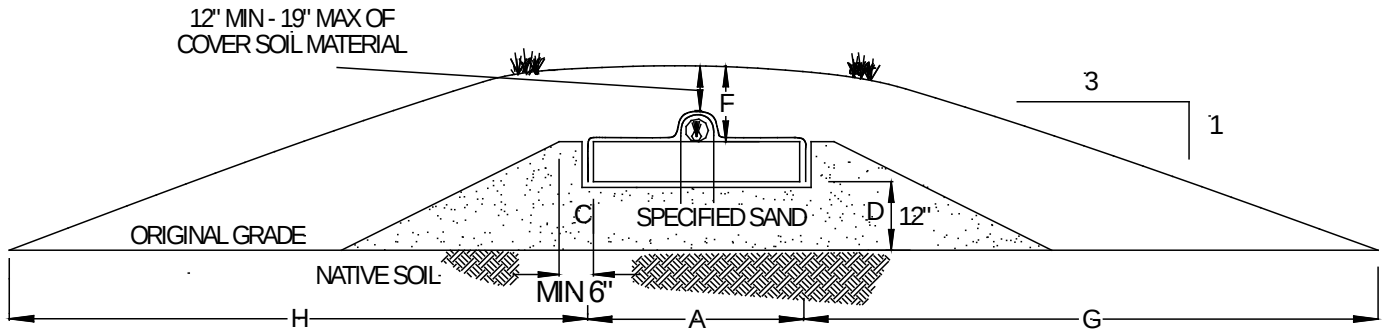
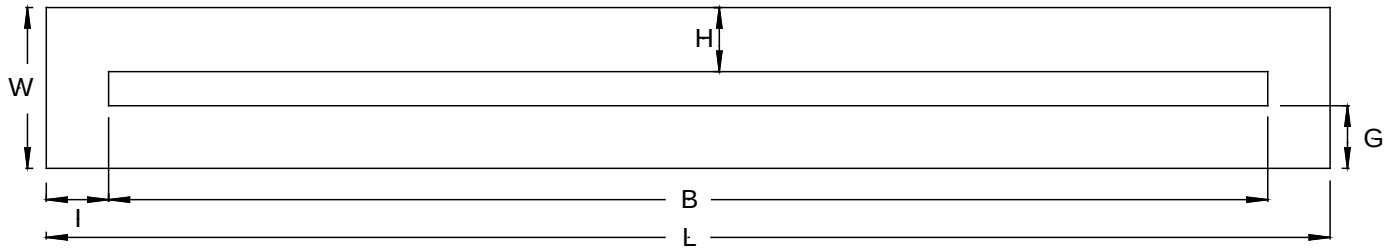


FIGURE 14: PLAN VIEW – PRESSURE ELEVATED MOUND SYSTEM



A – Distribution cell width (accounts for sand) – **Minimum 4 ft**
B – Distribution cell length
C – Up slope fill depth under distribution cell – **Minimum 1 ft**
D – Down slope fill depth under distribution cell – **Minimum 1 ft**
E – Distribution cell depth – **Constant 7 in**
F – Depth of final cover – **Min 16 inches** (Includes 4" pipe and a minimum 12 inches of cover soil material)
G – Distance from edge of distribution cell to down slope edge of fill
H – Distance from edge of distribution cell to up slope edge of fill
I – Distance from end of distribution cell to edge of fill
L – Overall mound fill length
W – Overall mound fill width

4.1 Elevated Mound Design Examples

4.1 DISTRIBUTION BED GUIDANCE: Units may not have more than one foot of sand up or downslope of any unit. The maximum distance of the distribution cell edge measured to the unit is one foot, and the minimum distance to the distribution cell edge is six inches.

4.2 MINIMUM SLOPE REQUIREMENTS: Maintain a 3:1 slope or gentler for all slopes off the bed. Elevated systems using GSF modules will not be permitted on slopes greater than 6%.

4.3 PLACEMENT OF THE ELJEN BED: Place the Eljen bed in the middle of the absorption area for sites with slopes less than 0.5%. For sites with greater than 0.5% slope, place the Eljen units 6 inches from the upper edge of the absorption bed.

4.4 ELEVATED MOUND SYSTEM: Follow the guidelines in 410 IAC 6-8.3 (79) to complete the mound. When placing the Eljen Bed on the basal area, there must be 12 inches of INDOT SPEC 23 Sand under the A42 or B43 Modules. The basal sand can account for this.

4.5 PRESSURE ELEVATED MOUND SYSTEM: Pressure distribution is only allowed for elevated configurations.

4.6 PERIMETER DRAINS: If perimeter drains are utilized they must remain 10 feet from the edge of the system sand perimeter.

4.7 MINIMUM NUMBER OF UNITS PER BEDROOM: If using A42 units, maintain 6 units per bedroom as a minimum. If using B43 units, maintain 5 units per bedroom as a minimum.

Example 5 - Pressure Mound – A42 Modules – Greater than 0.5% - 6% slope.

House Size:	4 bedrooms
Daily Design Flow: 4 Bedrooms x 150 gallons per day	600 gpd
Slope of site:	6%
Soil Loading Rate:	0.25 gpd/ft^2
A42: Minimum number of units per bedroom: 6 per Bedroom x 4 Bedrooms	24 A42 Modules
B43: Minimum number of units per bedroom: 5 per Bedroom x 4 Bedrooms	20 B43 Modules

4.8 CALCULATE VARIABLES:

A – Distribution cell width = **4 ft**

(***NOTE:*** The minimum width of distribution cell is **4 ft.**)

Cell width must conform to 6-8.3 (79) (3) (A)

Consult the regulations 6-8.3 (79) (a) (3). Minimum bed width is 4 feet for all systems. If the site permits, promote thin systems. For this example, the maximum cell width is:

Maximum Distribution Bed Width = 0.83 x √ (Daily Design Flow x Soil Loading Rate ÷ n)

TABLE 7: N VALUE FOR MOUNDS

DDF (gpd)	n
≤ 1500	3
1501 - 3000	4
3001 - 4000	5

For this example, the maximum cell width is: 5.8 ft

4.1 Elevated Mound Design Examples

B – Distribution cell length = Daily Design Flow ÷ 1.2 gpd/ft^2 (constant) ÷ Distribution Cell Width
600 gpd ÷ 1.2 gpd/ft^2 ÷ 4 ft = **125 ft**

Units required – Units required are determined by (Distributions Cell Length – 1) ÷ 4
Units required – (125 – 1) ÷ 4 = **31 modules**
For this system we decided to use B43s. For this system, use 31 B43 Modules.

C – Up slope fill depth under distribution cell = **Minimum 12 inches**
(***NOTE:*** For this example, assume the depth of fill at the up slope edge of the distribution cell is **1 ft** to maintain separation distance from a restrictive layer. *Note: Restrictive layer is measured to sand/soil interface*.)

D – Down slope fill depth under distribution cell = **Minimum 12 inches**
C + (Slope of site x A)
1 ft + (0.06 x 4 ft) = **1.2 ft**

E – Distribution cell depth – Constant 7 in., convert to feet – **0.6 ft**

F – Depth of final cover = **16 inches or 1.3 ft, this includes cover and pipe over unit.**
(***NOTE:*** For the side slope of the mound, we are using a **recommended 3:1 slope)**

G – Distance from edge of distribution cell to down slope edge of fill:
Down slope correction factor = 100 ÷ [100 – (side slope x % ground slope)]
100 ÷ [100 – (3 x 6)] = **1.2**
4 x (D + E + F) x Down slope correction factor
4 x (1.2 + 0.6 + 1.3) x 1.2 = **12.4 ft**

H – Distance from edge of distribution cell to up slope edge of fill
Up slope correction factor – 100 ÷ [100 + (side slope x % ground slope)]
100 ÷ [100 + (3 x 6)] = **0.9**
4 x (C + E + F) x Up slope correction factor
4 x (1 + 0.6 + 1.3) x 0.9 = **10.4 ft**

I – Distance from end of distribution cell to edge of fill
4 x [{(C + D)/2} + E + F]
4 x [(1 + 1.2)/2 + 0.6 + 1.3] = **12 ft**

L – Overall mound fill length
B + 2(I)
125 ft + 2 (12 ft) = **149 ft**

W – Overall mound fill width
A + G + H
4 + 12.4 + 10.4 = **26.8 ft**

4.9 VERIFY MINIMUM REQUIREMENT MET:

TABLE 8: MINIMUM ELEVATED MOUND FOOTPRINT REQUIRED

Soil Loading Rate (gpd/sf)	Required Footprint (Square Feet)		
	Bedrooms per House		
	3	4	5
1.2	216	288	360
0.75	300	400	500
0.6	375	500	625
0.5	450	600	750
0.3	1005	1340	1675
0.25	1206	1608	2010

Using the Table 8, determine required footprint

Minimum required footprint 1608 ft^2
Determine the Minimum Distribution Cell Size: Daily Design Flow ÷ 1.2 gpd/ft^2
600 gpd ÷ 1.2 gpd/ft^2 500 ft^2

Determine minimum downslope area needed: Minimum required footprint – minimum distribution cell size
1608 ft^2 - 500 ft^2 1108 ft^2
Determine if Design meets required downslope.
B (Distribution Cell Length) x G (Distance from edge of distribution cell to down slope edge of fill)
125 ft x 12.4 ft 1550 ft^2
Since 1550 ft^2 is greater than 1108 ft^2, the design meets the minimum area requirements.

Make sure to consult Rule 410 IAC 6-8.3-80, Design of Basal Area. In this example, the sand extension from the distribution cell would only be 8.64 feet long. Add 0.36 feet to the sand extension to meet Rule 410 IAC 6-8.3-80. Final Dimensions of the system are on the following page.

4.1 Elevated Mound Design Examples

FIGURE 15: CROSS SECTION – 600 GPD – MOUND SYSTEM

EXISTING GRADE GREATER THAN 0.5%

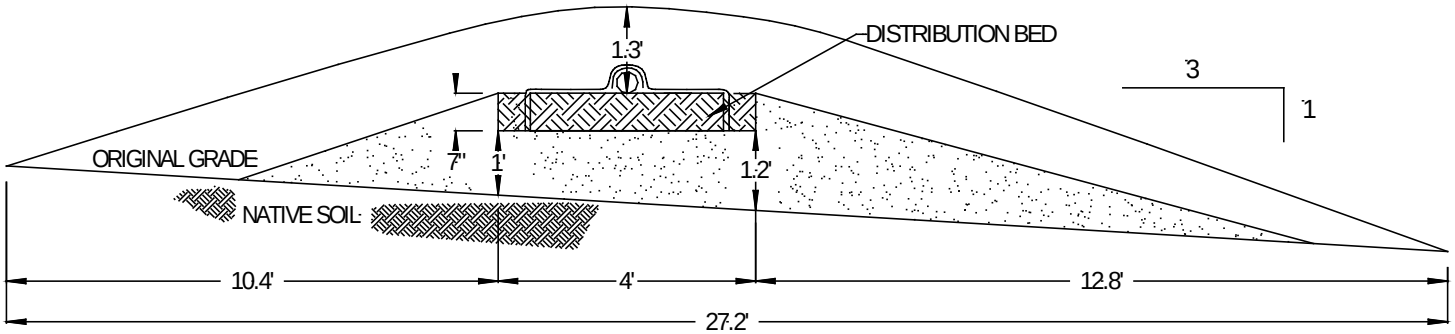


FIGURE 16: PLAN VIEW – 600 GPD – MOUND SYSTEM

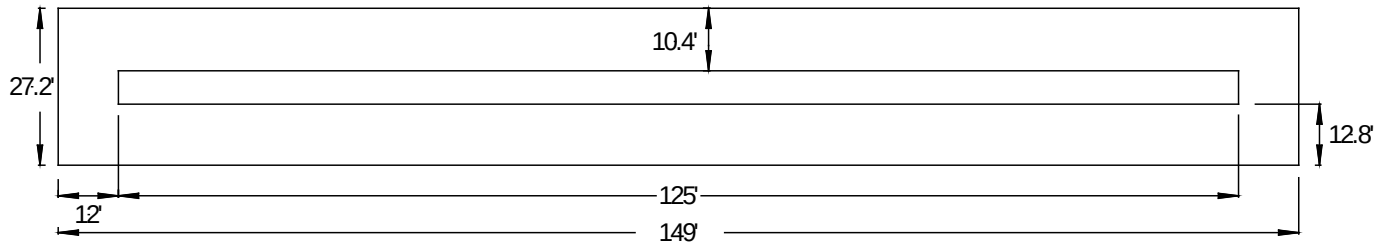
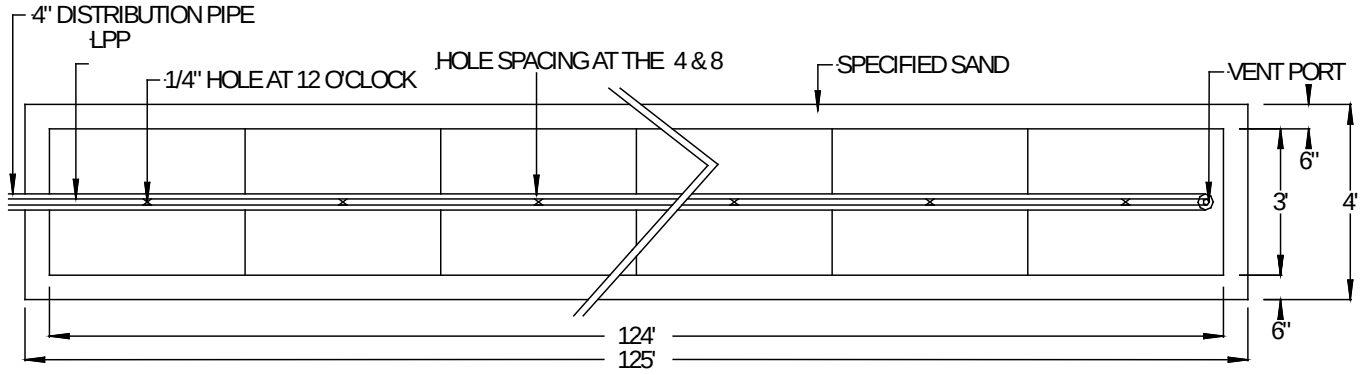


FIGURE 17: PLAN VIEW – 600 GPD – DISTRIBUTION CELL MOUND SYSTEM



5.0 Dosing Distribution Guidance

5.1 ADDITIONAL GUIDANCE
Dosing tanks and effluent pumps must comply with ISDH Rule 410 6-8.3 Section 62 and 65 for dosing tanks and effluent pumps.

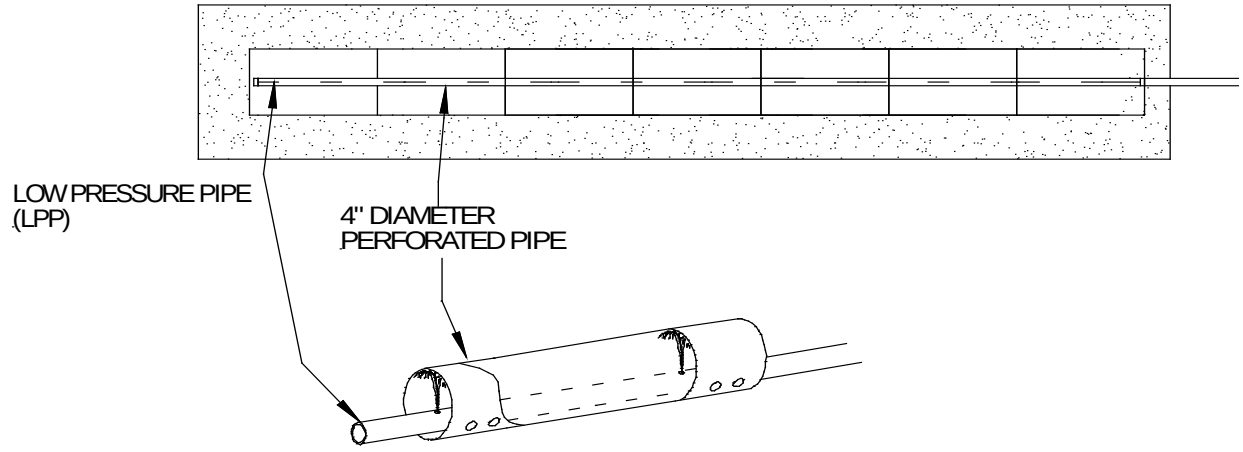
Section 410 IAC 6-8.3 (78) Subsurface Pressure Distribution is enforced except when noted.

5.2 DOSING DESIGN CRITERIA: The pump requirements contained in section 410 IAC 6-8.3 (75) (d) (1) & (2) 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. Use a maximum of ***3 gallons per dose per A42 module or 4 gallons per dose per B43 module*** in the system. Adjust pump gallons per minute and run time to achieve the above maximum dose. Use a minimum pump run time of one minute. For required flood dosed requirements please refer to section 7.0

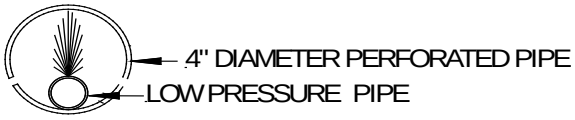
6.0 Pressure Distribution Guidance

Standard procedures for design of pressure distribution networks apply to the GSF filter. Orifices shall be 4-foot on center spacing so the orifices fall in the center of each module. An orifice size of ¼ inch shall be maintained. A ¼inch diameter drain hole is required at the 6 o'clock distal end of each pressure lateral for required drainage. The 1.5 inch is specified throughout the lateral pipe network and 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 18: PRESSURE PIPE PLACEMENT

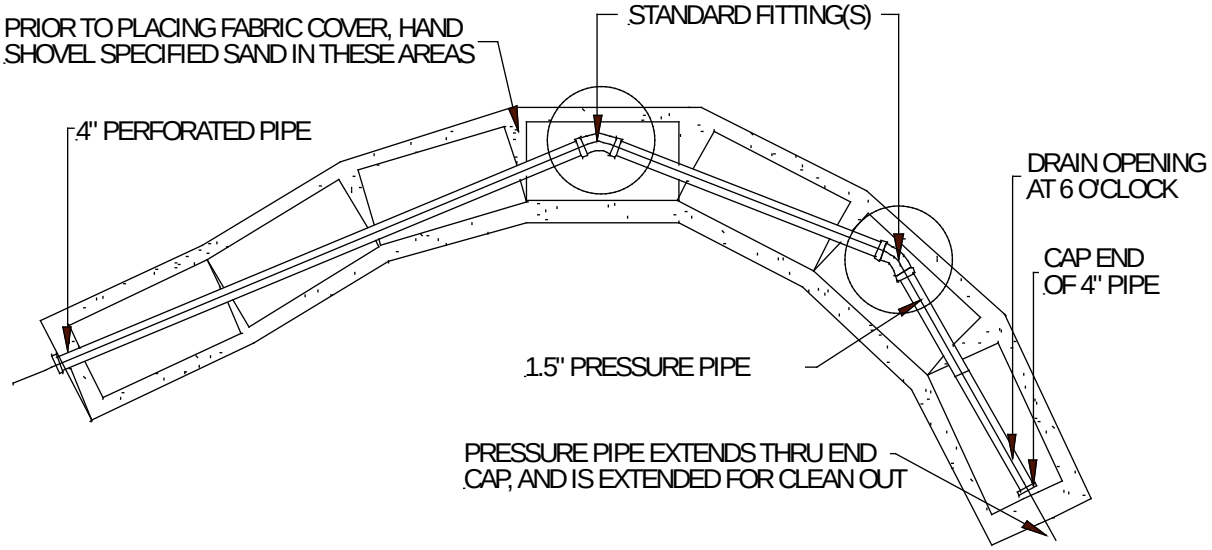


PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS



6.0 Pressure Distribution Guidance

FIGURE 19: CONTOURED TRENCH INSTALLATION



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.

7.0 Flood Dosed Guidance

Comply with ISDH Rule 410 IAC 6-8.3 (76) (b) required discharge rates for flood-dosed systems in regards to pump discharge rates. Refer to section 5.2 of this manual to size the dosing pump volume.

Pump selection shall be based on manufacturers pump curves for the required discharge rate from Table 8, as follows, at the total head imposed on the pump:

TABLE 9: REQUIRED PUMP DISCHARGE RATES FOR FLOOD DOSED SYSTEMS

REQUIRED PUMP DISCHARGE RATES FOR FLOOD DOSED SYSTEMS

Number of Bedrooms	Discharge rate in Gallons per Minute
1	30
2	30
3	30-45
4	30-60
5	38-75
6	45-90

The total head for a subsurface soil absorption system using flood dosing shall be the elevation difference between the pump and the highest point in the pressure network in addition to the friction loss in the delivery pipe expressed in feet.

8.0 Pump Controls

Demand and Pressure Dosed 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 pump chamber and is secure from tampering and resistant to weather (minimum of NEMA4). The control panel shall be equipped with cycle counters and elapsed time meters. Where a water supply water meter is available it may be possible to eliminate the counters or timers.

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.

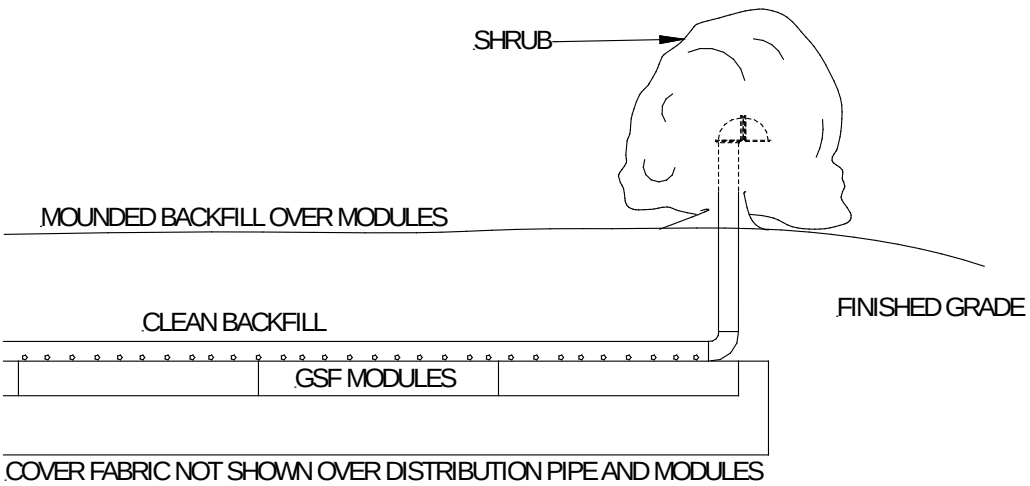
9.0 System Ventilation

9.1 SYSTEM VENTILATION: Air vents are required on all absorption systems located 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 Module 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. The extension of the distribution pipe to the vent provides adequate delivery of air into the GSF system.

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

9.2 VENTILATION PLACEMENT: In a GSF system, the vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs, as shown 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 20: GSF WITH 4” VENT EXTENDED TO CONVENIENT LOCATION



10.0 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 one port per lateral. At least one inspection port should be place 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 toe as well.

FIGURE 21: MONITORING WELL FOR SAND-SOIL INTERFACE

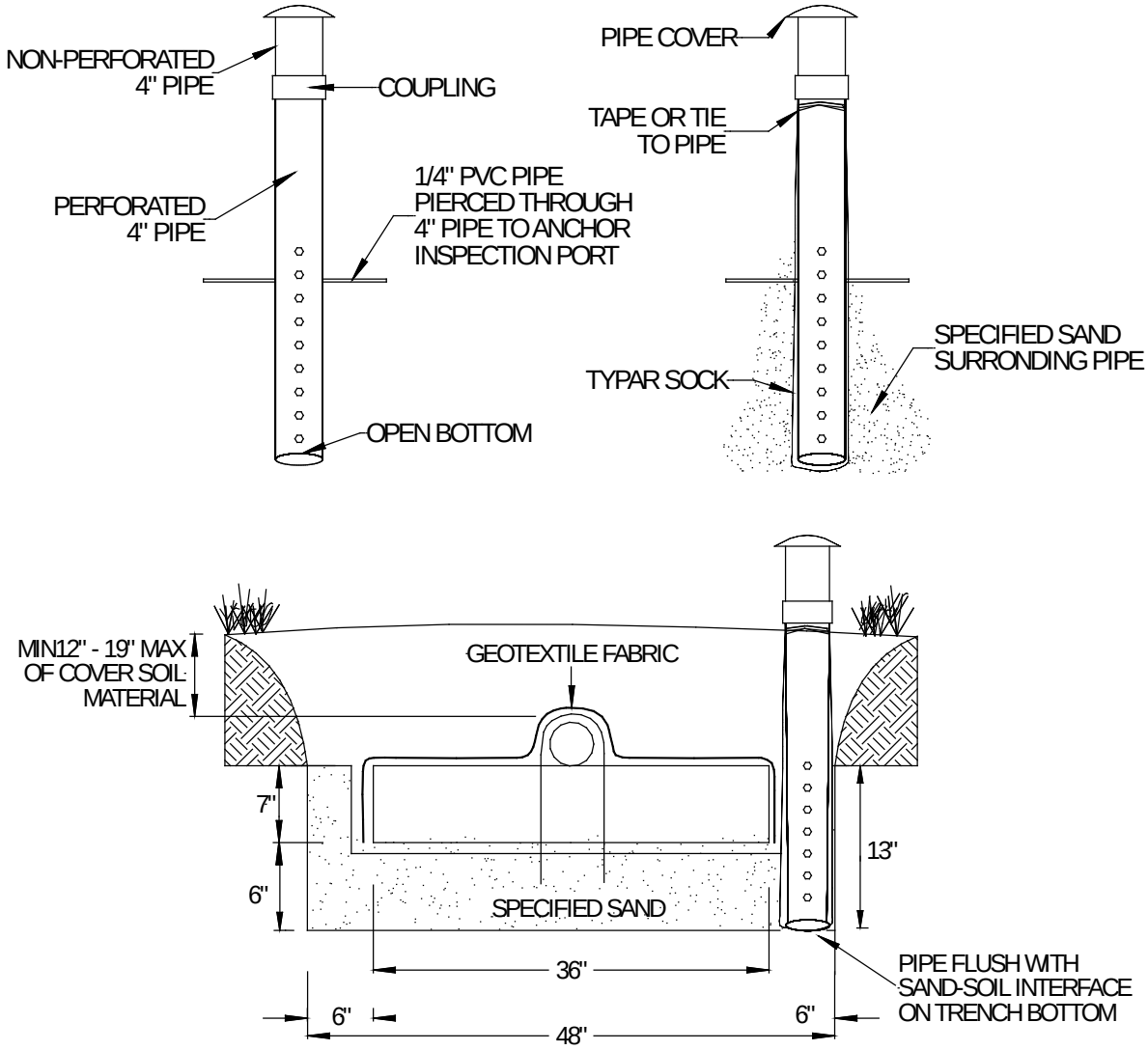


TABLE 10: GSF INSPECTION CHECK LIST

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
Inspection Data, (complete all fields)				
Is daily flow within the system design flow? If no, explain:	Yes	No		
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		

TABLE 10: GSF Inspection Check List (continued)

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 softer 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
Are the system vents in place?	Yes	No	Comments
Are they operational? If no, describe conditions and location:	Yes	No	
Describe any other pertinent issues:			

Inspected by:	
License Number:	
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.

Indiana GSF Registration Form

In accordance with manufacturers requirements for each installation, Indiana installers of Eljen systems must complete and fax, email or mail a copy of this form to one of the following addresses:

US Mail:

Eljen Corporation
125 McKee Street
East Hartford, CT
06108

Website Online Submission: www.eljen.com – http://www.eljen.com/Pages/GSF/GSFinstallationForm_IN.html

Email: indianagsfsystem@eljen.com – Subject: IN GSF System Installation Form

Fax: 860-610-0427 – Subject: Indiana GSF System Installation Form

Indiana GSF Registration Form

INSTALLED BY:

NAME _____
COMPANY _____
ADDRESS _____
TELEPHONE _____

DESIGNED BY:

NAME _____
COMPANY _____
ADDRESS _____
TELEPHONE _____

INSPECTED BY:

NAME _____
COMPANY _____
ADDRESS _____
TELEPHONE _____

SITE LOCATION:

NAME _____
COMPANY _____
ADDRESS _____
TELEPHONE _____

MODULES USED B43 (48in x 36in x 7in) A42 (48in x 24in x 7in) B23 (24in x 36in x 7in)
(Circle One)

NUMBER OF BEDROOMS 1 2 3 4 5 (Number Greater than 5) ____
(Circle One)

DAILY DESIGN FLOW: Number of Bedrooms **x** 150 gpd= _____

SYSTEM CONFIGURATION: Subsurface Bed Trench Elevated Mound
(Circle One)
Subsurface requires 6 inches of sand beneath module
Elevated Mounds requires 12 in of sand beneath module

TYPE OF SYSTEM: Gravity Pressure Flood Dosed
(Circle One)

Indiana GSF Registration Form

AREA REDUCTION: Refer to section labeled notes below tables 5 and 6 on page 13

SITE SLOPE: Elevated Systems: (6% max slope) Subsurface System (15% max slope)
(Circle One)

TRENCH/LATERAL LENGTH:
Gravity and Flood Dosed systems have a maximum length of 100 feet.

PERIMETER DRAIN Yes No
(Circle One)

*Reference 410 IAC 6-8.3 (59) for depth requirements of subsurface drainage.

VENTING
(Circle One) Yes No

*Venting is required if system cover exceeds 18 inches.

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

Innovative Environmental Products & Solutions Since 1970

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