



Geotextile Sand Filter

Eljen Iowa Lined Proprietary Sand Filter

Design and Installation Manual



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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) is placed over the GSF modules.
Design Flow	The estimated peak flow that is used to size a GSF system is 150 gallons per day per Bedroom.
GSF	The Eljen Geotextile Sand Filter Modules and the sand layer at the base and along the sides of the modules. The GSF meets Iowa Chapter 69 requirements for proprietary treatment systems, and testing in accordance with NSF/ANSI Standard 40 demonstrates treatment of domestic-strength wastewater to Class I levels.
GSF Module	The individual module of a GSF system. The module is comprised of a cusped plastic core and geotextile fabric.
Specified Sand	To ensure proper system operation, the system MUST be installed using ASTM C33 or equivalent Sand. ASTM C33 or equivalent sand will have less than 10% passing the #100 Sieve and less than 5% passing the # 200 sieve. Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

TABLE 1: SPECIFIED SAND SIEVE REQUIREMENTS

ASTM C33 SAND SPECIFICATION		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
3/8 inch	9.52 mm	100
No. 4	4.76 mm	95 - 100
No. 8	2.38 mm	80 - 100
No. 16	1.19 mm	50 - 85
No. 30	590 µm	25 - 60
No. 50	297 µm	5 - 30
No. 100	149 µm	0 - 10
No. 200	75 µm	0 - 5

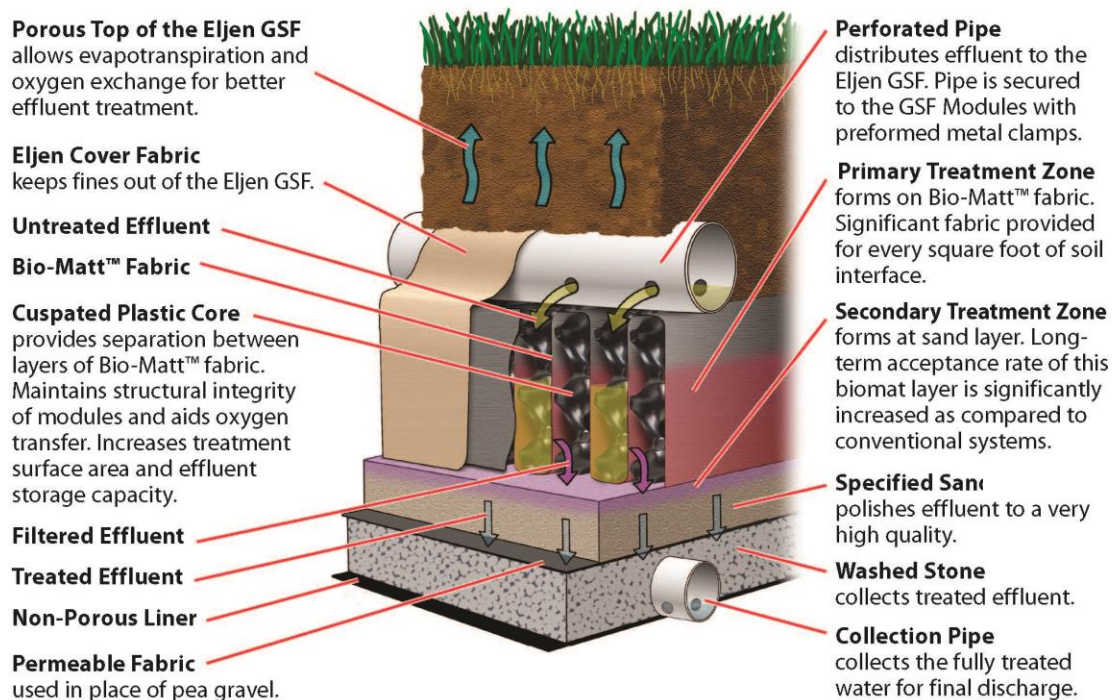
Primary Treatment Zone

- Perforated pipe is centered above the GSF module to distribute septic effluent over and into corrugations created by the cusped 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 collection pipe. The Specified Sand supports nitrification of the effluent, which reduces oxygen demand at final disposal.

FIGURE 1: GSF SYSTEM OPERATION



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 should 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 of the disposal area may be up-sized for expected higher than normal water use.

For example:

- Luxury homes, homes with a Jacuzzi style tub, 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.

1.0.8 LINED SYSTEMS: The Eljen Iowa Proprietary Lined Sand Filter system shall/must be permitted following 567 IAC Ch. 69.6(2)21 (private sewage disposal systems) by your local administrative authority typically your local County Sanitarian or Local Board of Health.

1.0.8 MAINTENANCE AGREEMENT: The Eljen Iowa Proprietary Lined Sand Filter system requires no maintenance.

2.0 System Sizing and Guidance

2.1 REQUIREMENTS: GSF systems must meet the design and installation requirements in this manual, local rules and regulations. Chapter 69 of the Iowa Regulations, Private Sewage Disposal Systems and the local regulations 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.

2.2 NUMBER OF GSF MODULES REQUIRED: The minimum design requirements per 150 gpd are 8 A42 modules for gravity systems and 6 A42 Modules for siphon and pressure-dosed systems. See TABLE 2.

2.3 SIZING GSF SYSTEMS:

TABLE 2: RESIDENTIAL SYSTEM SIZING

Distribution	Minimum Square Foot per Bedroom	Minimum Units Required
Gravity	96 ft ² /bedroom	8 A42s per bedroom
Siphon-dosed	72 ft ² /bedroom	6 A42s per bedroom
Pressure-dosed	72 ft ² /bedroom	6 A42s per bedroom

3.0 Eljen Iowa Proprietary Lined Sand Filter Example

Eljen Iowa Proprietary Lined Sand Filter Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
System Distribution:	Pressure-dosed

1. Calculate The Minimum Absorption Area (See TABLE 2)

TABLE 2: RESIDENTIAL SYSTEM SIZING



Distribution	Minimum Square Foot per Bedroom	Minimum Units Required
Gravity	96 ft ² /bedroom	8 A42s per bedroom
Siphon-dosed	72 ft ² /bedroom	6 A42s per bedroom
Pressure-dosed	72 ft ² /bedroom	6 A42s per bedroom

Absorption Area: Number of Bedrooms x Minimum Square Foot per Bedroom

$$3 \text{ Bedrooms} \times 72 \text{ ft}^2/\text{bedroom} = 216.0 \text{ ft}^2$$

2. Calculate Number of Modules Required (See TABLE 2)

Number of units required = Bedrooms x Units per Bedroom

$$3 \text{ Bedrooms} \times 6 \text{ A42s per bedroom} = 18 \text{ Modules}$$

3. Calculate Minimum Sand Filter Length:

For this configuration, we will use 3 rows

$$18 \text{ Modules} \div 3 \text{ Rows} = 6 \text{ Mods/Row}$$

(Round up to even numbers if needed)

4. Calculate Minimum Row Length (Modules are 4ft in length):

$$6 \text{ A42 Modules} \times 4 \text{ ft} + 1 = 25 \text{ ft in Length}$$

5. Calculate Minimum Bed Width (each row = 3 ft)

$$3 \text{ Rows} \times 3 \text{ ft} = 9 \text{ ft in Width}$$

Final Dimension Layout

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

Bed Length	25 ft
Bed Width	9 ft
Minimum Number of Modules	18 Modules
Modules per Row	6 A42s
Lateral to Lateral Spacing	3 ft
Lateral to Edge Spacing	1.5 ft
System Area	225 ft ²

3.0 Eljen Iowa Proprietary Lined Sand Filter Example

FIGURE 2: LINED SAND FILTER - PLAN VIEW

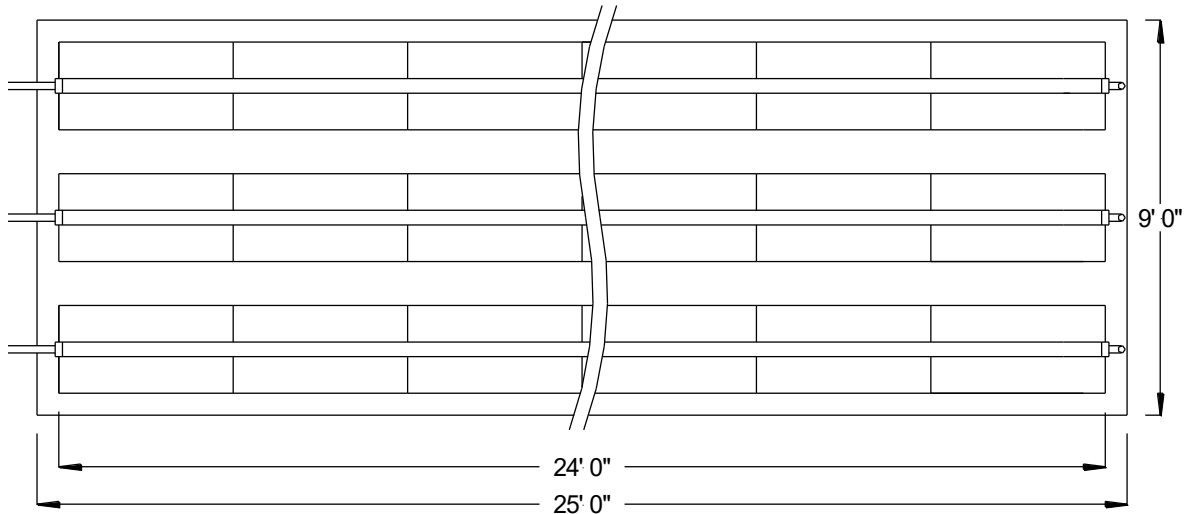


FIGURE 3: LINED SAND FILTER - CROSS SECTION

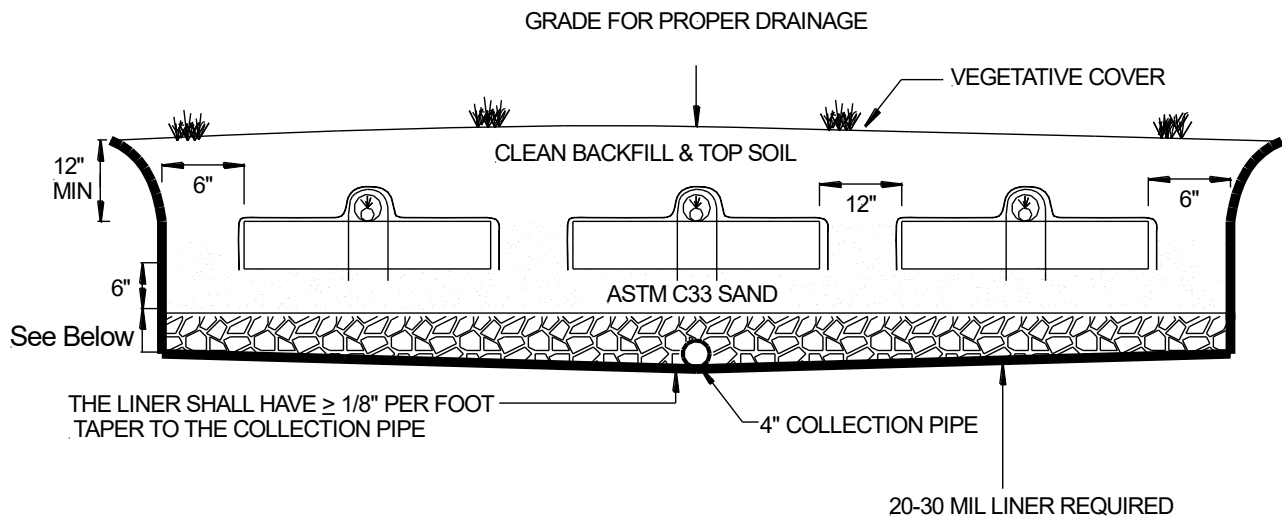
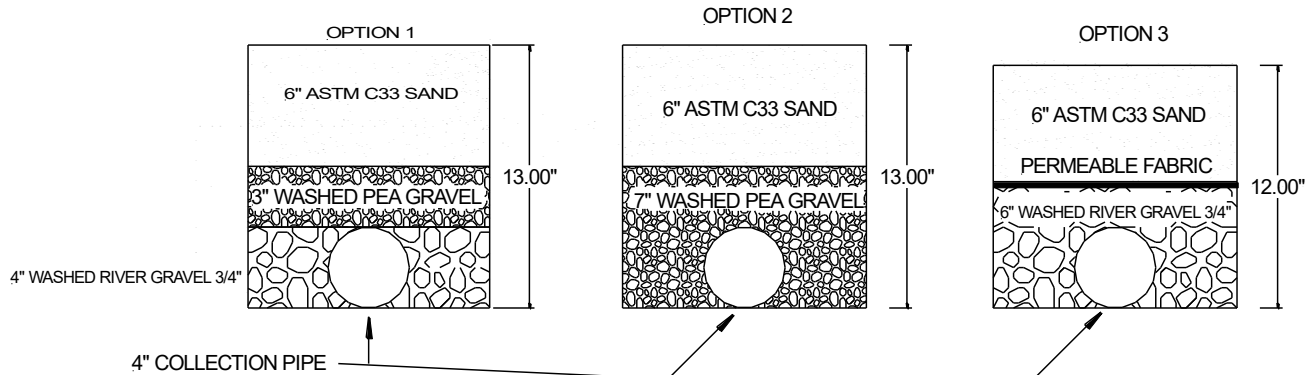
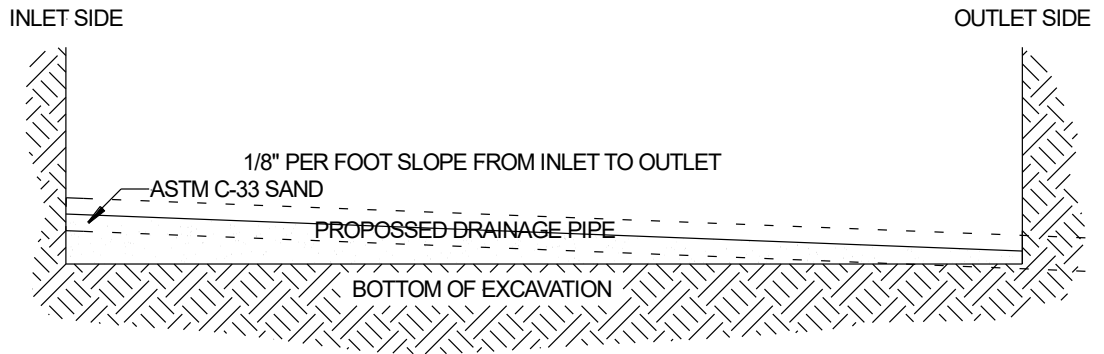


FIGURE 4: LINED SAND FILTER COLLECTION LAYER OPTIONS - CROSS SECTION



4.0 Installation Procedures

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 ensure storm water drainage and surface water is diverted away from the absorption area once the system is complete.
4. Excavate the bed area.
 - a. Slope the system 1/8" per foot from the inlet to the outlet of the system. The easiest method to create this slope is make a full excavation to the OUTLET SIDE height and then build the slope with the ASTM C-33 Sand.



5. Place the 20 – 30 mil liner (Optionally; 2 or 3 layers of 10 mil meet this requirement)
6. Place collection pipe (SDR35 OR SCH40) down, in the center of the liner, and make appropriate connections to discharge out of the liner. Ensure the pipe is pitched appropriately towards the liner exit to final.
7. There are 3 options for constructing the sand filter collection layer. (FIGURE 4):
 - a. Option1: Place 4-inches of washed 3/4" river gravel over the collection pipe, place an additional 3-inches of 3/8" diameter pea gravel over the stone to a level height.
 - b. Option 2: Place 7-inches of washed pea gravel, 3/8" diameter, from the bottom of the collection pipe to 3" above the collection pipe.
 - c. Option 3: Place 6-inches of washed 3/4" river gravel from the bottom of the collection pipe to a level height, 2" above the collection pipe. A permeable fabric may be use above the sand layer, see option 1, to keep the sand in place.
8. Place aggregate over collection pipe in the liner to a level height in order to create the sand filter collection layer.

FIGURE 7: COMPLETED COLLECTION LAYER



9. Place and compact a 6" level layer of ASTM C-33 sand along the top of the collection layer.

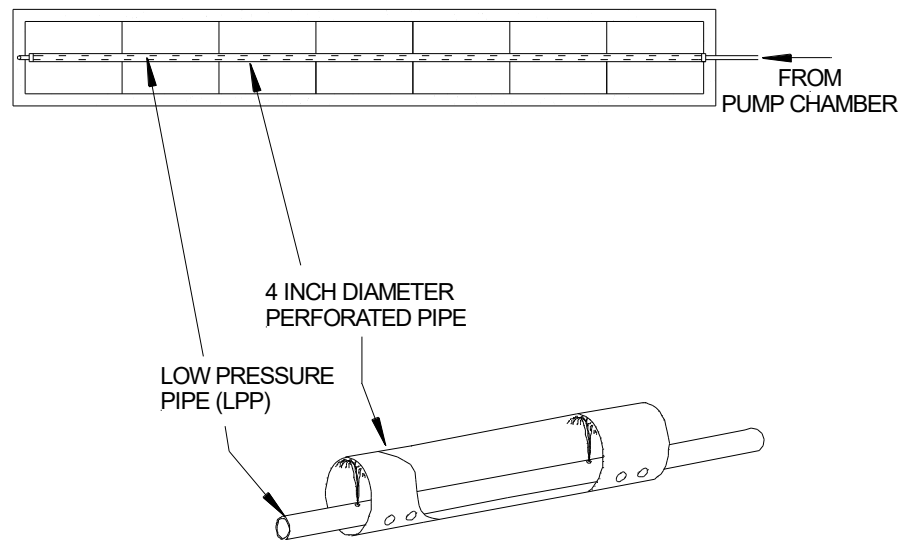
4.0 Installation Procedures

10. 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.
11. Place the GSF modules in their rows with the white stripe up.
12. A 4-inch perforated pipe, SDR 35 or SCH40, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock positions with a max spacing of 12" on center.
13. All 4-inch distribution pipes are secured with manufacturers supplied wire clamps, one per module.
14. For Pressure Distribution Systems, see section 5.0 Pressure Distribution Guidance
15. Ensure the bed and rows are level.
16. **Cover fabric substitution is not allowed.** The installer shall 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.
17. 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. The Specified Sand, at a minimum, must be at or above the top of the GSF module.
18. Complete backfill with topsoil and a minimum of 12-inches of cover over the GSF modules. 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 seeded to control erosion.

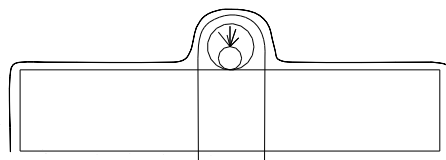
5.0 Pressure Distribution Guidance

1. Pipe Placement: Insert the lateral pipe network (sized per design and local code) inside the 4-inch perforated pipe, SDR 35 or SCH40, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock positions with a max spacing of 12" on center.
2. Pipe Orientation:
 - a. Set the drilled orifices on the pressure pipe to spray directly upwards at the 12 o'clock position towards the top interior of the 4-inch perforated pipe not to exceed 5/16" diameter spaced every 48" maximum (FIGURE 5)
3. Drain Holes: Provide a minimum of one drain hole at the 6 o'clock position over every module to ensure proper drainage.
4. Termination & Cleanouts: Cap both ends of the pipe assembly and install a cleanout at the end of each module row (FIGURE 6).

FIGURE 5: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS



5.0 Pressure Distribution Guidance

Ensure that the pressure lines (LPP) cleanouts extend to grade for easy access. Install a threaded cap at the top and use either a long sweep 90° elbow or two 45° elbows to reach grade. This prevents pipe blockages and allows access for diagnostic tools and hydro-jetting equipment.

FIGURE 6: PRESSURE CLEANOUT

