

LESSON 3-2: Eljen GSF System Design Requirements

General Absorption Area Design Specifications

Eljen GSF is approved for sites meeting the on-site testing criteria listed in Title 25, Chapter 73 and the Eljen listing

In-ground Trench or bed applications are approved when the Eljen GSF is used on sites with greater than 60 inches of suitable soil

An in-ground bed and an elevated absorption area would have rows of modules in their absorption area

A row consists of a module and the specified sand on each side of the module



Four rows of modules are being placed on specified sand during the construction of this particular absorption area.

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Module requirements are the same for the following absorption areas

- In-Ground
- Above-Ground

The design criteria for all absorption areas must adhere to the Title 25, Chapter 73 regulations, unless the Eljen GSF Listing has specified otherwise.

Typically, suitable soil depth determines the type of absorption area that may be permitted. Some sites will require percolation testing. Other sites may require a soil morphological analysis. This course addresses the use of an Eljen GSF System that may be permitted on sites where the absorption area site testing has been conducted in accordance with Title 25, Chapters 73, of the regulations or in accordance with the Eljen listing.

General Absorption Area Design Specifications

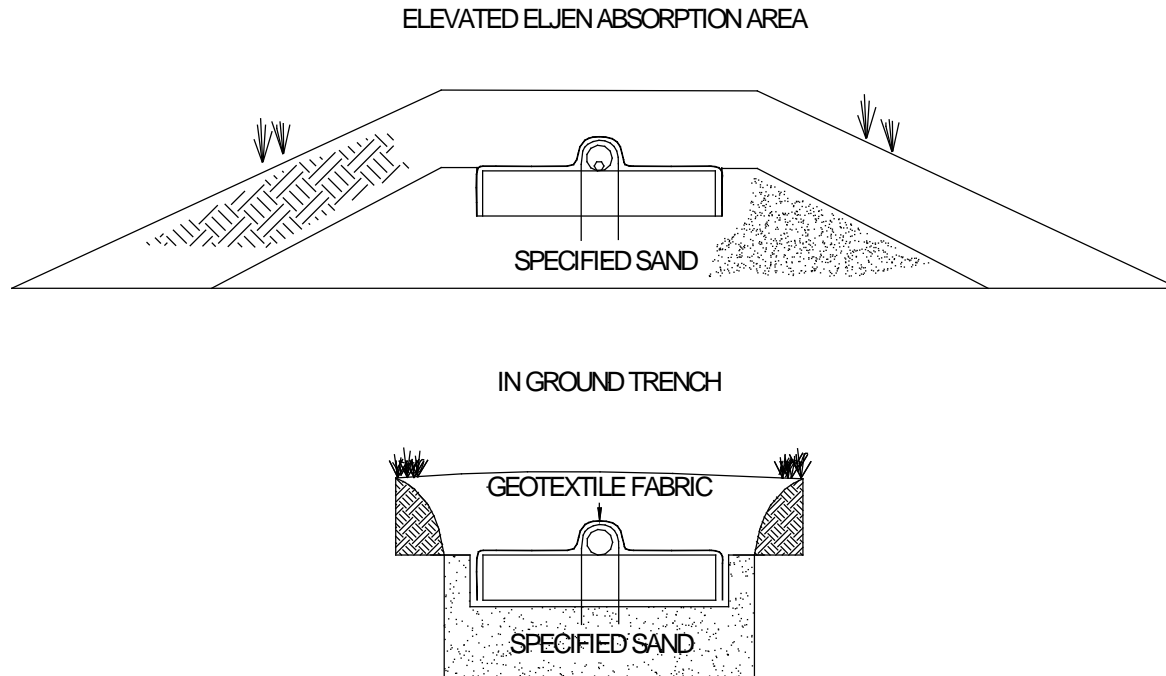


Diagram of typical Eljen GSF installations for either an elevated or in-ground absorption area.

General Absorption Area Design Specifications

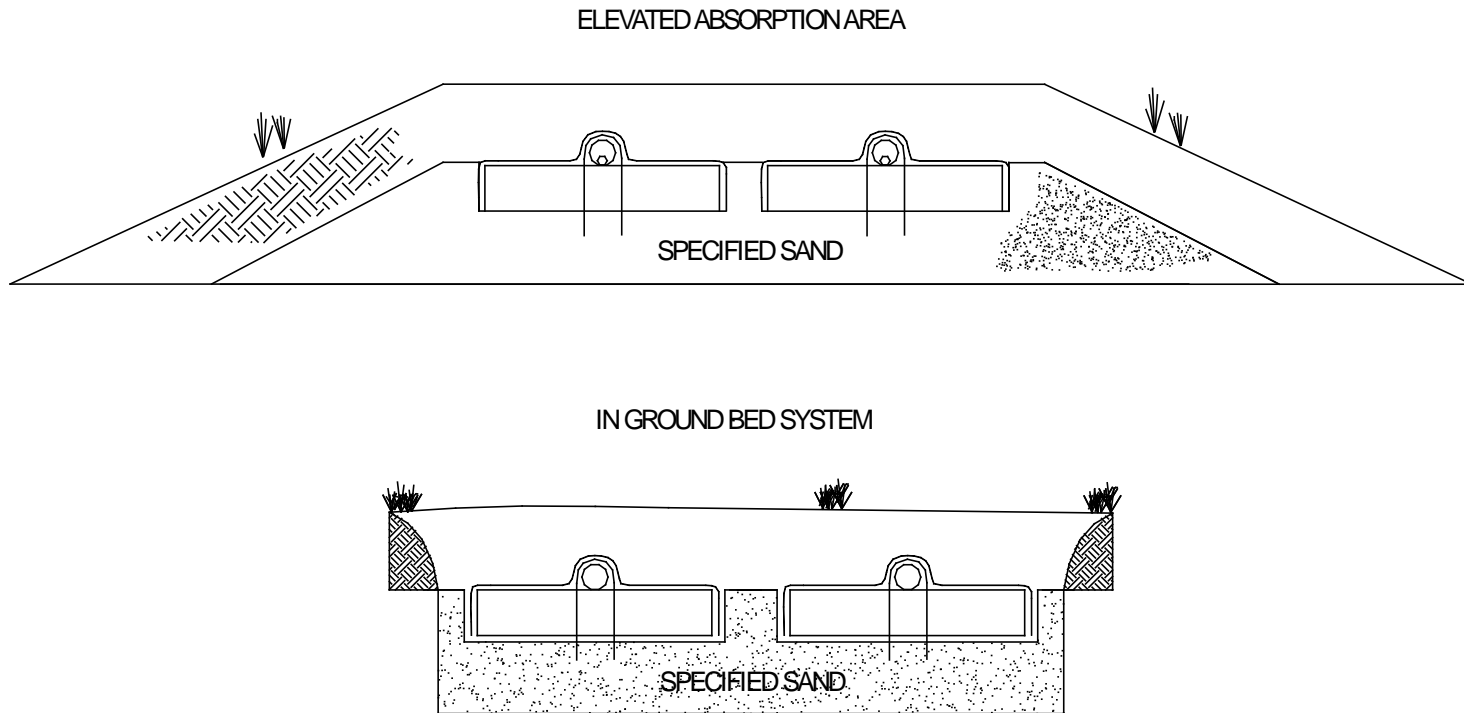


Diagram of typical Eljen GSF installations for either an elevated absorption area or in-ground absorption area.

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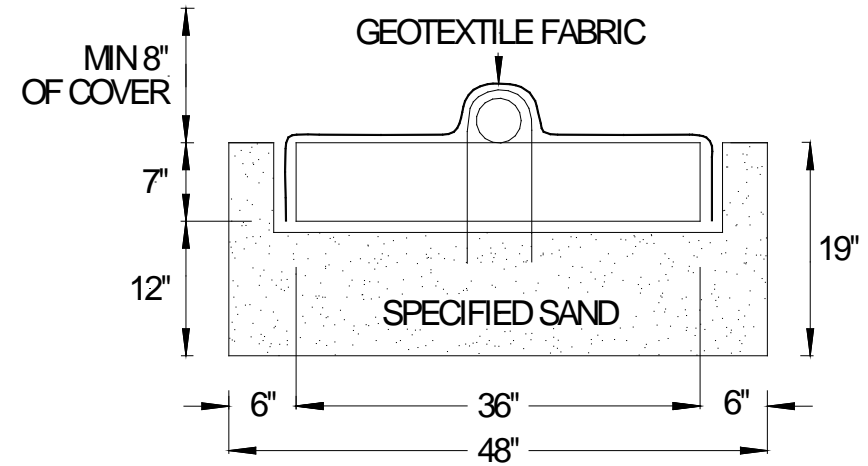
LIMITING ZONES ≥ 20 INCHES

Standard Eljen Configurations

Percolation Rate = 3 to 60 min/in

Minimum Specified Sand

- 12 inches under the modules
- 6 inches at the ends of the modules
- 6 inches on the sides of the modules



Standard Eljen Configurations for percolation rates ranging from 3 min/in to 60 min/in.

The Eljen listing requires a minimum of two laterals per absorption area.

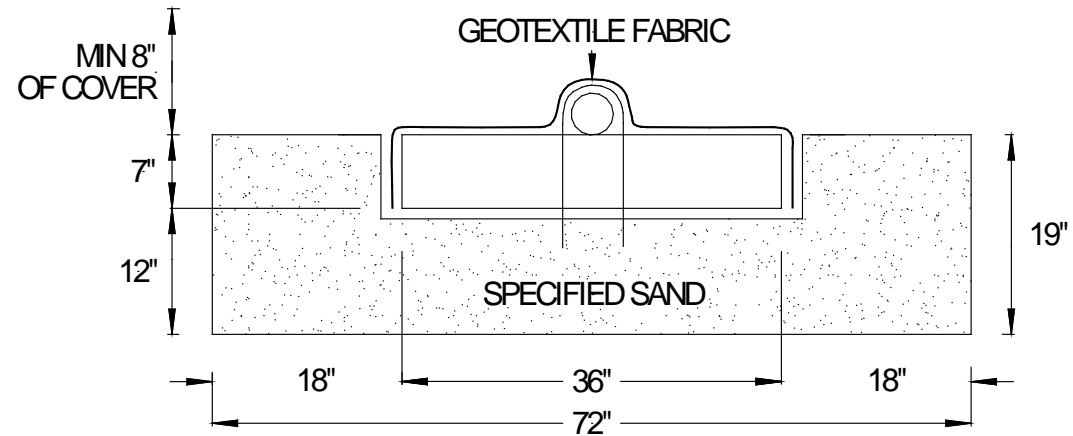
LIMITING ZONES \geq 20 INCHES

Standard Eljen Configurations

Percolation Rate = 61 to 180 min/in

Minimum Specified Sand

- 12 inches under the modules
- 6 inches at the ends of the modules
- 18 inches on the sides of the modules



Standard Eljen Configurations for percolation rates ranging from 61 min/in to 180 min/in.

The Eljen listing requires a minimum of two laterals per absorption area.

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LIMITING ZONES ≥ 20 INCHES

Configuration of Beds

Percolation Rate = 3 to 60 min/in

Minimum Specified Sand

- 12 inches under the modules
- 6 inches at the ends of the modules
- 6 inches on the sides of the modules

(6 inches + 6 inches = 12 inches between rows of modules)



The minimum depth of specified sand below the GSF module is 12 inches.

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LIMITING ZONES \geq 20 INCHES

Configuration of Beds

Percolation Rate = 61 to 180 min/in

Minimum Specified Sand

- 12 inches under the modules
- 6 inches at the ends of the modules
- 18 inches on sides of the modules

(18 inches + 18 inches = 36 inches between rows of modules)



The minimum depth of specified sand below the GSF module is 12 inches.

LIMITING ZONES < 20 INCHES

Shallow Limiting Zone Absorption Area Configuration (less than 20 inches of suitable soil)

When siting the Eljen GSF on a shallow limiting elevated absorption area, the following criteria are applicable:

A qualified soil scientist will use the Hydraulic Linear Loading Rate (HLLR) table found as Table 1 of the listing to determine the absorption area length and width

A minimum of 6 inches of specified sand must be placed on the sides of the modules. If the 6 inches on each side of the module (12 inches total) and the 3-foot module do not equal the width determined by the HLLR chart, then additional sand must be added until the required width is reached.

A minimum of 12 inches of specified sand must be placed underneath the modules.

A minimum of 6 inches of specified sand must be placed at the ends of the modules.

General Absorption Area Design Specifications

SURFACE WATER DIVERSION



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The area surrounding the tanks and the absorption areas must be constructed to divert surface water away from the absorption area.

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Calculating Number of Modules

The number of modules required in a system will be calculated for sites with suitable soils of at least 20 inches and those with less than 20 inches.

≥ 20 inches of suitable soil

To determine the number of modules required for an absorption area on a site with 20 inches or more of suitable soil, the total square feet of required absorption area is calculated using the Title 25, Section 73.16, Table A. The percolation rate (min/in) and the peak daily flow (gpd) from Title 25, Section 73.17 will be needed to perform this calculation.

Calculating the Minimum Required Square Footage of an Absorption Area

Title 25, Section 73.16, Table A

Examples:

#1) In-ground Bed

Percolation rate = 28 min/in

Peak daily flow = 400 gpd

$(28 \text{ min/in} - 15) \times (0.040) + (1.19) = 1.71 \text{ sq ft/gal}$

$1.71 \text{ sq ft/gal} \times 400 \text{ gpd} = 684 \text{ sq ft}$

#2) Elevated Bed

Percolation rate = 62 min/in

Peak daily flow = 400 gpd

$(62 \text{ min/in} - 60) \times (0.020) + (2.22) = 2.26 \text{ sq ft/gal}$

$2.26 \text{ sq ft/gal} \times 400 \text{ gpd} = 904 \text{ sq ft}$

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≥ 20 INCHES OF SUITABLE SOIL

A 40 Percent Absorption Area Size Reduction is allowed when the percolation rate is between 3 to 60 min/inch percolation rates

40% reduction taken off total square foot requirement is taken into account using the following formulas

40% reduction = total sq ft of absorption area x (1.00-0.40)

OR

40% reduction = total sq ft of absorption area x 0.60

Calculating 40 Percent Reduction in an Absorption Area

Title 25, Section 73, Table A

Examples:

#1) In-ground Bed

Percolation rate = 28 min/in

Peak daily flow = 400 gpd

$(28 \text{ min/in} - 15) \times (0.04) + (1.19) = 1.71 \text{ sq ft/gal}$

$1.71 \text{ sq ft/gal} \times 400 \text{ gpd} = 684 \text{ sq ft}$

$684 \text{ sq ft} \times 0.60 = 411 \text{ sq ft}$

#2) Elevated Bed

Percolation rate = 62 min/in

Peak daily flow = 400 gpd

In this example, no reduction is allowed because the percolation rate is higher than the minimum 60 minutes per inch.

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Calculating Number of Modules (w/o size reduction)

≥ 20 INCHES OF SUITABLE SOIL

If the calculation used to determine the number of required modules comes out to a fraction, round up to the nearest whole number. Modules cannot be cut or otherwise resized.



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Effective Bottom Absorption Area

To calculate the minimum number of modules necessary for an Eljen GSF System, the total square feet of the absorption area is divided by the effective bottom absorption area of the modules. The value of the effective bottom absorption area depends on the percolation rate. It could be either:

- 16 square feet per module if the percolation rate is 3 to 60 min/in, or
- 24 square feet per module if the percolation rate is 61 to 180 min/in

Minimum number of modules = absorption area square feet ÷ effective bottom absorption area of the modules

Examples: (400 gpd peak daily flow)

- 1) Percolation rate = 28 min/in
Total square feet = 684 sq ft
Minimum number of modules = $684 \text{ sq ft} \div 16 \text{ sq ft/module} = 43 \text{ modules}$
- 2) Percolation rate = 62 min/in
Total square feet = 904 sq ft
Minimum number of modules = $904 \text{ sq ft} \div 24 \text{ sq ft/module} = 38 \text{ modules}$

Calculating Number of Modules

<20 Inches of Suitable Soil – Shallow Limiting Zone Elevated Absorption Area

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When a site has less than 20 inches of suitable soil, the length of the shallow limiting elevated absorption area must be calculated using the HLLR table.

Length of absorption area = Peak daily flow ÷ HLLR

Subsequently, the number of modules is calculated as follows: Minimum number of modules = length of absorption area ÷ 4 ft (module length)

An absorption area sized using the HLLR may not be reduced. A qualified soil scientist will assign the HLLR and the ILR. However, it is the local agency SEO's responsibility to verify that the loading rates are consistent with the information provided in the soil morphological report.

Calculating Number of Modules

<20 Inches of Suitable Soil – Shallow Limiting Zone Elevated Absorption Area

Example:

HLLR = 3.5 gal/ft/day

Peak daily flow = 400 gpd for three bedrooms

- 1) Length of absorption area = Peak daily flow ÷ HLLR
 $400 \text{ gpd} \div 3.5 \text{ gal/ft/day} = 114.3$, round up to 115 linear feet
- 2) Minimum number of B43 modules = length of absorption area ÷ 4 ft (module length)
 $115 \text{ ft} \div 4 \text{ ft} = 28.75$ modules, round to 29 modules

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DESIGN SUMMARY TABLE

Percolation Rate	Reduction Allowed	GSF Module Area (ft ²)	Sand Perimeter	Sand at the Ends of Row	Sand Between Module Rows
3 min/in to 60 min/in	Up to 40%	16	Min 6"	Min 6"	Min 12"
61 min/in to 180 min/in	No	24	Min 18"	Min 6"	Min 36"
HLLR table	No	calculate using HLLR table	Total width of absorption area must be rounded up to nearest whole number	Min 6"	Not Applicable