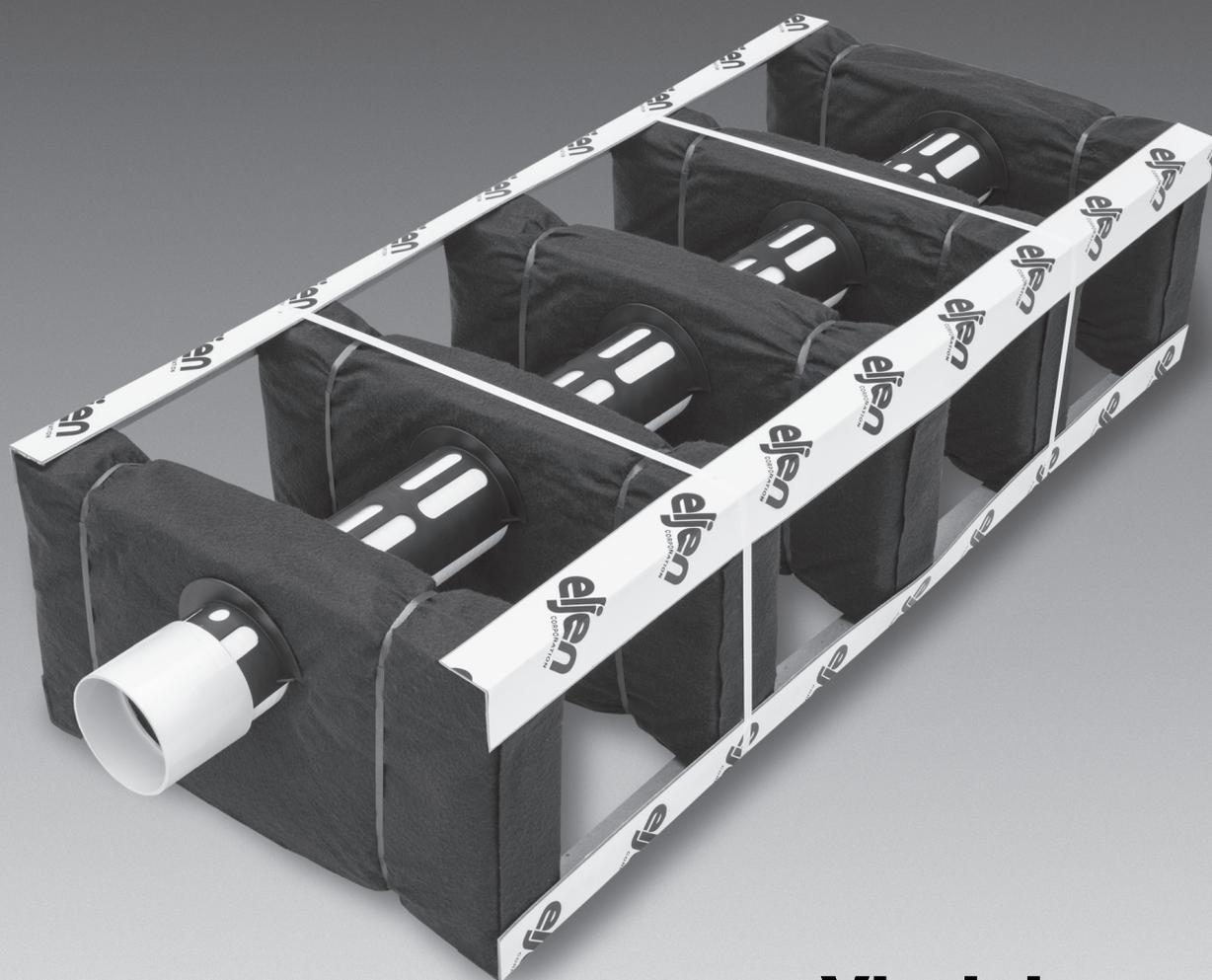


# Mantis

Wastewater Systems



## System Design & Installation Manual



**eljen**  
CORPORATION

*Innovative Environmental Products & Solutions Since 1970*

**Virginia**  
**June 2013**

**[www.eljen.com](http://www.eljen.com)**

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# Glossary of Terms

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**Mantis M<sup>5</sup> Series Units**

The Mantis M<sup>5</sup> Series units come preassembled and are 5 feet in length (as measured from the Support Distribution Pipe) and 12” high. 12” and 24” wide models are available. The 12” wide model is the Mantis 5.1, and the 24” wide model is the Mantis 5.2. All models have 6” of specified sand under and to the sides of the product. 1” of specified sand is placed over the units prior to backfill.

**Support Distribution Pipe**

The Mantis M<sup>5</sup> Series Support Distribution Pipe is 5 feet in length and constructed from crush resistant PVC Pipe. The pipes provide 3 pre-drilled one inch holes within each Filter Support Module at the 12, 5 and 7 o’clock position.

**Filter Support Module**

There are 5 Filter Support Modules for each M<sup>5</sup> unit. All Filter Support Modules are 4” thick. The 5.1 model is 12” wide and the 5.2 model is 24” wide.

**Specified Sand**

The Specified Sand envelope around the Mantis M<sup>5</sup> Series (6” minimum underneath, 6” minimum on the sides, 1” minimum on the top, and 8” in-between the Support Modules) shall meet the requirements as indicated in the Specified Sand Requirements chart listed below. This sand is an **ASTM C33 WASHED CONCRETE SAND WITH LESS THAN 10% PASSING #100 SIEVE AND LESS THAN 5% PASSING A #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**

Eljen Mantis M <sup>5</sup> Series ASTM C33 Specified Sand Requirements		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
0.375”	9.5 mm	100.0
#4	4.75 mm	95.0 – 100.0
#8	2.36 mm	80.0 – 100.0
#16	1.18 mm	50.0 – 85.0
#30	600 µm	25.0 – 60.0
#50	300 µm	5.0 – 30.0
#100	150 µm	< 10.0
#200	75 µm	< 5.0
Request a sieve analysis from your material supplier to ensure that the system sand meets the specification requirements listed above.		

**Design Flow**

The estimated design flow that is used to size a Mantis system is **150** gallons per day per Bedroom.

# Mantis M<sup>5</sup> General Description

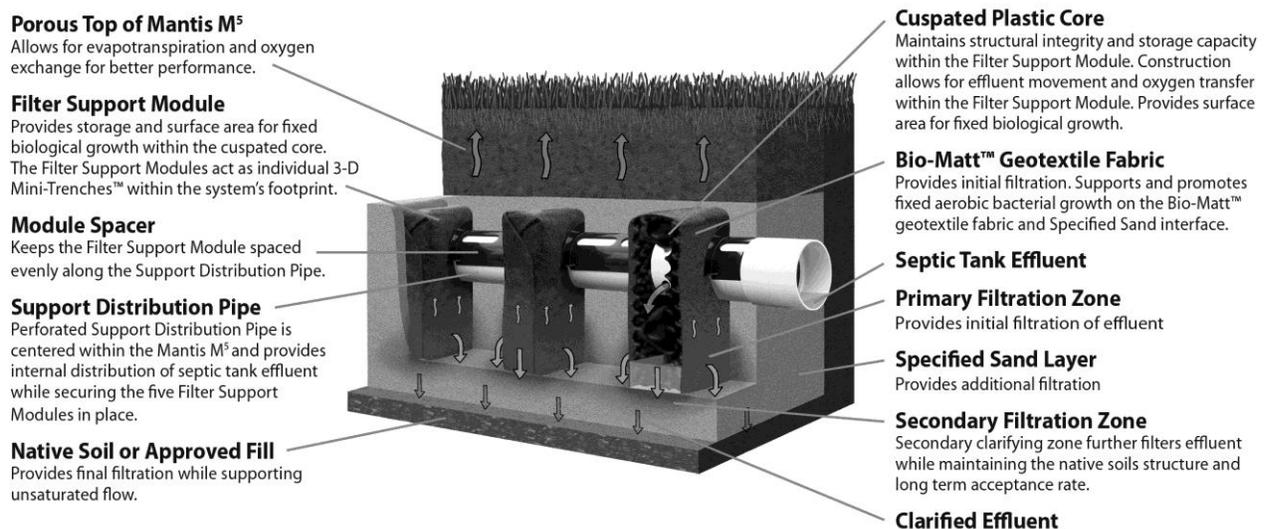
Note: Mantis M5 Series systems must be designed and constructed according to this Design & Installation Manual, the State of Virginia Sewage Handling and Disposal Regulations (12VAC5-610), and the Regulations for Alternative Onsite Sewage Systems (12VAC5-613), hereinafter the "Regulations". Additional criteria may be utilized. To receive design standards for specially engineered pressure systems or commercial systems, contact Eljen's Technical Resource Department at 1-800-444-1359.

## How the Mantis M<sup>5</sup> Series System Works

The Eljen Mantis M<sup>5</sup> Series is a wastewater dispersal and disposal technology that applies clarified effluent to the native soil through a proprietary filtering process. The Mantis M<sup>5</sup> protects the native soils long term acceptance rate by keeping the biological growth off the native soils and within the Mantis M<sup>5</sup> units. The Mantis M<sup>5</sup> utilizes 3-D Mini-Trenches™ to improve effluent quality resulting in greater performance, reliability, and ease of operation.

- The perforated Support Distribution Pipe is centered within the Mantis M<sup>5</sup> and provides internal distribution of septic tank effluent while securing the five Filter Support Modules.
- The Filter Support Modules filter septic tank effluent and act as individual 3-D Mini-Trenches™ within the systems footprint. Each module consists of a cusped core surrounded by Bio-Matt™ geotextile fabric. The Mantis M<sup>5</sup>'s unique design increases the available surface area within each module. This is known as *Infiltrative Surface Optimization (ISO)* and provides a system surface area that greatly exceeds that of the Filter Support Module, a traditional gravel trench or that of gravel replacement technology.
- Open air channels within the Filter Support Modules support and promote fixed aerobic bacterial growth on the Bio-Matt™ geotextile fabric interface.
- Septic tank effluent migrates through the Filter Support Modules and into the Specified Sand layer which surrounds each Mantis M<sup>5</sup> unit. The Filter Support Module clarifies septic tank effluent and assists in its delivery to the Specified Sand. This process promotes unsaturated flow in the Specified Sand and native soils while maintaining the native soils structure, long term acceptance rate, and its ability to effectively absorb the clarified effluent.
- The Specified Sand layer also protects the native soil from compaction, helps maintain existing pore spaces within the native soil column, and preserves the native soil's natural infiltration capacity which is critical for long-term performance.

FIGURE 1: MANTIS M<sup>5</sup> COMPONENTS



# Mantis M<sup>5</sup> Series Design Tables

**TABLE 2: Mantis M<sup>5</sup> Gravelless Equivalency Sizing**

Mantis M <sup>5</sup> Gravelless Equivalency Sizing		
Existing Gravel Permit Trench Length	Minimum Number of Mantis M5 Units Required	Mantis M5 Equivalent Trench Length (ft)
20	3	15
25	4	20
30	5	25
35	6	30
40	6	30
45	7	35
50	8	40
55	9	45
60	9	45
65	10	50
70	11	55
75	12	60
80	12	60
85	13	65
90	14	70
95	15	75
100	15	75

**Notes:**

- Mantis M<sup>5</sup> trench system row lengths listed in Table 2 above are for both Mantis M5.2 & M5.1 units. Mantis M<sup>5</sup> Equivalent Trench Length must be the same width (2' or 3') as the existing gravel permit trench length. When designing please verify you are meeting the minimum required system area based on design flow and soil type.
- A conventional gravel/pipe system can be easily converted to an Eljen Mantis M<sup>5</sup> gravelless system utilizing the following equivalencies based on 12 VAC 5-610-950.
  - Mantis M5.2 unit (3 foot wide trench) =
    - a. 20 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - b. 17.6 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
  - Mantis M5.1 unit (2 foot wide trench) =
    - c. 13.3 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - d. 11.7 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
- The minimum absorption area for single family residential dwellings shall be 400 ft<sup>2</sup>, requiring a minimum of 27 M5.2 units or 40 M5.1 units.

# Mantis M<sup>5</sup> Series Design Tables

**TABLE 3: Mantis M<sup>5</sup> Trench Sizing Square Feet per 100 Gallons**

Mantis M <sup>5</sup> Trench Sizing for Gravity & Pressure Systems							
Percolation Rate (Min/Inch)	Area Required (Ft <sup>2</sup> /100 Gal)						
	Gravity (ft <sup>2</sup> )	Gravity Gravelless (ft <sup>2</sup> )	Number of Mantis M5.2 Modules (3 ft Trench)	Number of Mantis 5.1 Module (2 ft Trench)	Low Pressure Distribution (ft <sup>2</sup> )	Number of Mantis M5.2 Modules (3 ft Trench)	Number of Mantis 5.1 Module (2 ft Trench)
5	110	83	6	9	110	8	11
10	120	90	6	9	120	8	12
15	132	99	7	10	132	9	14
20	146	110	8	11	146	10	15
25	158	119	8	12	158	11	16
30	174	131	9	14	164	11	17
35	191	144	10	15	170	12	17
40	209	157	11	16	176	12	18
45	229	172	12	18	185	13	19
50	251	189	13	19	193	13	20
55	275	207	14	21	206	14	21
60	302	227	16	23	217	15	22
65	331	249	17	25	228	16	23
70	363	273	19	28	240	16	24
75	398	299	20	30	251	17	26
80	437	328	22	33	262	18	27
85	479	360	24	36	273	19	28
90	525	394	27	40	284	19	29
95	575	489	33	49	288	20	29
100	631	536	36	54	316	22	32
105	692	588	40	59	346	24	35
110	759	645	44	65	379	26	38
115	832	707	48	71	416	28	42
120	912	775	52	78	456	31	46

**Notes:**

- Mantis M<sup>5</sup> Series System Sizing is based on Table 5.4 located in 12 VAC 5-610-950.
- The minimum Mantis system area shown in Table 3 above incorporates the following approved system sizing credit when converting gravel based systems to gravelless.
  - Mantis M5.2 unit =
    - a. 4.0 ft<sup>2</sup>/lf or 20 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - b. 3.52 ft<sup>2</sup>/lf or 17.6 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
  - Mantis M5.1 unit =
    - c. 2.66 ft<sup>2</sup>/lf or 13.33 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - d. 2.35 ft<sup>2</sup>/lf or 11.76 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
- The minimum absorption area for single family residential dwellings shall be 400 ft<sup>2</sup>, requiring a minimum of 27 M5.2 units or 40 M5.1 units.

# Mantis M<sup>5</sup> Series Design Tables

**TABLE 4: Mantis M<sup>5</sup> Trench Sizing Square Feet per Bedroom**

Mantis M <sup>5</sup> Trench Sizing for Gravity & Pressure Systems							
Percolation Rate (Min/Inch)	Area Required (Ft <sup>2</sup> /Bedroom)						
	Gravity (ft <sup>2</sup> )	Gravity Gravelless (ft <sup>2</sup> )	Number of Mantis M5.2 Modules (3 ft Trench)	Number of Mantis 5.1 Module (2 ft Trench)	Low Pressure Distribution (ft <sup>2</sup> )	Number of Mantis M5.2 Modules (3 ft Trench)	Number of Mantis 5.1 Module (2 ft Trench)
5	165	124	9	13	165	11	17
10	180	135	9	14	180	12	18
15	198	149	10	15	198	14	20
20	218	164	11	17	218	15	22
25	237	178	12	18	237	16	24
30	260	195	13	20	255	17	26
35	286	215	15	22	260	18	26
40	314	236	16	24	264	18	27
45	344	258	18	26	279	19	28
50	376	282	19	29	293	20	30
55	412	309	21	31	309	21	31
60	452	339	23	34	325	22	33
65	496	372	25	38	342	23	35
70	544	408	28	41	359	24	36
75	596	447	30	45	375	25	38
80	656	492	33	50	394	27	40
85	718	539	36	54	409	28	41
90	786	590	40	59	424	29	43
95	862	733	49	74	431	29	44
100	946	804	54	81	473	32	48
105	1038	882	59	89	519	35	52
110	1138	967	65	97	569	38	57
115	1248	1061	71	107	624	42	63
120	1368	1163	78	117	684	46	69

**Notes:**

- Mantis M<sup>5</sup> Series System Sizing is based on Table 5.4 located in 12 VAC 5-610-950.
- The minimum Mantis system area shown in Table 3 above incorporates the following approved system sizing credit when converting gravel based systems to gravelless.
  - Mantis M5.2 unit =
    - 4.0 ft<sup>2</sup>/lf or 20 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - 3.52 ft<sup>2</sup>/lf or 17.6 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
  - Mantis M5.1 unit =
    - 2.66 ft<sup>2</sup>/lf or 13.33 ft<sup>2</sup> per unit in Soil Classes I – III (5 – 90 min/inch) &
    - 2.35 ft<sup>2</sup>/lf or 11.76 ft<sup>2</sup> per unit in Soil Class IV (>90 – 120 min/inch)
- The minimum absorption area for single family residential dwellings shall be 400 ft<sup>2</sup>, requiring a minimum of 27 M5.2 units or 40 M5.1 units.

## 1.0 General System Information

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**1.1 MANTIS M<sup>5</sup> GRAVELLESS MATERIAL USE BY VDH ONSITE SOIL EVALUATORS (OSE):** In accordance with GMP #135.A, OSEs employed by VDH will include a statement on every VDH permit that allows the use of gravelless material.

The agency approved statement is as follows: *“Gravelless material may be used, in lieu of gravel and pipe, within the approved absorption area in accordance with Table 5.4 of 12VAC5-610. If gravelless material is used, then the distribution box location remains the same. Install the amount shown for gravel, or, at a minimum, \_\_\_ trenches, \_\_\_ feet long, \_\_\_ depth, \_\_\_ foot center-to-center spacing. Contact [local] Health Department at [local health department number] to address installation questions.”*

As stated in GMP #135.A, if sufficient area for use of a gravity gravelless system exists (at regulation sizing), but there is insufficient area for a gravity gravel and pipe trench system, VDH OSEs will specify a primary absorption area based on regulation sizing for gravelless material. The decision process for a VDH OSE is outlined in Appendix A of GMP #135.A.

For permits based on VDH OSE work, and issued prior to the effective date of the emergency regulations, gravelless material may be used in lieu of gravel and pipe when installed in accordance with Table 5.4 of the Regulations. Per GMP #135.A, if gravelless material is used, the VDH OSE will document on the inspection statement and as-built drawing all modifications made to use the gravelless material.

When gravelless material is used, the total area (“footprint”) for the primary and reserve area (if applicable) must comply with the minimum requirements of the regulations and the manufacturer’s instructions.

For specific information please refer to GMP #135.A.

**1.2 MANTIS M<sup>5</sup> GRAVELLES MATERIAL USE BY PRIVATE PROFESSIONAL ENGINEERS (PE) AND ONSITE SOIL EVALUATORS (OSE):** In accordance with 12VAC5-610-330, 12VAC5-610-930.F.8, and Va. Code Section 32.1-164.1, gravelless material may be used, provided the certifying PE or OSE approves such use. Private sector OSEs and PEs may use gravelless material when designating primary absorption areas and reserves (if applicable) for certification letters and subdivision approvals.

For specific information please refer to GMP #135.A.

**1.3 MANTIS M<sup>5</sup> FIELD SIZE AND NUMBER OF UNITS:** System size will vary depending on design flow and soil analysis. Tables 3 & 4 indicate the minimum number of Mantis units required for various soil percolation rates, distribution methods and design flows.

**1.4 NON-RESIDENTIAL BUILDINGS & RESIDENTIAL INSTITUTIONS:** Commercial systems require different sizing and design criteria as compared to residential systems. Please contact Eljen’s Technical Resource Department at 1-800-444-1359 for more information on commercial systems.

**1.5 DEPTH TO GROUND WATER OR RESTRICTIVE LAYER:** As required by state regulations; the bottom of the Mantis M<sup>5</sup> Series system requires an 18-inch minimum separation distance from the maximum seasonal high groundwater table or bedrock. *Note: 18” separation distance must be measured from the bottom of 6” sand layer. The 18” separation distance may be reduced when the product is used in conjunction with an AOSS approved TL-2 or TL-3 effluent alternative treatment system.*

**1.6 SPECIFIED SAND SPECIFICATION FOR MANTIS M<sup>5</sup> SERIES SYSTEMS:** The first 6 inches of Specified Sand immediately under, between filter support modules, between unit rows and around the perimeter of the Mantis M<sup>5</sup> Series system must be an **ASTM C33 WASHED CONCRETE SAND WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 5% PASSING A #200 SIEVE.**

**1.7 VEHICULAR TRAFFIC AND PAVED AREAS OVER SYSTEM:** All vehicular traffic is prohibited over the Mantis system. This is due to the compaction of material required to support traffic loading. Compaction greatly diminishes absorption below the system and reduces the void space that naturally exists in soils for oxygen transfer and water migration. For shallow installations, light-weight track mounted machines are best for setting the final grade. It is also permissible to back-blade the soil to set final minimum cover.

**1.8 SYSTEM VENTING:** Eljen requires venting when the system has greater than 18” of cover material as measured from the top of the unit to finished grade. This will ensure proper aeration of the units.

## 1.0 General System Information

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**1.9 BACKFILL & FINISH GRADING:** Complete backfill over the Mantis M<sup>5</sup> units followed by topsoil to a minimum depth of 6 inches. 1 inch of the fill is Specified Sand, immediately on top of the unit. Systems with total cover that exceeds 18" as measured from the top of the units to finished grade shall be vented at the distal (far) end of the system. Backfill material shall be well graded sandy fill; clean, porous, and devoid of large rocks. Divert surface runoff with diversion ditches or berms. Finish grade to prevent surface ponding. Seed and loam system area to protect from erosion.

**1.10 MAXIMUM BURIAL DEPTH:** Maximum burial depth for Mantis M<sup>5</sup> units is 8 feet from the top of unit in trench applications.

**1.11 EFFLUENT FILTERS:** Effluent filters are recommended as a means of preventing solids from leaving the tank.

**1.12 DISTRIBUTION PIPE LAYOUT:** No additional distribution pipe is needed to connect units to one another. The Support Distribution Pipe runs through the center of the units and provides distribution for all configurations.

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

However, if such units are proposed to be used, other measures must be taken to prevent solids from leaving the tank and entering the drain field system such as:

- Increasing the septic tank capacity by a minimum of 30%, or
- Installation of a second septic tank installed in series, or
- Installation of an appropriate sized septic tank outlet effluent filter.

*NOTE: Eljen recommends the use of septic tank effluent filters on all systems, especially on those systems that a garbage disposal is installed. It is recommended that effluent filters be used even if the tanks design capacity has been increased. Filters with higher filtration are recommended for systems with garbage disposals.*

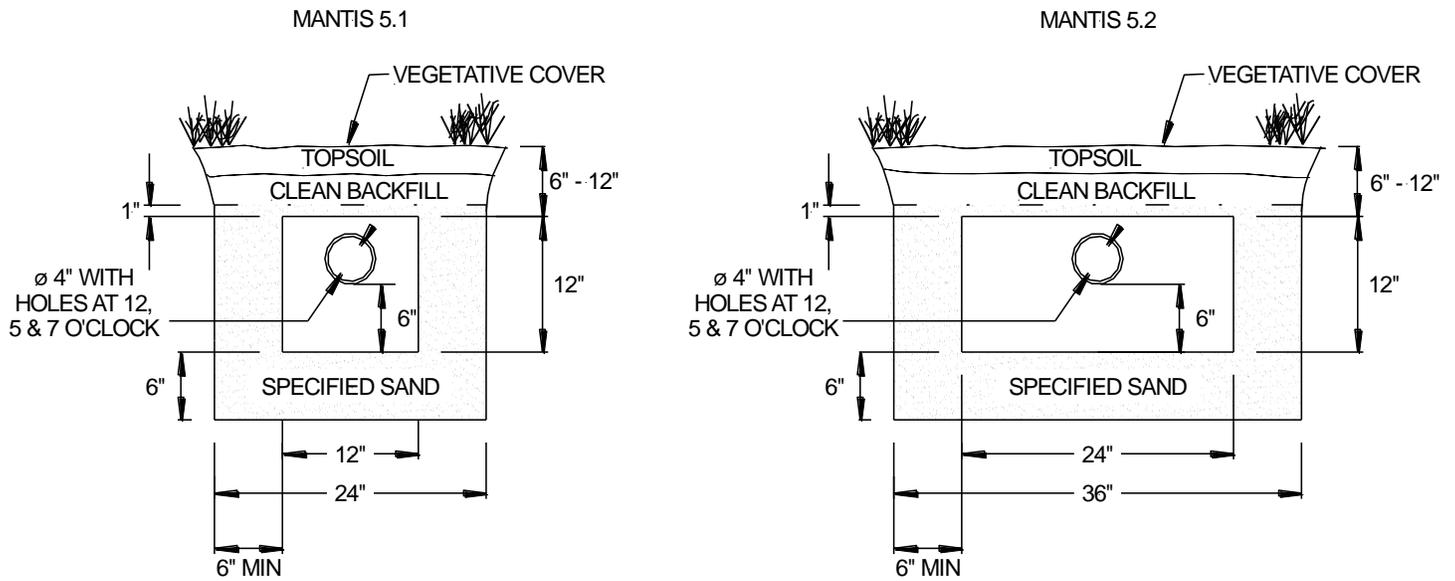
**1.14 ADDITIONAL FACTORS EFFECTING RESIDENTIAL SYSTEM SIZE:** Homes with expected higher than normal water usage should consider increasing the septic tank volume as well as increasing the size and number of units in the disposal area. For example: Homes with tubs holding more than 100 gallons or utilizing other high use fixtures and homes with higher than normal occupancy should consider septic tank and drain field modifications.

**1.15 WATER SOFTENERS OR CONDITIONERS:** Discharge of water softener or conditioner backwash to Eljen Products is not allowed. Discharge from these devices shall be into a separate disposal system meeting the requirements of State and Local Regulations.

**1.16 PLANS AND SPECIFICATIONS:** Typical system drawings and specifications are shown in this manual. When used in conjunction with a permit sketch, site specific specifications, and manufacturer installation criteria, these documents will normally be sufficient to assure a system can be properly installed. In some instances where a complex system is encountered, formal plans and specifications may be required.

## 1.0 General System Information

FIGURE 2: MANTIS M<sup>5</sup> TRENCH CROSS SECTION



## 2.0 Design for Level or Sloped Sites

**TRENCH ROW SPACING:** 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. The Mantis M<sup>5</sup> units and Specified Sand must be installed level at their design elevations.

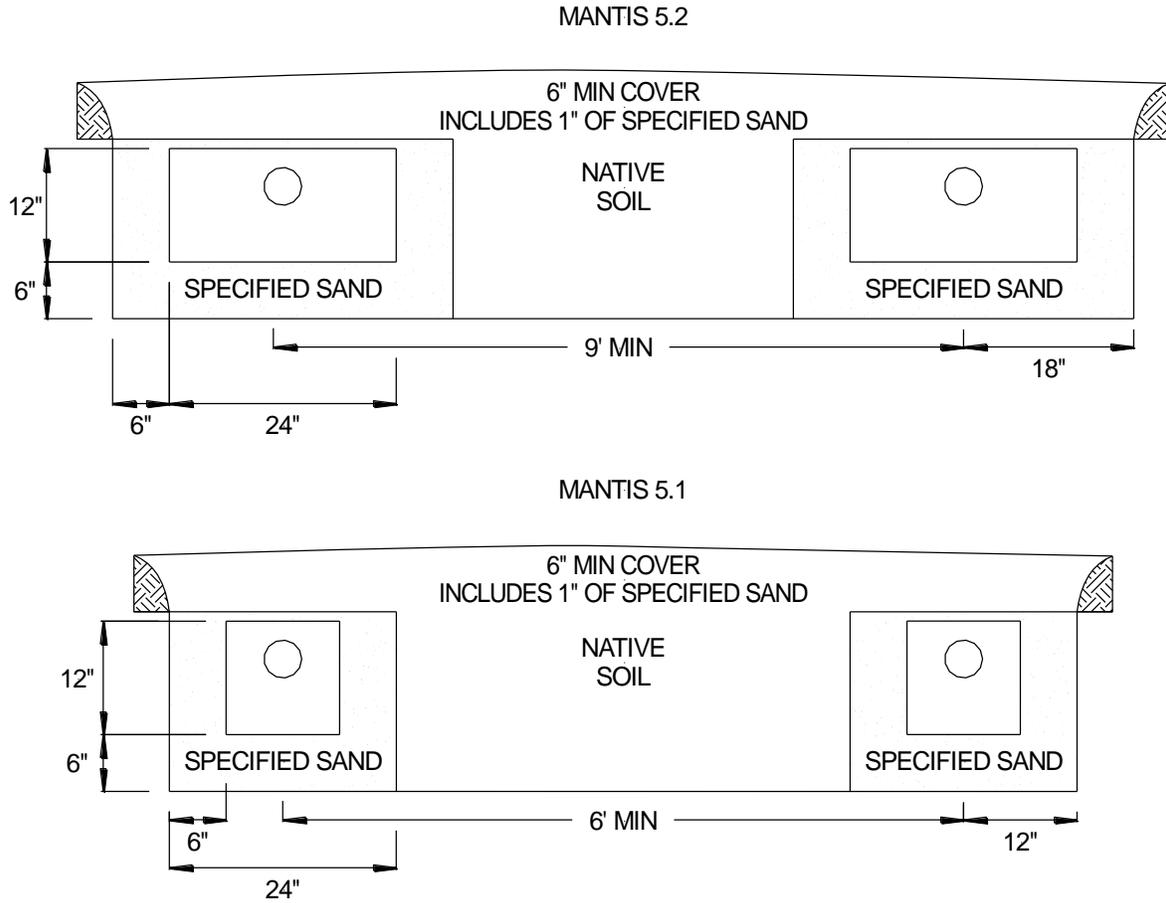
### 3.0 Trench Installation Guidance

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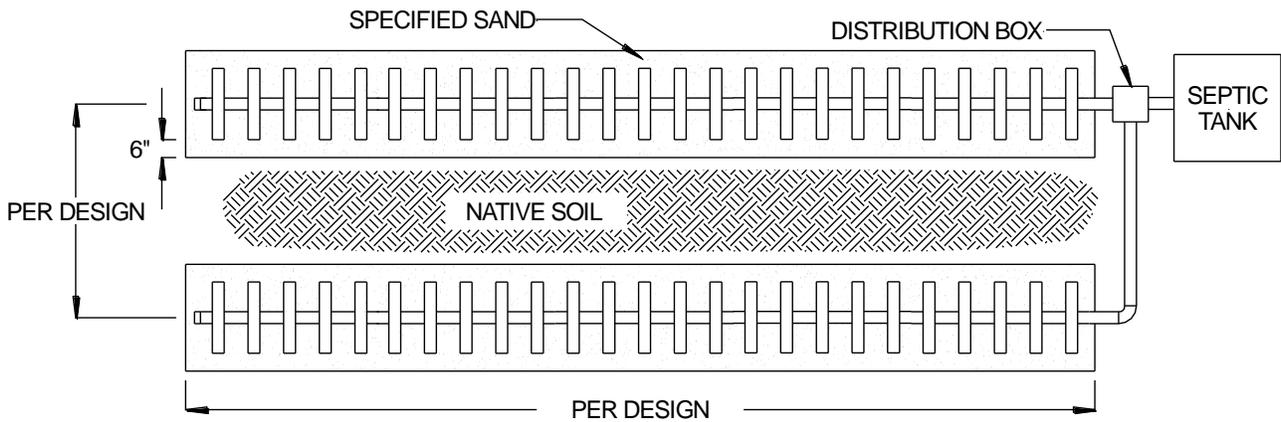
1. Carefully lay out all boundaries defining the location and elevation for all system components.
2. Prepare the site according to state and local regulations. Do not install a system on frozen or saturated soils. Take precautions not to compact or smear the area with heavy machinery.
3. Plan all drainage 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 a minimum thirty-six inch (36") wide level trench for the Mantis 5.2 unit or a minimum twenty-four inch (24") wide level trench for the Mantis 5.1 unit. Remove all organic soil, roots, and rocks within the absorption trench area.
5. Scarify receiving layers including sidewalls to eliminate soil smearing. Once scarifying is completed, avoid walking over prepared absorption area until the Specified Sand has been placed on the bottom of the trench.
6. Place, compact, and rake a minimum 6" level layer of Specified Sand along the trench bottom. Specified Sand must meet the minimum requirements listed on Table 1 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 Specified Sand layer.
7. Center the Mantis units in the trench with the fabric side up, adjust the filter support modules to ensure they are spaced evenly and have not shifted during placement. **NO PRE-DRILLED HOLES SHOULD BE VISIBLE.**
8. Connect the units by inserting the Support Distribution Pipe to one another. Direction changes are accomplished by using a variety of the shelf fittings.
9. Install a termination cap or vent piping if required at the distal (far) end of the distribution pipe.
10. Begin placing Specified Sand between the filter support modules and to the sides of the units. Specified Sand must be placed lightly and may be accomplished with a backhoe or other suitable equipment. **DO NOT** drop full loads of Specified Sand directly on the units.
11. Steps for placement of Specified Sand.
  - a. Starting at the top center of the units, use a minimal amount of Specified Sand necessary to set in place the bottom section of the Filter support modules at their correct spacing.
  - b. Compact the sand that is in-between the filter support modules. Ensure that the void area under the Support Distribution Pipe is filled and compacted with Specified Sand.
  - c. Additional Specified Sand is lightly added between the filter support modules and along the sides of the Mantis units to bring the sand fill 1-inch above the Filter Support Modules to account for sand settling.
  - d. Continue to moderately tamp and compact the sand that is in-between the Filter Support Modules. Spread additional Specified Sand as necessary.
12. Set distribution box to the proper elevation to achieve a 1/8" drop per foot to the first unit. Make the connection to the beginning of the first unit from the distribution box with SDR-35 pipe or equivalent.
13. Complete backfill over the Mantis M<sup>5</sup> units followed by topsoil to a depth of 6" – 18" as measured from the top of the units. 1" of the fill is Specified Sand, immediately on top of the unit. Systems with total cover that exceeds 18" as measured from the top of the units to finished grade shall be vented at the distal (far) end of the system. Backfill material shall be well graded sandy fill; clean, porous, and devoid of large rocks. Divert surface runoff with diversion ditches or berms. Finish grade to prevent surface ponding. Seed or sod excavated areas to protect against erosion. Do not drive or pave over the absorption area.

### 3.0 Trench Installation Drawings

**FIGURE 3: MANTIS M<sup>5</sup> MULTIPLE TRENCH CROSS SECTION**



**FIGURE 4: MANTIS M<sup>5</sup> MULTIPLE TRENCH PLAN VIEW**



*Note: Center-to-center trench 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. The Mantis M<sup>5</sup> units and Specified Sand must be installed level at their design elevations.*

## 4.0 Pumped System Guidance

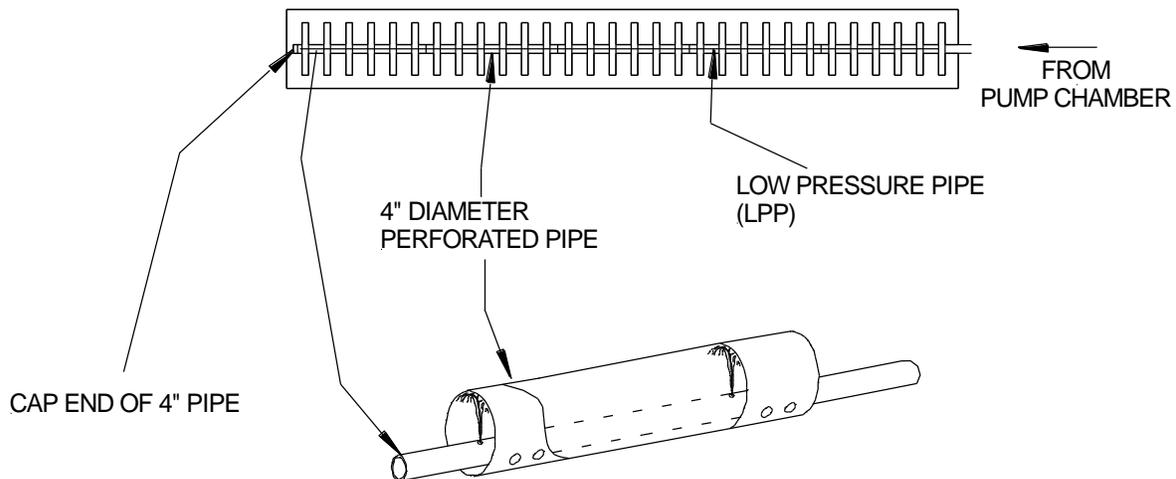
**4.1 PUMP DOSED DISTRIBUTION BOX:** Specify an oversized distribution box for pumped systems. Provide velocity reduction in the D-box with a tee or baffle.

**4.2 PRESSURE OR PUMPED DOSED DESIGN CRITERIA:** Dosing volume must be set to deliver a maximum of 6 gallons per Mantis 5.2 per dose cycle or 3 gallons per Mantis 5.1 per dose cycle.

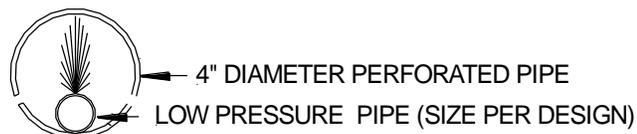
**4.3 LOW PRESSURE DISTRIBUTION:** Per 12 VAC 5-610-940 (c) (1), Pressure percolation lines should have a minimum 1 1/4 inch inside diameter. Orifices should be designed at 3/16 inch to 1/4 inch in diameter and at pre-determined intervals per design and code. Design requirements will vary depending on length of system and dose volume. At least one drain hole per line at the 6 o'clock position must added to each line.

Flushing ports are required at the distal end of all pressure distribution networks. Flushing valves and vents can be consolidated in larger systems by using valves on the outlet manifold.

**FIGURE 5: MANTIS M<sup>5</sup> SERIES PRESSURE DISTRIBUTION – ORIFICE LAYOUT**

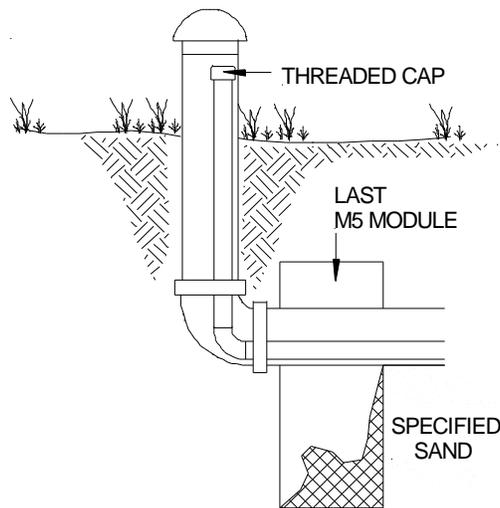


**PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS**



## 4.0 Pump System Guidance

FIGURE 6: MANTIS M<sup>5</sup> SERIES PRESSURE CLEAN OUT FOR PRESSURIZED SYSTEMS

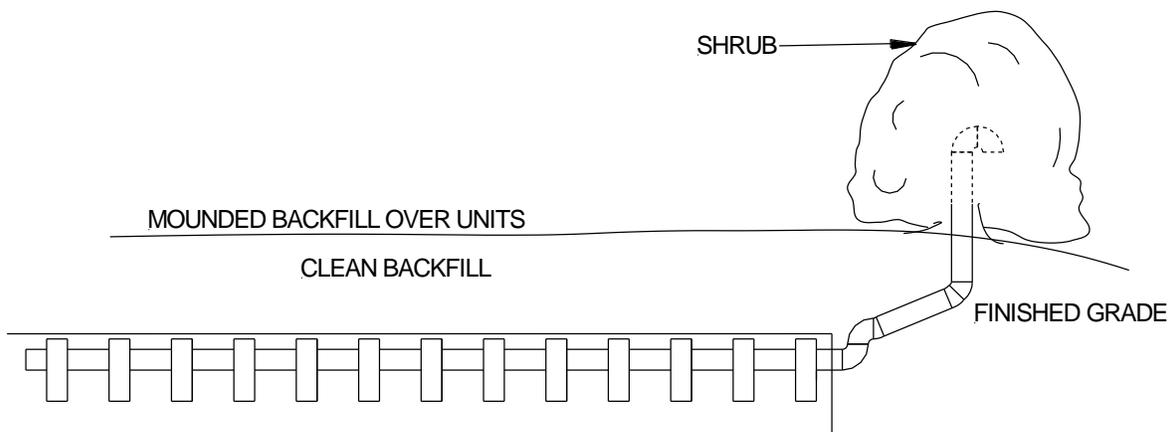


## 5.0 System Ventilation Guidance

**SYSTEM VENTILATION:** Air vents are required at the distal end of unit rows on all absorption systems with more than 18 inches of soil cover as measured from the top of the Mantis units or located under impervious surfaces. This will ensure proper aeration of the Mantis system. The extension of the distribution pipe at the distal end of each row to the vent provides adequate delivery of air into the Mantis system, as shown in Figure 7.

The vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs. Corrugated pipe can be used to vent the system. Make sure the pipe has a pitch towards the surface so it does not accumulate water or condensation that will close off the airflow to the system.

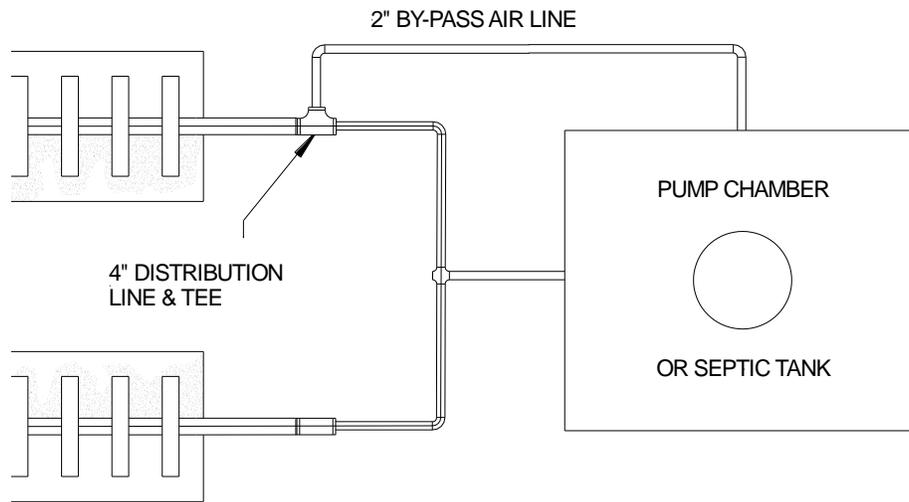
FIGURE 7: MANTIS M<sup>5</sup> SERIES VENTING DETAIL FOR GRAVITY SYSTEMS



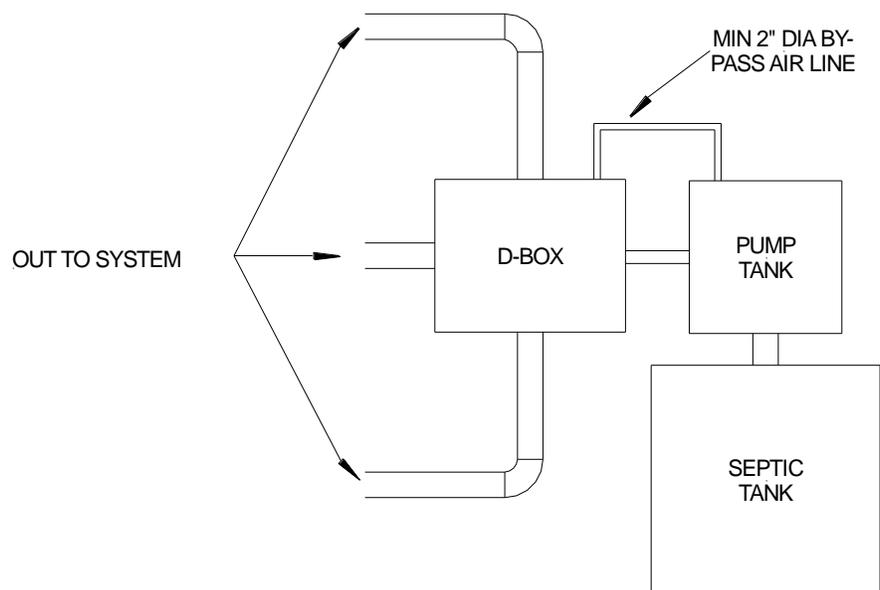
## 5.0 System Ventilation Example Drawing

If a pressurized system is specified with greater than 18 inches of cover, an additional 2-inch minimum airline must be extended from the 4-inch distribution line back to a knockout or riser on the septic tank or pump chamber (see Figure 8). If a pump dosed system is specified with greater than 18 inches of cover, an additional 2-inch minimum airline must be extended from the D-box back to a knockout or riser on the septic tank or pump chamber (see Figure 9). These methods will help maintain the continuity of airflow from the field.

**FIGURE 8: MANTIS M<sup>5</sup> SERIES 2" BY-PASS LINE FOR PRESSURIZED SYSTEM**



**FIGURE 9: MANTIS SERIES 2" BY-PASS LINE FOR PUMP DOSED SYSTEM**



## 6.0 Recommended Notes on Design Plans

- This system is not designed for backwash from a water softener.
- This system (is/is not) designed for the use of a garbage disposal.
- The Mantis system is not for use under vehicular traffic or for under paving applications.
- Organic topsoil layer must be removed from trench and slope extension areas prior to approved fill or Specified Sand placement. Scarify subsoil prior to select fill or Specified Sand placement.
- All Mantis M<sup>5</sup> Series installations utilize a Specified Sand envelope around the units. 6" minimum underneath, 6" minimum on the sides, 1" minimum on top, and 8" between the Filter Support Modules. The Specified Sand specification is listed below: The Specified Sand shall be washed concrete sand meeting the requirements of ASTM C33 with less than 10% passing a #100 sieve and less than 5% passing a #200 sieve.

### SPECIFIED SAND SIEVE REQUIREMENTS

Eljen Mantis M <sup>5</sup> Specified Sand Requirements		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
0.375"	9.5 mm	100.0
#4	4.75 mm	95.0 – 100.0
#8	2.36 mm	80.0 – 100.0
#16	1.18 mm	50.0 – 85.0
#30	600 µm	25.0 – 60.0
#50	300 µm	5.0 – 30.0
#100	150 µm	< 10.0
#200	75 µm	< 5.0
Request a sieve analysis from your material supplier to ensure that the system sand meets the specification requirements listed above.		

- Eljen Corporation recommends the use of an appropriate sized septic tank effluent filter for all Mantis systems.
- Pumped systems shall have an oversized distribution box utilizing a velocity reduction tee or baffle.
- Eljen mandates venting when the system will have more than 18" of cover material as measured from the top of the unit to finished grade.
- After backfill, there should be a minimum of 6" of material as measured from the top of the Filter support modules to the finished grade. The first inch of that fill is specified sand.
- Backfill and Finish Grading: Carefully place backfill over the units, followed by a total minimum depth of 6 – 12 inches of well graded sandy fill; clean, porous, and devoid of rocks, as measured from the top of the filter support modules. Finish grade must divert surface runoff from the soil treatment area and prevent surface ponding. Protect the system area from erosion by loaming and seeding or by using other approved methods of erosion control.
- Fill material shall meet the Eljen Mantis M<sup>5</sup> Series Design & Installation Manual requirements. All fill material shall be clean sand, free of topsoil, directly beneath the system area.
- For pumped systems, set pump floats or pump control panels to deliver a maximum of 6 gallons per Mantis 5.2 per dose cycle or 3 gallons per Mantis 5.1 per dose cycle.
- This design complies with and must be installed in accordance with the most current Eljen Design and Installation Manual.



## 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.



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