



# MANTIS

*Wastewater Leaching System*

## Connecticut Design & Installation Manual

March 2012



**536-8**



**536-8 LowPro**

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## Terms and Definitions

**MANTIS 536-8** The Mantis 536-8 unit comes preassembled and is 5 feet in length (as measured from the Support Distribution Pipe) x 36" wide x 18" high. The system is installed in a minimum 48" wide trench with a Specified Sand envelope around the Mantis units.

**MANTIS 536-8 LowPro** The Mantis 536-8 LowPro unit comes preassembled and is 5 feet in length (as measured from the Support Distribution Pipe) x 36" wide x 12" high. The system is installed in a minimum 48" wide trench with a Specified Sand envelope around the Mantis units.

**Specified Sand** The Specified Sand envelope around the Mantis units (6" minimum underneath, 6" minimum on the sides, 1" minimum on the top, and 3" in-between the Support Modules) shall meet the requirements as indicated in the Eljen Mantis Specified Sand Requirements chart listed below. This sand is a medium to coarse textured, washed, silica sand with less than 10% passing a #100 sieve and less than 5% passing a #200 sieve based on a wet sieve analysis. If your material falls outside of the specification, contact Eljen's Technical Resource Department at 1-800-444-1359 for a review of the sieve report. Eljen may approve the material under certain conditions to be used for the Specified Sand envelope around the Mantis units.

Some material suppliers are manufacturing their Connecticut Select Fill so that it will also meet the requirements of the Eljen Specified Sand Requirements specification, in such cases, that Connecticut Select Fill material can be used for the fill package and the sand envelope around the Mantis units as described above. Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

Eljen Mantis Specified Sand Requirements		
Sieve Size	Sieve Square Opening Size (mm)	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.		

**LPP** (Low Pressure Pipe) used for systems under pressure.

**SM** (Support Module) 18" high for the 536-8 unit or 12" high for the 536-8 LowPro unit, provides surface area for treatment of waste water and support for the Support Distribution Pipe (SDP). All surfaces of the Support Modules allow absorption into the surrounding specified washed sand.

**SDP** (Support Distribution Pipe) Provides module support/internal distribution and a venting conduit. The SDP houses the LPP when pressure distribution is required.

## General Description

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The Mantis 536-8 series has a unique design. Stone aggregate is replaced with Support Modules (SM) evenly spaced along a High-Density Polyethylene (HDPE) Support Distribution Pipe (SDP). Support Modules provide structural integrity, flow channels, and void space. The SDP provides structural integrity, internal distribution and acts as a venting conduit with either gravity or pressure installations.

The Mantis 536-8 and 536-8 LowPro units have nominal dimensions of (5' long) x (36" wide) x (18" high) and (5' long) x (36" wide) x (12" high) respectively. Eight Support Modules (SM) are spaced evenly along a 5 foot SDP with approximately 3 inches of Specified Sand between each Support Module. Support Modules are constructed of recycled high-impact polystyrene in a variety of dimpled shaped configurations. Each module is individually protected with a factory installed high quality geotextile fabric that protects the tops and sides of all Modules. The bottom of the Support Modules is open and has no fabric covering.

### **Gravity Distribution Systems:**

The factory installed Support Distribution Pipe (SDP) provides an invert height of 12 or 6 inches for gravity distribution. 4-inch couplings are supplied for the SDP and come preinstalled. The installing contractor must supply termination caps for the invert pipe(s) and material for system venting when required. Unlike previous Mantis models, Distribution pipes are not permitted for use on top of the Mantis 536-8 series. See Figures 1-6 for product cross-sections and venting details.

### **Pumped Distribution Systems:**

There are two ways to distribute effluent in the Mantis systems when a pump is required: Pressure dosing and pressure distribution. When pressure dosing is used, pump up to an oversized distribution box with baffles or a velocity reduction tee and then gravity flow the wastewater to the Mantis system. This method is the most cost effective and the easiest to install. Set pump floats or control panels to deliver a maximum of 12 gallons per Mantis 536-8 unit or 6 gallons per Mantis 536-8 LowPro unit per dosing cycle.

The second method of distributing effluent in pump systems is via pressure distribution. Pressure distribution utilizes low pressure pipe and specific orifice opening sizes based on a number of criteria. These systems are designed by professional engineers and are usually designed as part of a wastewater management program and require annual maintenance to be performed on the low pressure pipe network. System designers should contact Eljen's Technical Resource Department at 1-800-444-1359 for guidance when designing these types of systems.

### **Serial Distribution Systems:**

Gravity or dosed Mantis systems on sloped sites shall be serially loaded and utilize a drop box or high-level overflow box on each trench line. This will ensure that there is a continuity of air transfer throughout the system.

### **System Venting:**

Eljen mandates venting for the Mantis series when the system will have greater than 18" of cover material as measured from the top of the unit to finished grade. This will ensure proper aeration of the Modules and sand filter. The Mantis has aeration channels inside the Support Modules in each unit. Under normal operating conditions, only a fraction of the area inside the Support Modules is in use. The unused area inside the Support Modules remains 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 Mantis 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 Mantis system. To maintain this air flow and fully aerate the Mantis system, it is important that air vents are located only on the distal end of each Mantis pipe network.

If a pumped system is specified and has more than 18" of cover as measured from the top of the unit to finished grade, an additional 2" air line must be extended from the Mantis system distribution box back to the riser on the septic tank or the pump tank as shown in Figure 8. This maintains the continuity of air flow from the modules back into the house plumbing.

## **General Description**

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In the gravity fed Mantis system, the vent is usually a 4" diameter pipe extended to a convenient location behind shrubs. If the vent is extended, the pipe must not drain effluent and must have an invert higher than the system. When venting a gravity or pump system, the use of a Granular Activated Charcoal (or Carbon) Filter will address any odor issues that may occur.

### **System Cover:**

After backfill, there should be a minimum of 10" of material as measured from the top of the unit to the finished grade. The first inch of the fill is specified sand. Systems with more than 18" of cover material as measured from the top of the unit to the finished grade must be vented. Use clean native fill or fill material devoid of large rocks to complete the backfill process. Divert surface runoff with diversion ditches or berms. Finish final grade for excavated areas to prevent surface runoff from collecting on the system disposal area. Seed or sod excavated areas to protect against erosion. As with all systems, do not drive or pave over the disposal area.

### **Pre-Drilled Holes:**

The Support Distribution Pipe (SDP) is pre-drilled at the factory with 1-inch diameter holes at the 5, 7 & 12 o'clock positions within each Support Module. These internal holes insure 100% positive effluent transfer and venting to all Modules in the system. Unlike previous Mantis models, Distribution pipes are not permitted for use on top of the Mantis 536-8 series. This design provides 100% usage of bottom and sidewall area.

### **Vehicular Traffic or Mantis Under Paved Areas:**

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.

### **Non-Residential Buildings & Residential Institutions:**

Determine daily design flow unless specific water use data is available for the facility. Design flow based on metered flows must use a minimum 1.5 safety factor applied to all metered average daily water use. See the Connecticut Public Health Code Tables 4, 7, and 8 for the applicable sizing requirements of these systems.

### **Garbage Disposals:**

The use of a garbage disposal is not recommended as they can cause major septic system problems by generating an increased amount of suspended solids, grease and nutrients. If a garbage disposal is installed, a dual compartment septic tank must be used, and the overall volume of the tank must be increased by 250 gallons.

### **Water Softeners:**

The Connecticut Public Health Code prohibits the discharge of wastewater from water treatment systems to subsurface sewage disposal systems unless otherwise authorized by the Department of Environmental Protection (DEP). Onsite disposal of water treatment system wastewater via a separate/dedicated subsurface disposal system shall be in accordance with DEP guidance or General Permit.

### **Large Tubs:**

Many homes today have large capacity bathroom tubs. The Connecticut Public Health Code requires that the capacity of the septic tank be increased by 250 gallons for each 100 to 200 gallon tub, and the septic tank capacity be increased by 500 gallons for each tub over 200 gallons.

### **Septic Tank Effluent Filters:**

Eljen Corporation requires the use of an appropriate sized septic tank effluent filter for all Mantis systems.

### **Mantis Installation Checklist:**

An installation checklist is included at the end of this manual and can be used by septic inspectors or contractors as supporting documentation for their client files.

## Mantis System Installation Guidance

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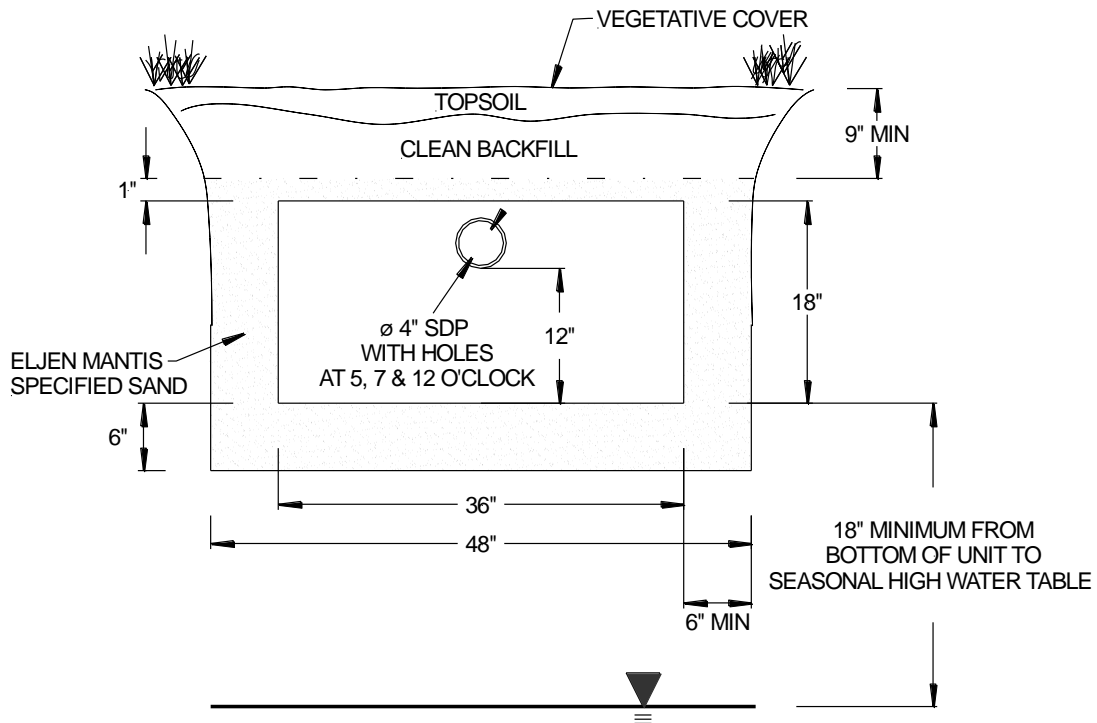
1. Carefully lay out the system components and boundaries defining the location and elevation for all trenches and distribution or drop boxes based on the outlet elevation of the septic tank and pipe grades required to maintain flow to each component.
2. Prepare the site according to state and local regulations. Do not install a system on frozen or saturated soils. When installing the Mantis in clayey soils, take precautions not to compact 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 forty-eight inch (48") wide level trench.
5. Remove all organic soil and roots within the absorption trench area.
6. Scarify receiving layers including sidewalls to eliminate soil smearing. Once scarifying is completed, avoid walking over prepared absorption area until 6" minimum of the Specified Sand has been placed on the bottom of the trench.
7. Place, compact, and rake a minimum 6" finished level layer of Specified Sand along the trench bottom. Specified Sand must meet the minimum requirements listed on the chart on Page 3 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.
8. Place the Mantis units in the trench with the fabric side up.
9. Adjust the modules to ensure they are spaced evenly and have not shifted during placement.
10. Center the units along the trench length. The remaining units are joined by connecting the Support Distribution Pipe (SDP) to one another. All pipe connections must be primed and glued.
11. Install termination caps at the end of the Support Distribution Pipe on each trench line to prevent soil intrusion into the Mantis units.
12. Direction changes are accomplished easily and quickly by using a variety of inexpensive off the shelf fittings. 90°, 45°, 22.5°, T, TY, and Y fittings are readily available at most local suppliers.
13. Specified Sand filling between and over the units may begin once the units are in the trench. Specified Sand must be placed lightly and may be accomplished with a backhoe or other suitable equipment.
14. Steps for placement of Specified Sand.
  - a. Starting at the top center of the Mantis units, use a minimal amount of Specified Sand necessary to set in place the bottom section of the Support Modules at their correct spacing.
  - b. Using a standard 2" x 4" wood stud, tamp and compact the sand that is in-between the Support Modules. Ensure that the void area under the Support Distribution Pipe is filled and compacted with Specified Sand.
  - c. After the Modules are set in place, cut the plastic straps holding the cardboard supports on the sides of the Mantis units.
  - d. Remove the cardboard supports from the bottom of the Mantis units by sliding them outward and along the bottom of the trench.

## Mantis System Installation Guidance

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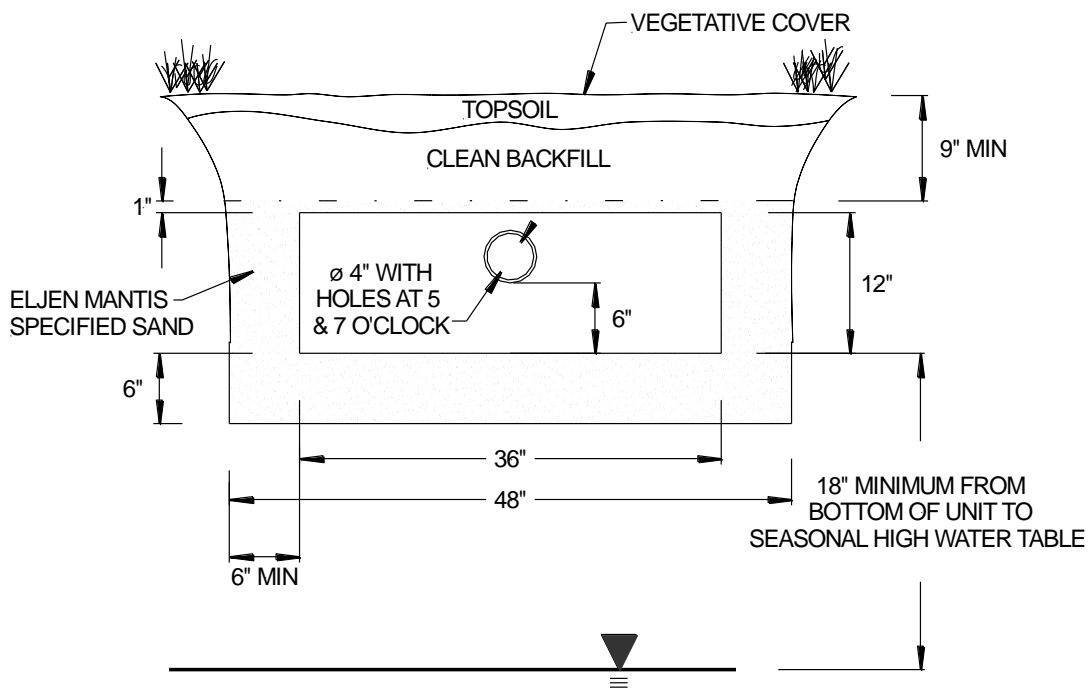
- e. Remove the cardboard supports that are on top of the Mantis units. Remove any remaining plastic straps from the cardboard supports from the trench.
  - f. Additional Specified Sand is lightly added between the Support Modules and along the sides of the Mantis units to bring the sand fill 1-inch above the Support Modules.
  - g. Using a standard 2" x 4" wood stud, continue to moderately tamp and compact the sand that is in-between the Support Modules. Spread additional Specified Sand as necessary.
15. Set distribution box to the proper elevation.
  16. Make the connection to the beginning of the first Mantis row from the distribution box with SDR-35 pipe.
  17. Install a termination cap or vent piping if required at the distal (far) end of the distribution pipe.
  18. Venting is optional but required when the system has more than 18" of cover material as measured from the top of the unit to finished grade.
  19. If required, install a 90° fitting at the distal (far) end of the SDP. Install a section of non-perforated pipe extended above final grade. Plumb to prevent rain water and pest intrusion from entering the system by using two 90° fittings or a mushroom cap fitting as shown in Figure 3 and 6.
  20. Prior to backfilling the system, provide 1 additional inch of the Specified Sand fill over the top of the units to account for sand settling.
  21. Complete backfill over the units followed by topsoil to a depth of 10" – 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. As with all systems, do not drive or pave over the absorption area.

**Figure 1: 536-8 Gravity Sand Fill Cross Section**



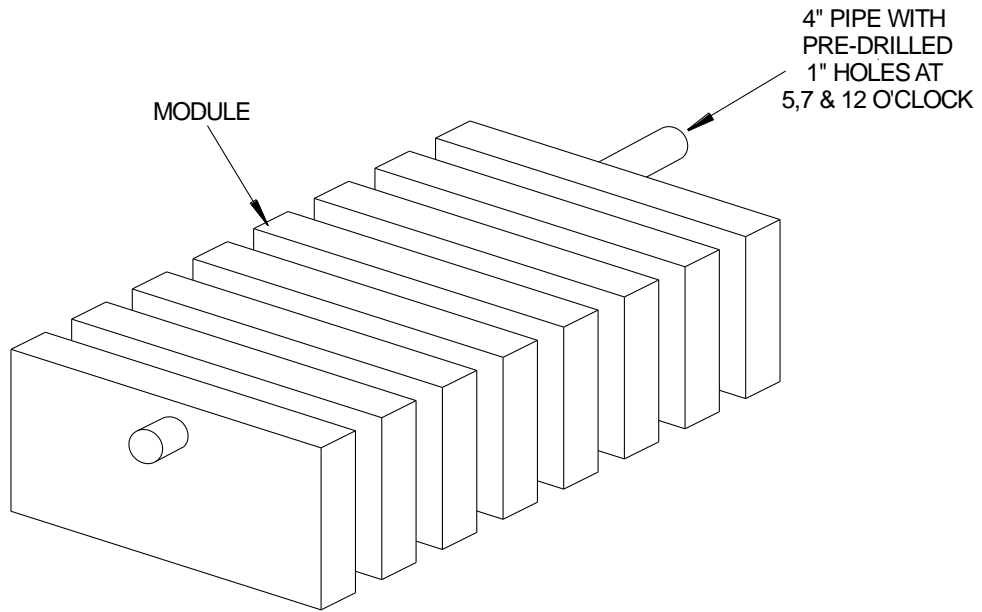
NOTE: VENTING REQUIRED WHEN MORE THAN 18" OF COVER AS MEASURED FROM THE TOP OF THE UNIT TO FINISHED GRADE

**Figure 2: 536-8 LowPro Gravity Sand Fill Cross Section**



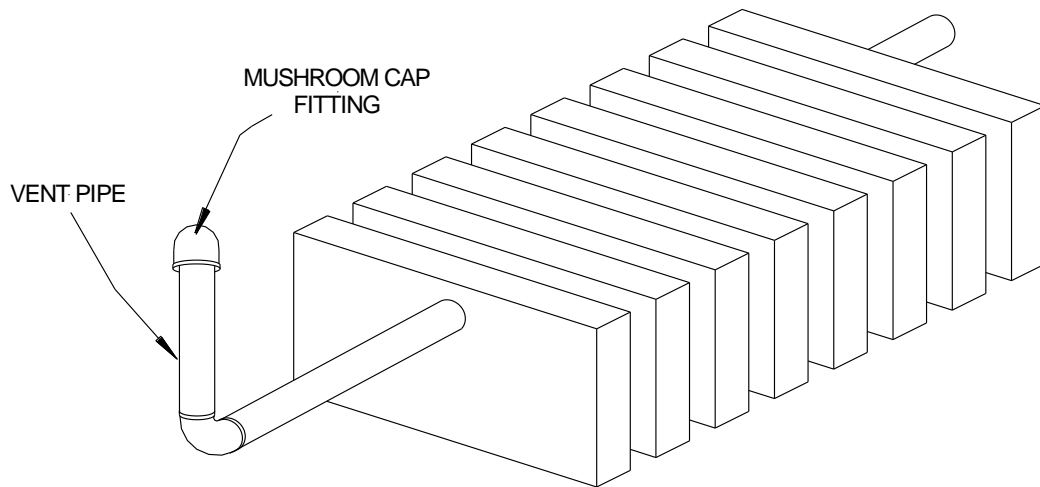
NOTE: VENTING REQUIRED WHEN MORE THAN 18" OF COVER AS MEASURED FROM THE TOP OF THE UNIT TO FINISHED GRADE

**Figure 3: 536-8 and LowPro Distribution Pipe Layout**



**Figure 4: 536-8 and LowPro Gravity Vent Detail**

For Systems with Greater than 18" of Cover



## Pumped System Installation Guidance

There are two ways to distribute effluent in the Mantis systems when is pump required: dosing, and pressure distribution.

### Dosing:

When dosing is used, pump up to an oversized distribution box with baffles or a velocity reduction tee and then gravity flow the wastewater to the Mantis system. The construction of the Mantis absorption field will be the same as the Gravity Installation Guidance found in this manual.

Set pump floats or pump control panels to deliver a maximum of 12 gallons per Mantis 536-8 unit or 6 gallons per Mantis 536-8 LowPro unit per dosing cycle.

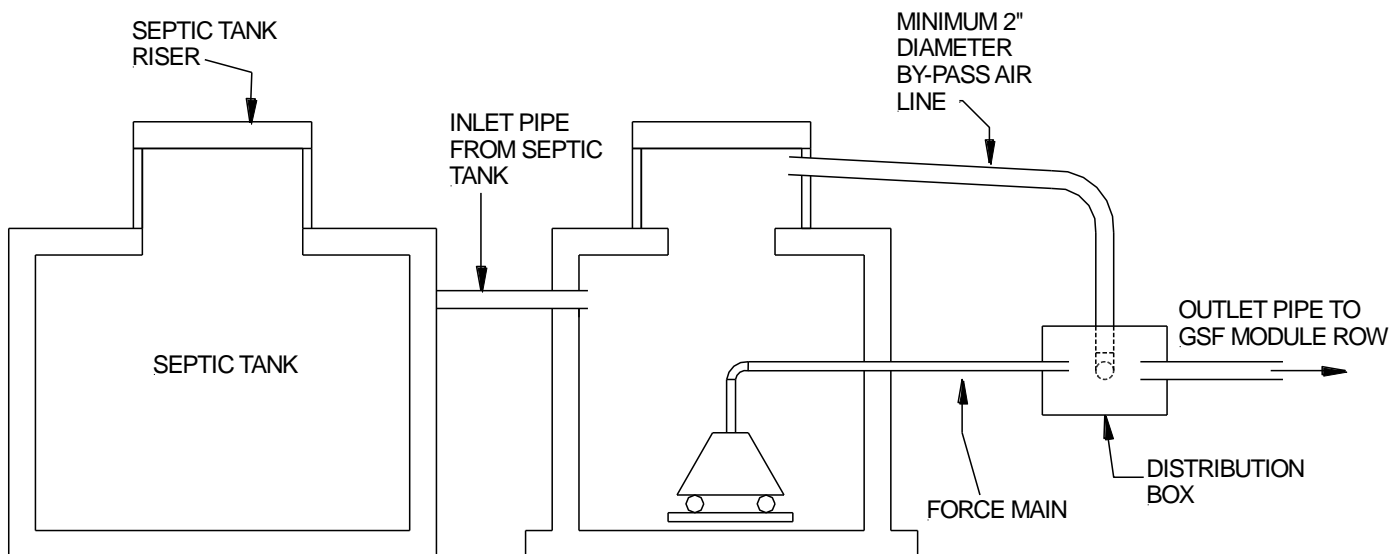
### Pressure Distribution:

The second method of distributing effluent for pump systems is via pressure distribution. Pressure distribution utilizes low pressure pipe and specific orifice opening sizes based on a number of criteria. These systems are designed by professional engineers and are usually designed as part of a wastewater management program and require annual maintenance to be performed on the low pressure pipe network. System designers should contact Eljen's Technical Resource Department at 1-800-444-1359 for guidance when designing these types of systems.

### Venting of Pumped Systems:

If a pumped system is specified and there is more than 18" of cover material as measured from the top of the Mantis units to finished grade, an additional 2" air line must be extended from the Mantis system distribution box back to the riser or knock out on the septic tank or the pump tank as shown in Figure 5. The vent on the distal (far) end of the Mantis system will be constructed the same as for gravity systems. This will maintain the continuity of air flow from the Mantis units back into the house plumbing.

**Figure 5: Venting for Pumped Systems with Greater than 18" of Cover**



## Required Notes on Design Plans

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- This system is not designed for backwash from a water softener.
- 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 select fill or Specified Sand placement.
- Scarify subsoil prior to select fill or Specified Sand placement.
- All Mantis installations utilize a Specified Sand envelope around the Mantis units. 6" minimum underneath, 6" minimum on the sides, 1" minimum on top, and 3" between the Support Modules of the Mantis units. The Mantis Specified Sand specification is listed below:

Eljen Mantis 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.		

NOTE: Eljen may approve the material under certain conditions to be used for the Specified Sand envelope around the Mantis units.

- Eljen Corporation requires 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 for the Mantis series 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 10" of material as measured from the top of the Modules to the finished grade. The first inch of that fill is specified sand.
- For pumped systems, set pump floats or pump control panels to deliver a maximum of 12 gallons per Mantis 536-8 unit or 6 gallons per Mantis 536-8 LowPro per dosing cycle.
- Non-residential buildings and residential institutions shall be designed using daily design flow unless specific water use data is available for the facility. Design flow based on metered flows must use a minimum 1.5 safety factor applied to all metered average daily water use. See Connecticut Public Health Code, Tables 4, 7 and 8.

# Mantis System Sizing Information

## Table 1: MANTIS 536-8 Simplified Sizing Chart

Effective Leaching Area = 11.0 Square Feet / Linear Foot

	2 Bedrooms		3 Bedrooms		4 Bedrooms		Each Bedroom Above Four			
	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Single Family		Multi-Family	
Percolation Rate	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*
Less Than 10.1	34	7	46	9	61	12	10	2	15	3
10.1 - 20.0	45	9	66	13	86	17	15	3	25	5
20.1 - 30.0	51	11	71	14	96	19	15	3	25	5
30.1 - 45.0	61	13	86	17	111	22	15	3	30	6
45.0 - 60.0	68	14	91	18	121	24	15	3	30	6
Greater Than 60.0	UNSUITABLE FOR LEACHING SYSTEMS									

\* Partial units are rounded up to the next highest number.

• Sizing charts do not reflect MLSS requirements.

• Multiple trench configurations will utilize 12' center to center spacing between Mantis rows.

**NOTE: Distribution pipes are not permitted for use on top of the Mantis 536-8 series.**

## Table 2: MANTIS 536-8 LowPro Simplified Sizing Chart

Effective Leaching Area = 6.5 Square Feet / Linear Foot

	2 Bedrooms		3 Bedrooms		4 Bedrooms		Each Bedroom Above Four			
	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Single Family		Multi-Family	
Percolation Rate	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*	Trench Length	Units*
Less Than 10.1	58	12	81	16	106	21	15	3	30	6
10.1 - 20.0	77	16	106	21	141	28	20	4	35	7
20.1 - 30.0	87	18	121	24	156	31	20	4	40	8
30.1 - 45.0	104	21	141	28	186	37	25	5	50	10
45.0 - 60.0	115	23	156	31	206	41	30	6	55	11
Greater Than 60.0	UNSUITABLE FOR LEACHING SYSTEMS									

\* Partial units are rounded up to the next highest number.

• Sizing charts do not reflect MLSS requirements.

• Multiple trench configurations will utilize 9' center to center spacing between Mantis rows.

**NOTE: Distribution pipes are not permitted for use on top of the Mantis 536-8 series.**



## Mantis Installation Checklist

DATE: \_\_\_\_\_

### Installation Address

Address: \_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

### Contractor Information

Contractor Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip code: \_\_\_\_\_

Email: \_\_\_\_\_

Phone #: \_\_\_\_\_ Fax#: \_\_\_\_\_

### Dwelling Information

Number of Bedrooms: 1 2 3 4 5 6 7 8 9 10

Number of Occupants: Adults \_\_\_\_\_ Children \_\_\_\_\_

Is Dwelling Occupied year round:  No  Yes

Water Supply to Dwelling:  Well  Municipal

Septic Tank Size: \_\_\_\_\_ Gallons Number of Compartments: 1 2 3

Pump Chamber Size: \_\_\_\_\_ Gallons

Soil Percolation Rate: \_\_\_\_\_ MPI

Unit used: 536-8 536-8 LowPro

Number of Mantis 536-8 Units: \_\_\_\_\_

Number of Garbage Disposals: 0 1 2 3 4 5

Number of Sewage Grinder Pumps: 0 1 2

Sump Pump:  No  Yes Discharged To:  Septic Tank  Dry Well  Surface

Water T/S:  No  Yes Discharged To:  Septic Tank  Dry Well  Surface

Swimming Pool:  No  Yes  Above Ground  In-Ground

Is Swimming Pool Up Slope of Mantis System:  No  Yes

### Mantis Installation Checklist

Mantis Specified Sand Supplier: \_\_\_\_\_ Location: \_\_\_\_\_

Copy of Mantis Specified Sand Sieve Report:  No  Yes

Distribution:  Gravity  Pump Floats Set to Deliver \_\_\_\_\_ Gallons / Unit / DC

Installation:  Regular Trench  Fill Package Depth: \_\_\_\_\_" Width: \_\_\_\_\_"

Scarification of Excavation

6" Minimum of Mantis Specified Sand Underneath Mantis Units

6" Minimum of Mantis Specified Sand on Each Side of Mantis Units

Mantis Specified Sand Placed Between Support Modules and Under Internal Pipe

1" Minimum of Mantis Specified Sand on Top of Mantis Units

Cardboard Corners Removed from Mantis Units

Termination Caps Installed where needed

Distribution Box Installed:  No  Yes

Vents Installed:  No  Yes

Final Grade to Prevent Storm Water Intrusion

Septic Tank Effluent Filter installed

### System Layout Drawing

## NOTES:



*Innovative Environmental Products and Solutions Since 1970*