

# INDIVIDUAL SEWAGE DISPOSAL SYSTEM DESIGN MANUAL for MANUFACTURED COMPONENTS



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The following manual provides guidance for the design, installation and use of various manufactured individual sewage disposal system components. If the proposal requires a hearing before the Board of Health additional requirements may be imposed.

The listing of any component in this manual does not reflect an endorsement of that component. Manufacturers or distributors may request to have their products listed in this manual by submitting documentation showing approval by the State of Colorado and providing additional information as requested.

Please contact CRAIG SANDERS at 303 271-5759 or [csanders@jeffco.us](mailto:csanders@jeffco.us) for further information or to report errors or omissions.

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## **PART I – ADVANCED TREATMENT UNITS (ATUs)**

Units of systems that provide additional wastewater treatment – primarily to reduce the concentration of BOD<sub>5</sub> and Total Suspended Solids – are considered an Acceptable Design if they meet the requirements of NSF 40 or equivalent.

Sizing of the unit shall be based on wastewater flows as set forth in the regulation, unless the manufacturer has obtained specific sizing approval from CDPHE. Units shown in this section have obtained such approvals.

Installation and operation of these units shall conform to all aspects of the Jefferson County individual sewage disposal system regulations. None of these units are considered nitrogen-reducing systems and there are no sizing, siting or setback reductions that can be claimed solely on the basis of their use.

### **GENERAL DESIGN REQUIREMENTS and CONSIDERATIONS**

These requirements apply to all ATUs and must be considered when developing a design for an individual sewage disposal system.

#### **Absorption / Evaporation Area**

- Shall be calculated per regulations with no reduction based solely on the use of an ATU (size reduction acceptable through use of chambered or gravel-less systems).
- The use of shallow distribution systems must comply with the requirements of Section IX of the State *Guidelines* for individual sewage disposal systems.

#### **Dosing**

- Dosing of the absorption system is required as set forth in the regulations. Due to the configuration of the ATU, dosing will not be permitted from the second compartment of the septic tank. A separate dosing tank or chamber is required.

#### **General Requirements**

- The owner will be required to obtain an operation and maintenance agreement with a responsible management entity and maintain this agreement for the lifetime of the system. This requirement does not apply to the Eljen GSF.
- A web-based system for remote monitoring of the ATU is required to verify operation of the specific components needed for proper operation, including blowers, and high and low water alarms. This requirement does not apply to the Eljen GSF.
- The septic tank for the ATU must be formed and cast specifically to accommodate the particular unit being proposed. It is not permissible to cut an opening in a standard septic tank to install an ATU.
- An effluent filter is NOT required for dosing effluent from mechanical systems that meet NSF/ANSI Standard 40. Since the Eljen GSF relies upon a septic tank for pre-treatment, an effluent filter IS required within the septic tank.
- The use of a specific ATU must be included in the engineer's design. Substitutions may not be made without the approval of the engineer and the Department.

## SOUTHERN AEROBIC TREATMENT UNIT

### Design Flow Rate

Bedrooms	Tank(s) - minimum capacity	Module(s)
Up to 3	Required pretreatment – 675 gallons	CM500, SM500
4	Required pretreatment – 900 gallons	SM600
5	Required pretreatment – 1125 gallons	SM750
6	Required pretreatment – 1350 gallons	SM1000
Commercial	Sizing based on wastewater flow rate and characteristics	

**MANUFACTURER** Southern Manufacturing  
P. O. Box 3615 Port Arthur, Texas 77640  
Phone (409) 962-4501 FAX:  
Website: [www.septicsolutionstexas.com](http://www.septicsolutionstexas.com)

**LOCAL REP** N/A

## DELTA ENVIRONMENTAL ECOPOD E50 TIF

### Design Flow Rate

Bedrooms	Tank(s) - minimum capacity	Module(s)
Up to 3	Required pretreatment – 675 gallons	E50
Commercial	Sizing based on wastewater flow rate and characteristics	

**MANUFACTURER** Delta Environmental Products  
8275 Florida Blvd Denham Springs LA 70726  
Phone: (225) 665-6162 FAX:  
Website: <http://www.deltaenvironmental.com>

**LOCAL REP** N/A

## HYDRO-ACTION INDUSTRIES AP 500

### Basic Design Criteria

Bedrooms	Tank(s) - minimum capacity	Module(s)
Up to 3	Required pretreatment – 675 gallons	AP 500
Commercial	Sizing based on wastewater flow rate and characteristics	

**MANUFACTURER** Bio-Action, Inc.  
3656 Burd Rd Mills WY 82644  
Phone: (307) 473-2246 FAX:  
Website: <http://www.bioactioninc.com>

**LOCAL REP** N/A

## **ELJEN GEOTEXTILE SAND FILTER (GSF)**

Although the Eljen GSF is listed as an ATU, it is a non-mechanical component that receives pre-treated effluent (from a septic or aerobic treatment tank) for final treatment and disposal. The A42 unit is typically used in Colorado.

### **Basic Design Criteria**

A septic tank that meets all the requirements of the individual sewage disposal system regulations must be installed to provide pre-treatment of effluent. Dosing is also required.

The number of GSF units required is shown below:

<b>Percolation rate (MPI)*</b>	<b>A42 modules Per bedroom**</b>	<b>B43 modules Per bedroom**</b>
5 to 30	8	6
31-40	9	7
41-60	10	8
over 60	12	10

\* not approved for percolation rates faster than 5 minutes per inch

\*\* designs for new systems must be sized for 2 bedrooms minimum

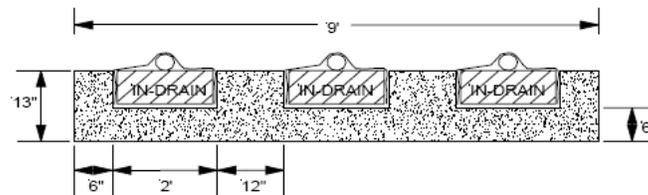
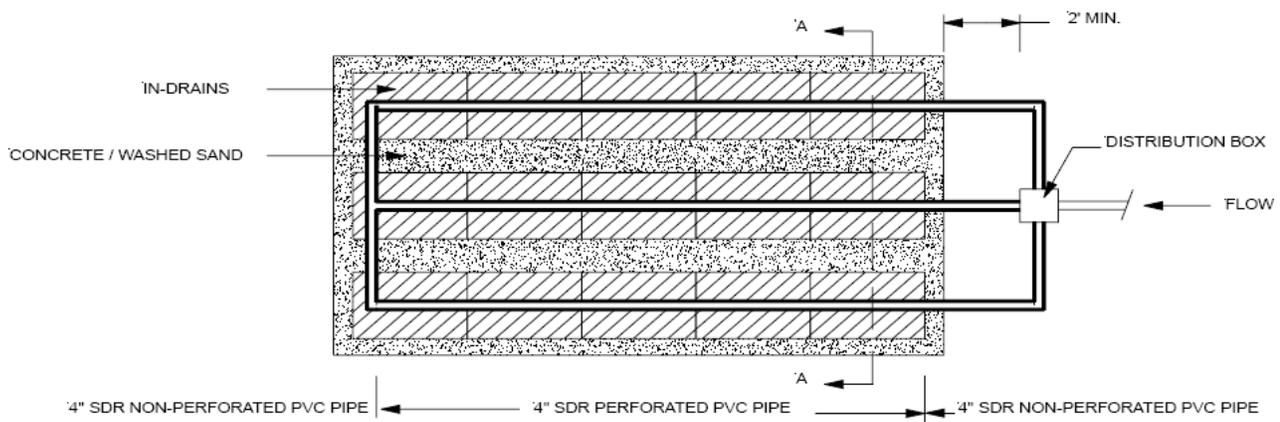
### **Illustrations**

See Page 6 for an illustration of a typical bed and trench installation. Note that the distances and setbacks shown are for illustration purposes only and the actual installation must comply with Jefferson County regulations and the engineer's design.

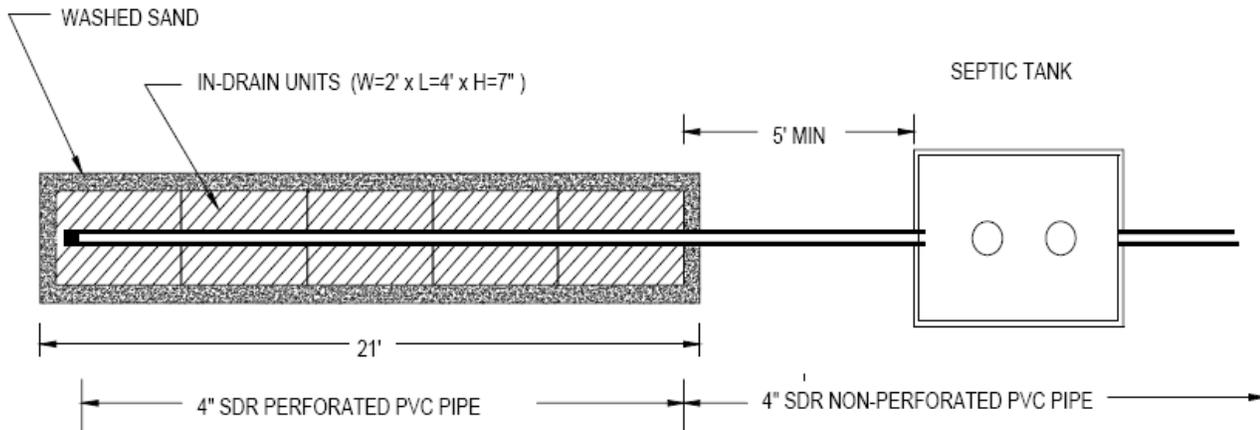
### **Installation Guidelines**

The GSF units may be installed in trenches or beds. Based on the characteristics of the soil, over-excavation and placement of suitable filter material may be required if a minimum of four (4) feet of suitable soil is not present.

1. Complete the excavation and place a 6" deep bed of C33 sand over the bottom of the entire excavation.
2. Lay down the rows of GSF units specified in the engineer's design so that each row is a minimum of 6" from the ends of the excavation and each row is no more than 12" apart.
3. Place the "anti-siltation" fabric – supplied by the manufacturer – over the GSF units and pipes only, leaving the sand exposed. The fabric is to be draped down the sides of the GSF as shown in the cross-sectional drawing, below.
4. Then, add more sand (between the GSF rows and also between the outer GSF rows and the sides of the excavation) up to the bottom of the distribution pipe.
5. Backfill to natural grade.



**TYPICAL BED INSTALLATION**



**TYPICAL TRENCH INSTALLATION**

**MANUFACTURER** Eljen Corporation  
 10 West Main, Ste 216  
 West Hartford CT 06107  
 Phone: (307) 473-2246 FAX:  
 Website: [www.eljen.com](http://www.eljen.com)

**LOCAL REP** Hans Schenk - Bioseptic Components, LLC  
 317 Tower Road South  
 Ridgeway, CO 81432  
 Phone: 970-316-1264 FAX: 970-626-3938  
 E-mail: [gsftech@centurylink.net](mailto:gsftech@centurylink.net)

## **PART II – NITROGEN-REDUCING SYSTEMS**

ATUs that reduce wastewater nitrogen concentrations are approved for use when they have either demonstrated – through sampling and testing - their long-term ability to do so, or have been certified as conforming to NSF Standard 245, or equivalent. NOTE: systems that meet NSF 245 have also been approved under NSF 40.

In addition, if the unit has also been approved by CDPHE and a specific sizing criteria established, those wastewater flow numbers may be used. Otherwise, the established wastewater flow rates in the regulation shall apply. Installation and operation of these units shall conform to all aspects of the Jefferson County individual sewage disposal system regulations.

### **GENERAL DESIGN REQUIREMENTS and CONSIDERATIONS**

These requirements apply to all nitrogen-reducing ATUs and must be considered when developing a design for an individual sewage disposal system.

#### **Absorption / Evaporation Area**

- Shall be calculated per regulations with no reduction based solely on the use of an ATU (size reduction acceptable through use of chambered or gravel-less systems).
- The use of shallow distribution systems must comply with the requirements of Section IX of the State *Guidelines* for individual sewage disposal systems.

#### **General Requirements**

- These systems have been approved based on sampling and testing and are considered Acceptable Designs with no limits on the number of installations.
- Routine effluent sampling and testing is not required.
- All systems shall be dosed with a dosing siphon or effluent pump.
- The owner will be required to obtain an operation and maintenance agreement with a responsible management entity and maintain this agreement for the lifetime of the system.
- The system must be properly equipped to allow remote monitoring of the operation of the system in a manner acceptable to the Department, including pump and or / blower operation, high and low water conditions and any other factor that must be routinely monitored. The engineer must specify the manner in which this will be accomplished.
- A 'start-up' letter from the responsible management entity must be submitted when the system is completed and ready for use, including the required remote monitoring.
- An effluent filter is NOT required for dosing effluent from mechanical systems that meet NSF/ANSI Standard 40.

- The use of a specific ATU must be included in the engineer’s design. Substitutions may not be made without the approval of the engineer and the Department.

### **OSI ADVANTEX® SYSTEMS**

#### **Design Flow Rate**

<b>Bedrooms</b>	<b>Tank(s) – minimum capacity</b>	<b>Module(s)</b>
Up to 4	1500 gal 2-compartment	1 AX-20 unit
5	1500 gal 2-comp + 1000 gallon 2-comp	2 AX-20 in series
6	1500 gal 2-comp + 1500 gallon 2-comp	2 AX-20 in series
Commercial	Sizing based on wastewater flow rate and characteristics	

**MANUFACTURER** Orenco Systems, Inc.  
 814 Airway Ave, Sutherlin OR 97479  
 Phone: (800) 348-9843 FAX: (541) 459-6781  
 Website: [www.orenco.com](http://www.orenco.com)

**LOCAL REP** Roger Shafer, P.E.  
 SCG Enterprises  
 Phone (888) 560-3334 FAX: (303) 697-9434  
 Website: [www.scgenterprises.com](http://www.scgenterprises.com)

### **BIO-MICROBICS MICROFAST® SYSTEMS**

#### **Design Flow Rate**

<b>Bedrooms</b>	<b>Tank(s) - minimum capacity</b>	<b>Module(s)</b>
Up to 3	1250 gal 2-comp, 625 gal in 1 <sup>st</sup> comp	Model 0.5
4-5	1500 gal 2-comp, 625 gal in 1 <sup>st</sup> comp	Model 0.75
6	2000 gal 2-comp, 1000 gal in 1 <sup>st</sup> comp	Model 0.9
Commercial	Sizing based on wastewater flow rate and characteristics	

- Due to the characteristics of the MicroFAST® module, the septic tank must be cast specifically to accommodate this unit. It is not permissible to cut an opening in a standard septic tank for the MicroFAST® unit. The engineer must specify the source of the tank in their design.

### **BIO-MICROBICS RETROFAST® SYSTEMS**

#### **Design Flow Rate**

<b>Bedrooms</b>	<b>Tank(s) - minimum capacity</b>	<b>Module(s)</b>
Up to 3	1250 gal 2-comp, 625 gal in 1 <sup>st</sup> comp	Model 0.5
4-5	1500 gal 2-comp, 625 gal in 1 <sup>st</sup> comp	Model 0.75
6	2000 gal 2-comp, 1000 gal in 1 <sup>st</sup> comp	Model 0.9
Commercial	Sizing based on wastewater flow rate and characteristics	

- The RetroFAST® unit is designed to be installed in an existing septic tank as a repair. If a new tank is provided, the installation must use the MicroFAST® system instead.

**MANUFACTURER** Bio-Microbics, Inc.  
 8450 Cole Parkway, Shawnee KS 66227  
 Phone: (800) 753-3278 FAX: (913) 422-0808  
 Website: [www.biomicrobics.com](http://www.biomicrobics.com)

**LOCAL REP** Tim Petz, P.E. [tpetz1@comcast.net](mailto:tpetz1@comcast.net)  
 ITS, Incorporated  
 Phone (303) 908-7823  
 Website: [www.allserviceseptic.com](http://www.allserviceseptic.com)

**HOOT® AEROBIC SYSTEMS**

**Design Flow Rate**

<b>Bedrooms</b>	<b>Tank(s) - minimum capacity</b>	<b>Module(s)</b>
Up to 3	1320 gal 2-comp, 400 gal in 1 <sup>st</sup> comp	H-500
4-5	Add 800 gallon pre-treatment tank for 5 bedrooms	H-600 (4 bdrms) H-750 (5 bdrms)
6	Add 1000 gallon pre-treatment tank for 6 bedrooms	H-1000 (6 bdrms)
Commercial	Sizing based on wastewater flow rate and characteristics	

- Due to the characteristics of the HOOT® module, the septic tank must be formed and cast specifically to accommodate this unit. It is not permissible to cut an opening in a standard septic tank for the HOOT® unit. The engineer must specify the source of the tank.

**MANUFACTURER** HOOT® Systems, LLC  
 2885 HWY 14 E, Lake Charles LA 70607  
 Phone: (888) 878-HOOT FAX: (337) 477-7904  
 Website: [www.hootsystems.com](http://www.hootsystems.com)

**LOCAL REP** Front Range Pre-Cast Inc  
 Phone (800) 783-3207 FAX: (303) 442-3209  
 Website: [www.flxx.com](http://www.flxx.com)

### PART III - GRAVEL-LESS SYSTEMS

Gravel-less systems must be approved by CDPHE and will be given a specific sizing in sq. ft. Components in this section have obtained a sizing standard from CDPHE.

The figures shown in the SIZING columns DOES NOT include the allowable reductions for those particular applications, so you must include that factor in your calculations of the number of chamber units required. Jefferson County allows a 50% size reduction for absorption trenches and a 40% size reduction for absorption beds. Jefferson County allows no additional reductions for dosing or water-saving fixtures.

MANUFACTURER / MODEL	SPECIAL NOTES (see below)	SIZING (SQ. FT.)	
		Bed	Trench
<b>INFILTRATOR</b>			
<i>Quick 4™ Standard</i>		9.2	9.87
<i>Quick 4™ Plus Standard</i>		9.72	11.55
<i>Quick 4™ Plus Standard (Low Profile)</i>		10	10
<i>Quick 4™ HC</i>		9.72	13.72
<i>Quick 4™ EQ 36™</i>		6.4	9.07
<b>ELJEN CORP GSF</b>	See listing under ATUs		
<b>ADS CORP</b>			
<i>ARC 18</i>		9.33	12.53
<i>ARC 24</i>		13.25	17.2
<i>ARC 36 LP</i>		20.42	24.5
<i>ARC 36 HC</i>		20.42	28.45

**NOTE: The Department has prepared an EXCEL spreadsheet for calculating the required number of chambers. It can be emailed to you upon request.**

**Chambers must be installed as complete units and may not be cut or reduced in length.**

## GENERAL DESIGN AND INSTALLATION REQUIREMENTS FOR GRAVEL-LESS SYSTEMS

### DESIGN CRITERIA

- To determine the required number of these units:
  1. **Calculate** the standard required absorption area per the regulations, based on soil percolation rate or gradation analysis.
  2. **Multiply** that number by 0.5 for trench installations and 0.6 for bed systems (this gives you the adjusted absorption area).
  3. **Divide** that number by the unit size shown on the previous page for the specific component to determine how many chambers will be required (round up for fractions greater than .5 and down for less than .5), making sure to use the correct number for beds or trenches.
  4. **Provide** a design for a trench or bed of sufficient dimensions to accommodate the required number of chamber units and assure equal distribution.

#### EXAMPLE 1:

GIVEN:           3 bedroom house  
                  Percolation rate 18 MPI  
                  Using Quick 4 Plus Standard units in a **bed** (40% reduction)

Calculated absorption area   =     711 sq. ft.  
Adjusted absorption area     =     711 x 0.6     =426.6 (round up to 427)  
Number of chambers           =     427 ÷ 9.72     =43.88 (round up to 44)

The design must include a bed of sufficient dimensions to accommodate 44 chambers and assure equal effluent distribution.

#### EXAMPLE 2:

GIVEN:           4 bedroom house  
                  Percolation rate of 45 MPI  
                  ARC 36 LP units in **trenches** (50% reduction)

Calculated absorption area   =     1207 sq. ft.  
Adjusted absorption area     =     1207 x 0.5     =603.5 (round up to 604)  
Number of chambers           =     604 ÷ 24.5     =24.65 (round up to 25)

The design must include trenches of sufficient width and length to accommodate 25 chambers and assure equal effluent distribution.

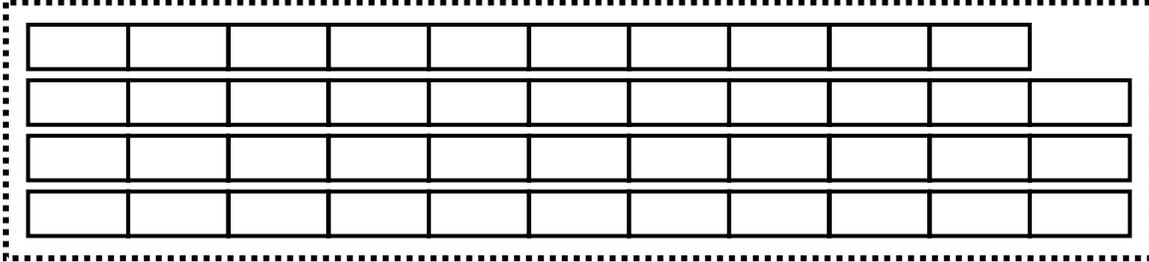
### INSTALLATION REQUIREMENTS

- In trenches, whenever possible each trench shall contain an equal number of units. However, in the case of an odd number of chambers or other such factors, shorter trenches may be included, provided that the shortest trench(es) contain only one chamber less than the longest trench(es) unless proportional effluent distribution is provided.
- In beds, whenever possible, each row shall contain an equal number of units. However, in the case of an odd number of chambers or other such factors, shorter

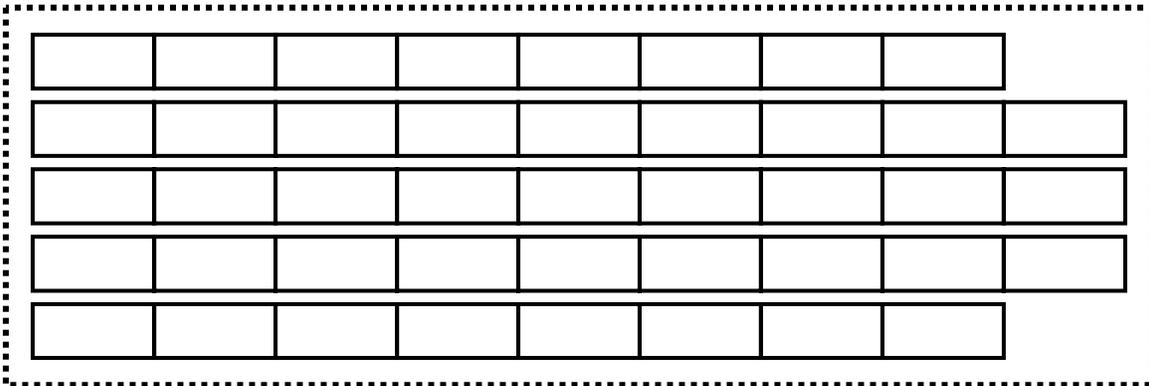
rows may be included, provided that the shortest row(s) contain only one chamber less than the longest row(s).

**EXAMPLES**

If 43 units are required and installed in a bed, the following (and similar) configurations are acceptable:



Three rows of 11 units and 1 row of 10 units. Note that the shortest row contains only one less chamber than the longest row.



Three rows of nine units and two rows of eight units, with the shorter rows being located at the edges of the bed. Note that the shortest rows contains only one less chamber than the longest rows.

- Any other variations will require the use of proportional distribution components.
- Internal distribution pipe is required for chamber units, either suspended from the top of the chamber or placed in contact with the ground.
- Dosing of the chambers is also required unless waived by the Regulations.
- A minimum of four (4) feet of suitable soil is required beneath the chambers, otherwise, over-excavation of the bed or trench will be required.
- All distance setbacks and other requirements apply to chamber installations.
- Chambers may not be buried in excess of manufacturer’s recommendations.

## **OTHER REQUIREMENTS and RESTRICTIONS**

- Use of chambers shall be in accordance with the manufacture's recommendations and/or any approval letters from CDPHE.
- Chambers may not be substituted for gravel-and-pipe systems without the submission and approval of an engineering change that includes the manufacturer and model of chamber to be used, calculations showing the number of chambers required and the size of the bed or trench needed to accommodate them.

### **GEO-FLOW® WASTEFLOW SMALL DIAMETER DRIP IRRIGATION PIPE**

- For optimum reliability, systems utilizing GEO-flow® WASTEFLOW pipe generally require pre-treatment of effluent, meaning an aeration or other type of advanced treatment system must be used to avoid clogging of the drip-emitters. If primary septic tank effluent is used, the manufacturer's sizing criteria must be followed which generally means a significant increase in the lineal feet of drip-line.
- To avoid clogging the small diameter drip-emitters, a Vortex® or equivalent spin filter must be installed between the tank and the field area.
- This pipe must be installed a minimum of 12" below natural grade, otherwise the installation must comply with the requirements of Section IX of the State *Guidelines* for individual sewage disposal systems.
- The system must be pressure dosed.
- A minimum of four (4) feet of suitable soil is required below the lines.
- A maintenance contract for the system is required to assure routine maintenance of both the secondary treatment system (if used) and the spin filter.
- The engineer must include design calculations for the required absorption area.

## PART IV - OTHER COMPONENTS

- TIRE CHIPS

The Department permits the use of tire chips in absorption systems under the following conditions:

- *the use of tire chips must be included in the engineer's design for the system – the installer may not substitute chips for gravel unless previously approved*
- *Tire chips must be clean and cut to a uniform size*
- *Tire chips shall be nominally two (2) inches in size and may range from ½ inch to a maximum of four (4) inches in any one direction*
- *Wire strands may not protrude from the tire chips more than 0.75 inches*
- *Tire chips must be free from balls of wire and fine particles less than 2 mm across*
- *Geo-textile fabric must be used to cover the tire chips prior to backfilling the trench*
- *Site must be thoroughly cleaned of tire chips following installation*

- CONCRETE AGGREGATE

The Department does not currently permit the use of concrete aggregate in absorption systems.

- EXPANDED SHALE AGGREGATE

The Department does not currently permit the use of expanded shale in absorption systems.

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