



Re-Circulating Synthetic Filter
Indiana Manual

Design Guide
and
Installation Manual



Models bearing the NSF mark are certified Class I
to one or more of the following standards:
NSF/ANSI 40
NSF/ANSI 245
NSF/ANSI 350

TABLE OF CONTENTS

1.0	Treatment Process Overview	1
2.0	Design	1
2.1	Re-circulation Tank Sizing	1
2.2	Filter Performance	2
2.3	Operating Costs	2
2.4	E-Z Treat Loading Rates	2
2.5	System Overview	3
2.6	Spray Manifold System	7
2.7	Filter Media Mattress Material	7
2.8	Decentralized Design Options for Commercial, Community, or Large On-site Systems	8
3.0	Installation Instructions	12
3.1	Pre-construction Meeting	12
3.2	Off Loading Treatment System	12
3.3	Excavating and Installing the Pod	13
3.4	Piping the E-Z Treat Pod Supply and Return	13
3.5	Installing the By-Pass Valve	13
3.6	Installing the Re-circulation Pump	14
3.7	Setting Pump Control Floats	14
4.0	Start-up	15
	Appendix 1: Model 600 & Model 750 Configurations	18
	Appendix 2: Model 1200 Configurations	20
	Appendix 3: Typical Commercial Configurations	22
	Appendix 4: High Strength Waste Case Study	24

1.0 Treatment Process Overview

The E-Z Treat Re-circulating Synthetic Filters system operates as a fixed media, packed bed filter system. In these treatment systems, larger solids contained in the applied effluent are retained within the media by filtration, typically in the upper level of the filter media. A bacterial film forms on the surface of media grains and provides for removal of soluble organic material and small colloidal matter by absorption by the bacteria in the film. Decomposition of the absorbed material occurs during rest periods in the filter, when there is no application of effluent. The organic material becomes an energy source for the bacteria to maintain themselves and produce new cells. Over time, as the filter matures, the film layer forms throughout the depth of the filter media and by-products of the biological process pass out of the filter. Re-circulation of the water leaving the filter back through the filter surface provides for additional treatment by the bacteria in the media bed, as well as a mechanism for moving partially decomposed organic materials, bacterial waste products and other debris from the filter. This keeps the pore spaces within the media from clogging. Treatment using recirculating media filtration systems is generally an aerobic process and re-aeration of the media, which occurs during the resting (non-dosing) periods, is essential for proper treatment.

2.0 Design

Many types of media are used in packed bed filters. Washed, graded sand was the most common. Other granular media used include crushed glass, garnet, anthracite, plastic, expanded clay, expanded shale, open-cell foam, extruded polystyrene, and bottom ash from coal-fired power plants.

Media characteristics can limit the number of doses possible. Media re-aeration must occur between doses. As the

effective size of the media decreases, the time for drainage and re-aeration of the media increases. The BOD₅ loading should decrease with decreasing effective size of the sand.

Table 1 Indiana Septic Tank Sizes

(c) Every septic tank shall have a minimum capacity below the water line as specified in Table III as follows:

Table III – Required Minimum Capacities for Septic Tanks	
Number of Bedrooms in Dwelling	Capacity of Tank in Gallons
2 or less	750
3	1,000
4	1,250
5	1,500
5+	1,500 plus 300 multiplied by the number of bedrooms over 5

EZ Treat/Indiana required recirculation tank/chamber Tank/ chamber size is minimum of 1X the design flow.

2.1 Re-circulation Tank Sizing

For single-family home systems, the re-circulation tank is typically sized to be equal to 1 times the design peak daily flow.

2.2 Filter Performance

When treating domestic strength sewage (300 mg/l BOD₅ or less) up to the design flows and loads, a properly maintained E-Z Treat Re-circulating Synthetic Filter will typically perform better than the 30-day average requirements of NSF Standard 40 Class 1 (25 mg/l CBOD₅ and 30 mg/l TSS).

Reductions in the CBOD₅ and suspended solids (TSS) influent concentrations will be attained within a few weeks of commissioning and should be consistently achieved over the lifetime of the styrene media.

CBOD₅ and suspended solids (TSS) treatment performance in the styrene media is not subject to significant variation with ambient air temperature fluctuations.

2.3 Operating Costs

Power costs for pumping at 3 to 4 kWh/day are in the range of \$9 to \$12/month.

The E-Z Treat Re-circulating Synthetic Filter system incorporates technology resulting from years of independent research in re-circulation sand bio-filtration. Our system applies each area of this technology in a pre-packaged system. This ensures consistent field performance in reducing BOD, TSS and Total Nitrogen. The system addresses media size and composition, drainage and ventilation, optimum dosing cycles per hour, depth of filter media, pre-treatment of effluent, pre-filtering of effluent to ensure particle size, even distribution of effluent over the media, and piping design that optimize treatment within the system.

Table 2
NSF Testing Performance Summary

Parameter	Effluent, Avg.
BOD ₅	2 mg/l
TSS	2 mg/l
DO	3.3 mg/l
Turbidity	2 NTU
E. coli *	2 MPN/100ml
pH	6.8 – 7.5
Total Nitrogen Reduction	64%

*with optional UV disinfection

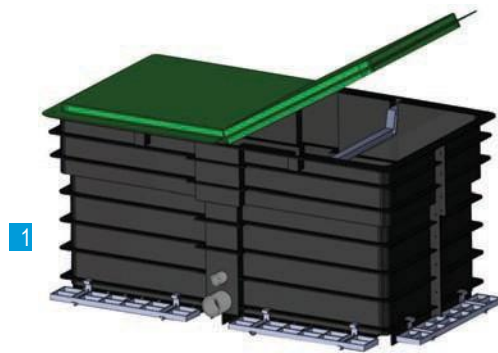
2.4 E-Z Treat Loading Rates

In accordance with the EPA Design Guidelines and field testing of the E-Z Treat Re-circulating Synthetic Filter Model 600 can be continuously loaded at 750 GPD and 2 lb BOD. Model 1200 can be continuously loaded at 1400 GPD and 4 lb BOD. EPA research and testing has proven that system designs, such as the E-Z Treat Re-circulating Synthetic Filter system, will produce a high quality effluent at loading rates in excess of 25 gal/ft²/day.

2.5 System Overview

Prior to entering the re-circulating pump tank the effluent will be treated in an anaerobic chamber fitted with an effluent filter; this filter should remove any solids greater than 1/8" manufacturer recommends 1/16". The second chamber will be a re-circulation chamber fitted with a float ball by-pass valve and re-circulation pump. The float ball by-pass valve connects, inside the re-circulation tank, to the 4" return line from

the pod. The float by-pass valve maintains a constant liquid volume in the re-circulation tank. The float by-pass valve allows the effluent to be constantly re-circulated through the synthetic filter discharging only the daily forward flow volume after it has passed through the pod. In designs using an external splitter box the float by-pass valve would be eliminated from the re-circulation chamber.



Standard Model 600 Package:

Item	Description
1	Model 600 Pod
2	STEP-30 Re-circulation Pump, 1/2 HP
3	Float By-Pass Valve
4	Control Panel
5	Septic Tank Effluent Filter (supplied by others)

Standard Model 750 Package:

1	Model 750 Pod
2	STEP -20 Re-circulation Pump, 1/2 HP
3	Float By-Pass Valve
4	Control Panel
5	Septic Tank Effluent Filter (supplied by others)

STEP-20 Re-circulation Pump

Table 3 Pump Specifications

Item	Description
Shell	Stainless steel
Discharge	10, 20 and 30 GPM models: fiberglass-reinforced thermoplastic; 50 GPM models: stainless steel
Discharge Bearing	Nylatron®
Impellers	Delrin®
Diffusers	Polycarbonate
Suction Caps	Polycarbonate with stainless steel wear ring
Thrust Pads	Proprietary specification
Shaft and Coupling	Stainless steel 300 grade
Intake	Fiberglass-reinforced thermoplastic
Intake Screen	Polypropylene
Jacketed Cord	300 volt "SOOW" jacketed 10" leads (2-wire with ground); optional 20", 30", 50" and 100" lengths available

Delrin® is a registered trademark of E.I. DuPont de Nemours & Company

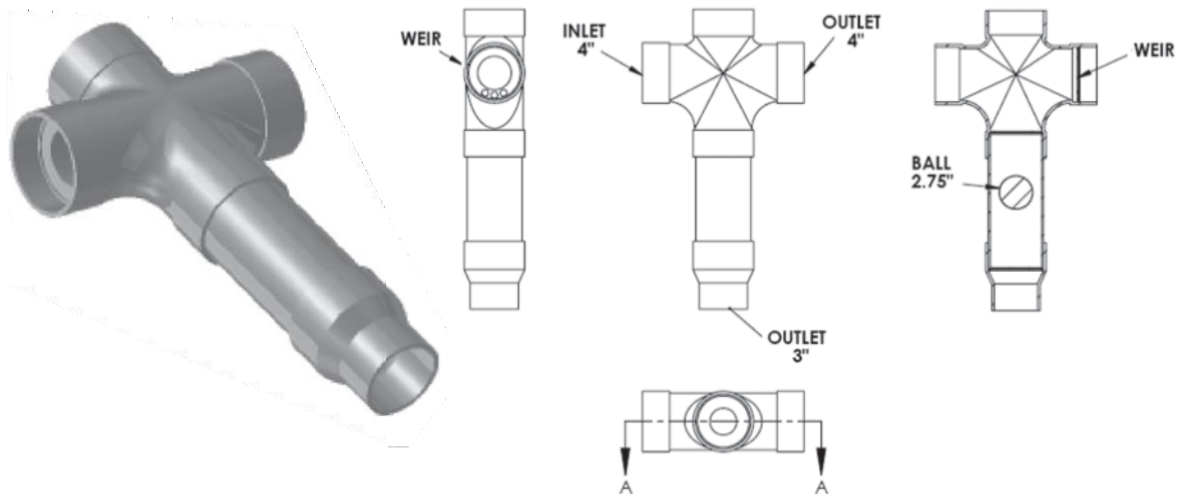
Nylatron® is a registered trademark of Polymer Corporation

S.T.E.P. Plus® is a registered trademark of Pentair Water

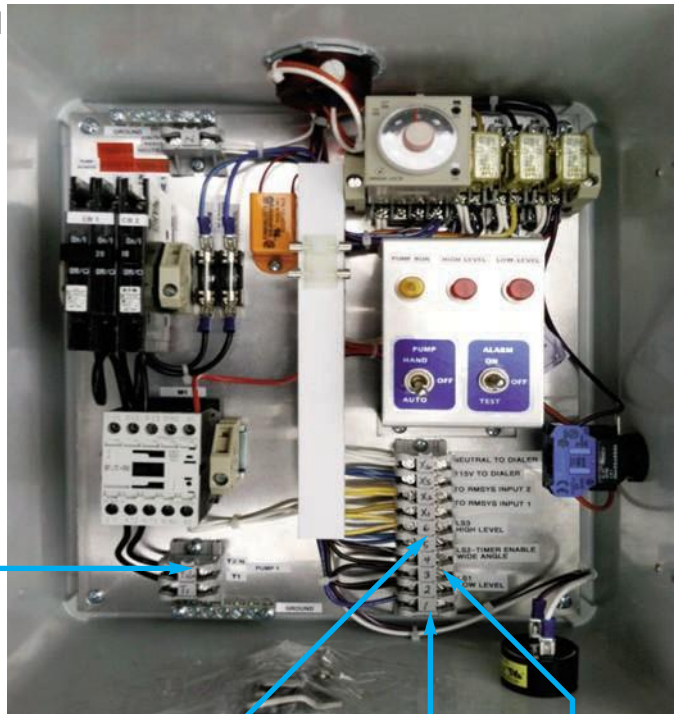
In order to provide the best products possible, specifications are subject to change.

Refer to Appendix A for Pump Curves

E-Z Treat Float Ball By-Pass Valve



E-Z Treat Re-circulation Pump Control Model EZ SR-12



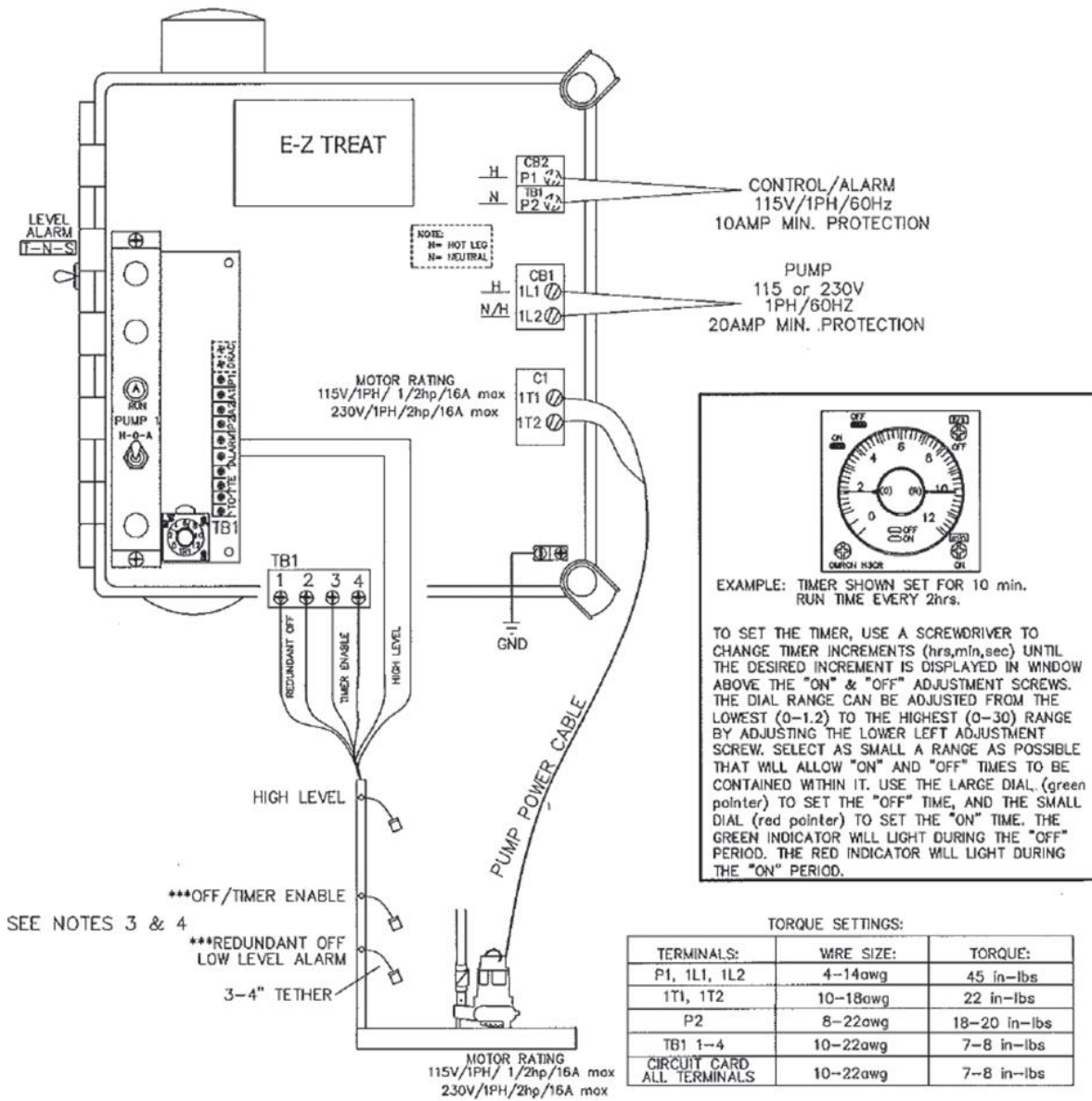
Re-circulation pump power source terminals T1 & T2

High Level Alarm (top float) connects to terminals #5 and 6

Low Level Alarm (bottom float) connects to terminals #1 and 2

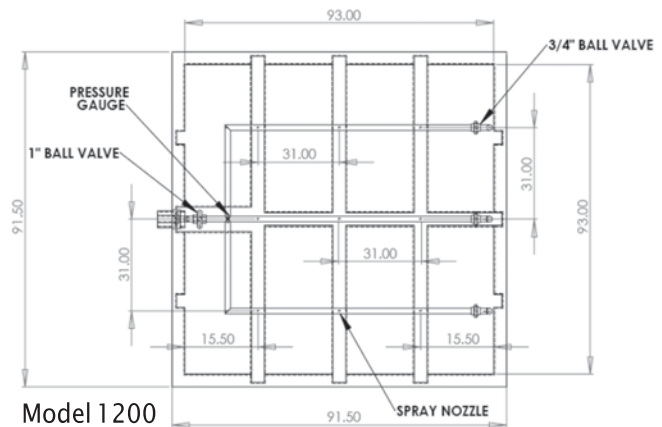
Wide Angle Pump "ON" & "OFF" timer activation (middle float) terminals #3 and 4

E-Z Treat Re-circulation Pump Control Model EZ SR-12



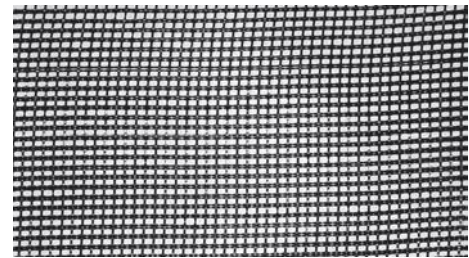
2.6 Spray Manifold System

To maximize the effectiveness of every cubic inch of the media material, the Model 600 employs a spray manifold with 8 evenly spaced wide-angle spray nozzles and Model 1200 employs 12 nozzles. The nozzles are plastic construction with a free passage of 0.0625" in diameter; this large free passage helps prevent nozzle clogging while maintaining a consistent misting spray. The manifold is assembled with a pressure gauge and valves allowing for flow rate adjustments.



2.7 Filter Media Mattress Material

The E-Z Treat Re-circulating Synthetic Filter system employs a manufactured synthetic media which is encapsulated in a mattress like container. The mattress is fabricated from a non-biodegradable; chemically resistant, loose weave polypropylene material with a weave pattern at 90-degree intersections creating 0.078 square openings allowing effluent and air to flow freely while containing the media material.



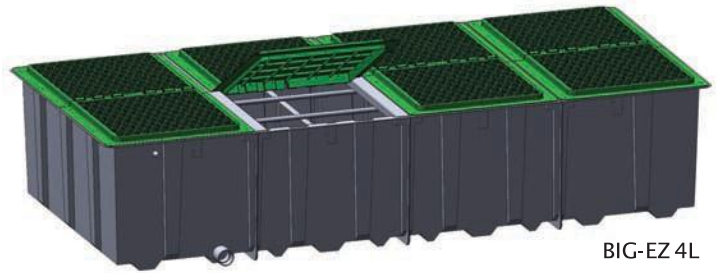
Polypropylene Mattress Material

This media is very uniform and provides ample surface area for biological growth. The media also has enough voids to accommodate good air and liquid flow. These void spaces also allow the passage of very small solids that would clog many filters. The media is very lightweight making it resistant to compaction which can lead to poor air and liquid flows, a problem that plagues many media filters. The media consists of lightweight, non-biodegradable plastic spheres.

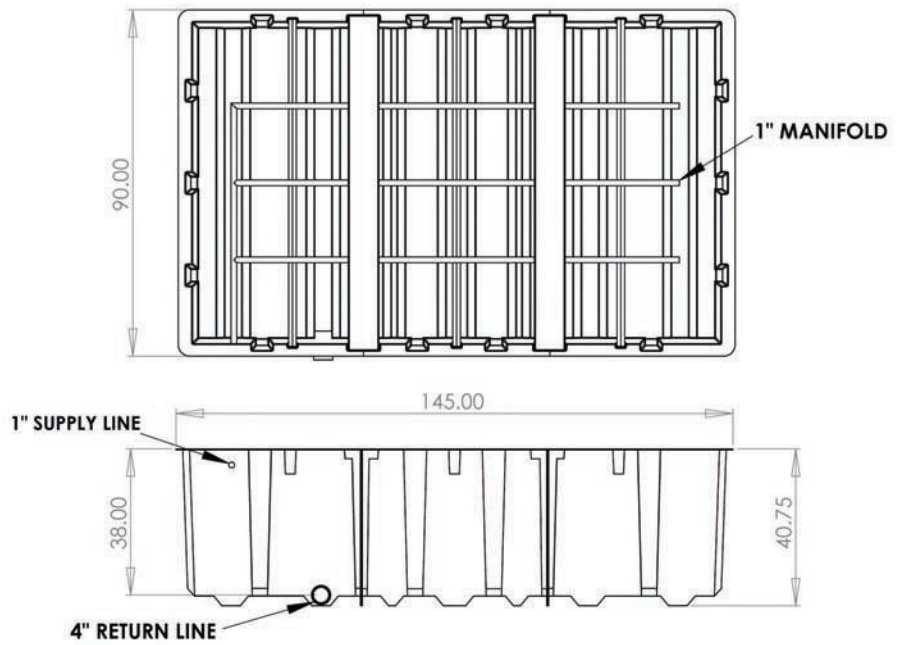


Styrene Media

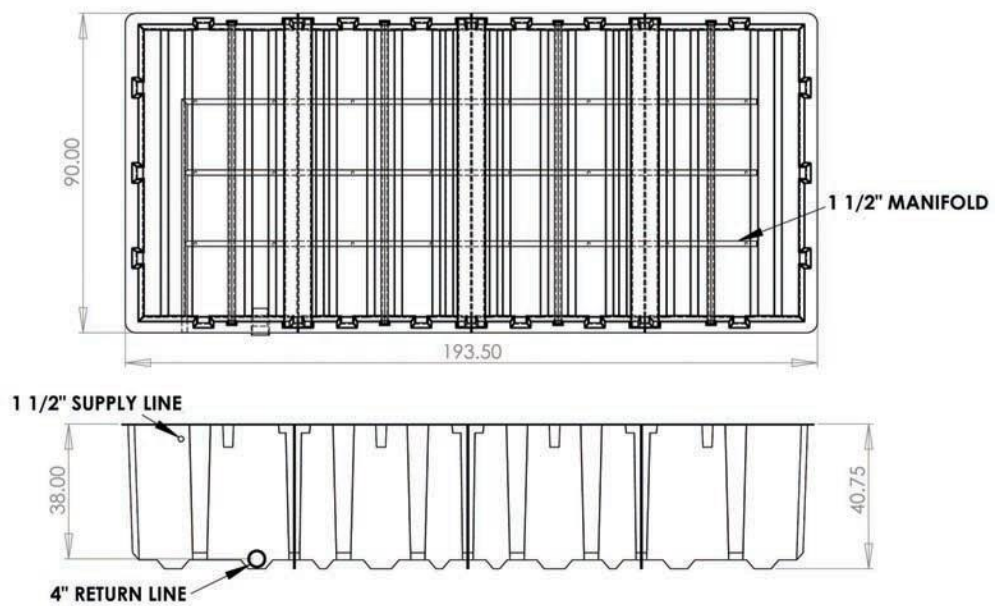
2.8 Decentralized Design Options for Commercial, Community, or Large On-site Systems



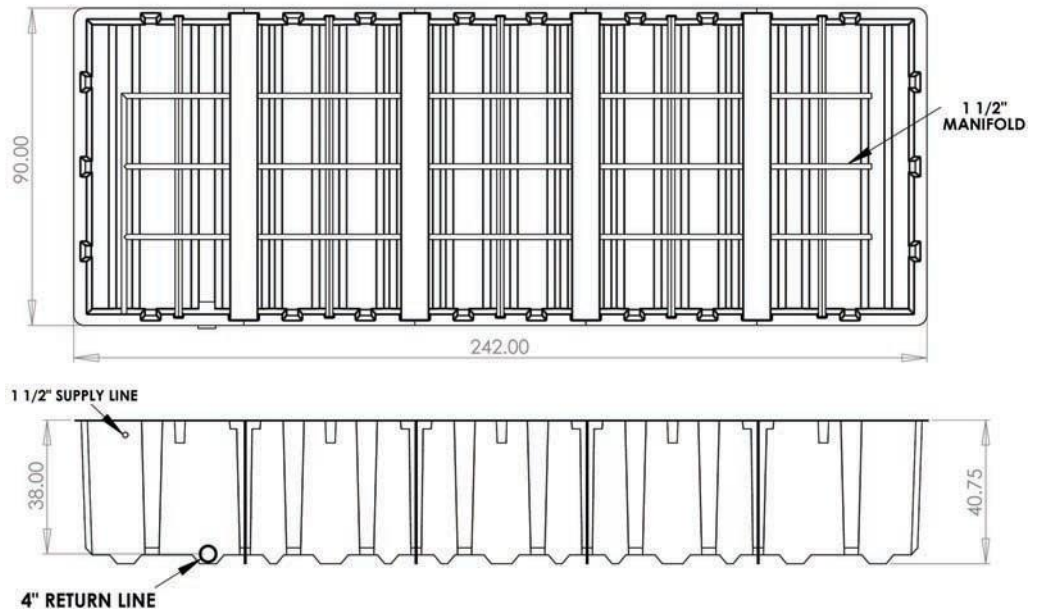
BIG-EZ 3L



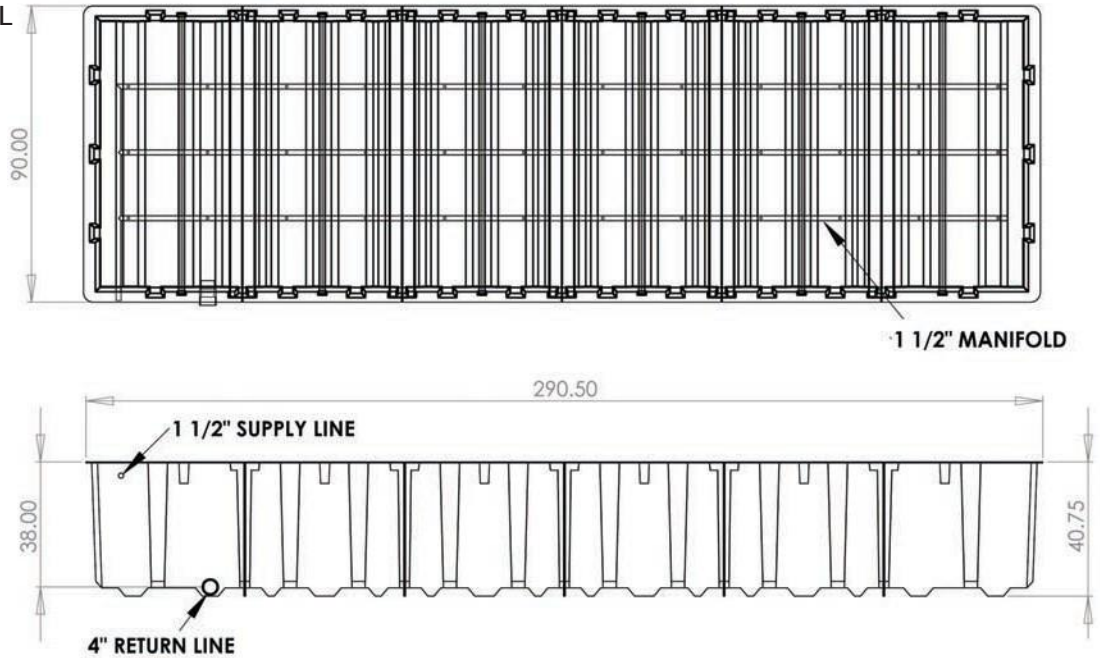
BIG-EZ 4L



BIG-EZ 5L



BIG-EZ 6L





Golf Club (Haymarket, VA.)

This system was installed at the club in 2009.

Effluent Dispersal Method: Low Pressure Pipe
 Daily Flow: 20,000 GPD
 Treated Effluent Parameters: BOD₅: 10 mg/l
 TSS: 10 mg/l
 TN: 20 mg/l



Residential Cluster (Lake James, NC)

This system services a lake-side complex consisting of single family homes, apartments, community center and swimming pool.

Effluent Dispersal Method: Infiltrator Chambers
 Daily Flow: 25,000 GPD
 Treated Effluent Parameters: BOD₅: 10 mg/l
 TSS: 10 mg/l
 TN: 20 mg/l



Motor Home Park (Smokey Mountains)

Effluent Dispersal Method:	Infiltrator Chambers
Daily Flow:	30,000 GPD
Treated Effluent Parameters:	BOD ₅ : 10 mg/l
	TSS: 10 mg/l
	TN: >60%

3.0 Installation Instructions

E-Z Treat Company or its representative will conduct an on-site training with each installer before they are certified to install E-Z Treat systems. The Design & Installation Manual, the Operation & Maintenance of the E-Z Treat technology will be discussed on site with the person(s) pursuing certification. If more than 3 people are being trained on the E-Z Treat technology SDH must be informed in writing 10 days in advance of the event. The training sessions is required for those that will be designing, installing, servicing, and permitting the technology.

The training will include instruction on proper site prep, locating pod, equipment handling, excavation, pod placement, piping, wiring and startup of the E-Z Treat system. Annual classroom training will be a requirement for installers to maintain their certification. As a condition of E-Z Treat certification, contractors must have proper state and local licenses and appropriate insurance policies. E-Z Treat distributors will only sell or authorize installations by E-Z Treat certified installers.

The E-Z Treatment pod will ship pre-assembled, requiring only field piping of the pod supply line and discharge line, installing the re-circulation pump, 4" float by-pass valve and the re-circulation control. When installing the E-Z Treat system the order of components installation is not critical and each segment can be installed independently.

3.1 Pre-construction Meeting

A pre-construction meeting required for a contractor's first installation and recommended for future installations before any construction commences. This meeting is an opportunity for the owner, builder, engineer/designer, local regulatory agencies, service provider and installer to clarify property lines, building location, system location, power sources, drainage areas, final site grading and answer general questions.

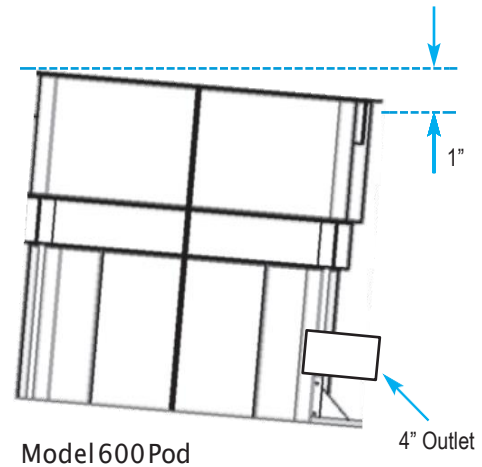
3.2 Off Loading Treatment System

The E-Z Treat Re-circulation Synthetic Filter pod is injection molded polyethylene weighing about 300 pounds. Because of the relative light weight and toughness of the material, special handling is not required. Two people can easily unload the pod. If machinery is used to off load the pod or transport it to the excavated hole; nylon straps, chains or cables used to lift the pod should be in good condition and rated for at least 1000 pounds. The re-circulation pump and control will be shipped in factory sealed cardboard box, these items are not fragile but should be handled with reasonable care not dropped or thrown.

3.3 Excavating and Installing the Pod

The first consideration when installing the E-Z Treat pod is to assure the pod is not located in a drainage area and the pod is located above the seasonal high water table, this will protect the pod from floating and prevent surface water infiltration.

- Excavate a hole approximately 6'W x 9'L x 4'H.
- Place 3/4" to 1" stone or equal to a height of 4" in the bottom of the excavation forming a level base for the pod to set, this will prevent settling of the pod and allow for leveling of the pod.
- Backfill the pod with clean fill soil, free of rocks and foreign material. Do not compact the fill, allow the soil to settle naturally.
- Once the pod is placed in the excavation adjust the pod to slope 1" toward the 4" PVC outlet this assure proper drainage.

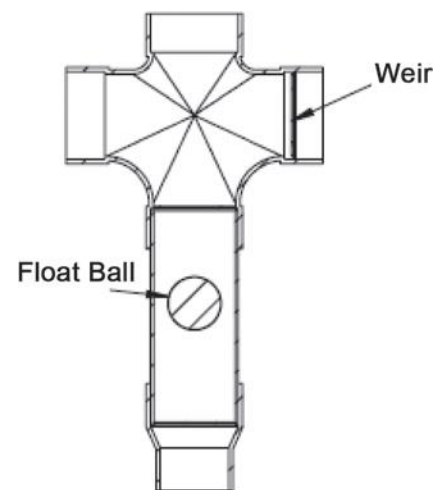


3.4 Piping the E-Z Treat Pod Supply and Return

- Once the pod is placed and leveled, connect 4" PVC pipe between the outlet of the pod and the by-pass valve located in the re-circulation tank.
- Attach 1" PVC supply line between the 1" inlet on the pod and the re-circulation pump.

3.5 Installing the By-Pass Valve

The by-pass valve is located in the re-circulation tank and one side is connected to the 4" PVC drain line coming from the pod and the other side is connected to the 4" PVC effluent discharge line or into the effluent pump tank.



3.6 Installing the Re-circulation Pump

Connect the 1" PVC pipe between the inlet of the pod and the re-circulation pump.

Always provide a quick disconnect device for removing the pump, this can be accomplished with a union, camlock coupler or pitless adapter.

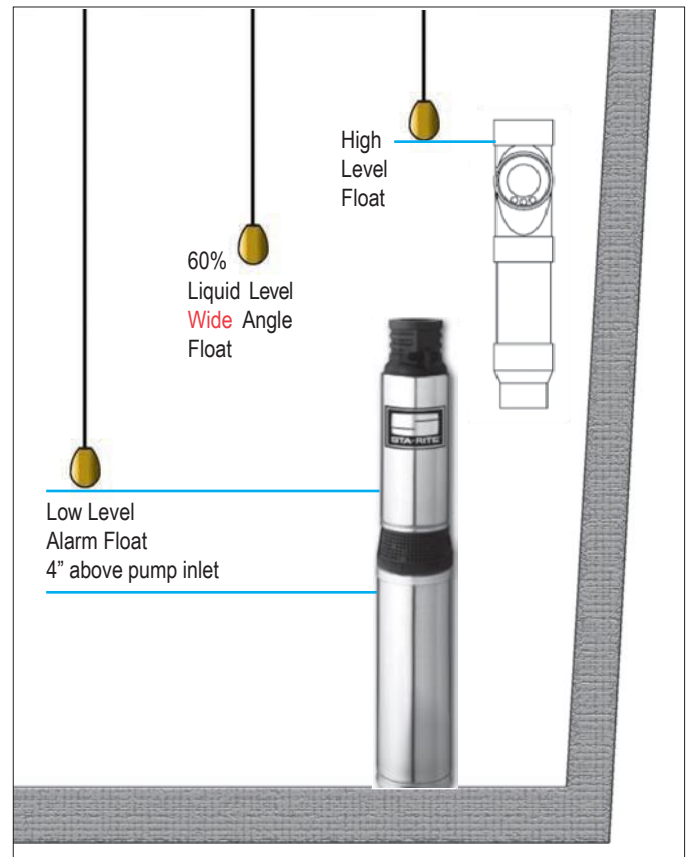
DO NOT install a check valve in the pump supply line this will prevent the supply line to the pod spray manifold from draining and may cause freezing.

3.7 Setting Pump Control Floats (see page 6)

The control panel will come with three liquid level floats:

1. Low Level Alarm Float protects the pump from run dry damage by turning off the pump and sound an audible and visual alarm. Set float to activate if the effluent level drops to 4" above the pump intake.
2. Timer Enable Float activates the pump runtime and assures the pump only runs when there is sufficient effluent in the re-circulation tank. Set float to activate when effluent level in the recirculation tank is filled to 50%.
3. High Level Alarm Float will sound an audible and visual alarm when the effluent in the re-circulation tank is too high. Set float to activate when the effluent level in the in the re-circulation tank is level with the top of the by-pass valve.

Float Settings



4.0 Start-up

Septic Tank and Re-circulation Tank
Thesepticandre-circulationtankshallbe inspected prior to start up to:

1. Verify the lid and riser assemblies are watertight. Check for any damaged, water weeping marks, holes or cracks. The system must remain watertight to perform properly.
2. Inspect the outlet effluent filter installation to insure it is installed in accordance with the effluent filter manufacturer's specifications.
3. Inspect the liquid level in the recirculation tank, the liquid should be sufficient to activate the Timer Enable Float.
4. Inspect the location of the float controls. They should be securely attached to the float bracket, free to float without obstructions and the location of the floats should correspond with the float diagram on page 10.

Power Supply

1. Verify the main power supply to the re-circulation panel has properly sized breakers, the proper voltage and is installed in protection water tight conduit.
2. Check the voltage and motor amp draw. If the readings are beyond the limits specified on the pump have an electrician check the main service line feeding the system control panel.

By-Pass Valve

1. Verify the main power supply to the re-circulation panel has properly sized breakers, the proper voltage and is installed in protection water tight conduit.
2. Check the voltage and motor amp draw. If the readings are beyond the limits specified on the pump have an electrician check the main service line feeding the system control panel.

Flush the Spray Manifold

1. At initial system start-up, remove the end caps from the spray manifold. Operate the re-circulation pump by turning the pump control to the "HAND-ON" position. Let the pump run for **one minute** then turn the pump control to the "OFF" position repeat this procedure three times to flush any construction debris such as dirt or pipe shavings from the spray manifold. Replace the end caps hand tight—do not use wrenches or pliers. Re-set the pump control selector switch to the "AUTO" position.
2. Using the ball valve located in the manifold supply line adjust the manifold pressure to 20 to 25 PSI.
3. Observe the system as it re-circulates. Visually verify all liquids flows freely through the system.

Setting the Re-circulation Pump Control

1. Check the functions of the E-Z Treat Re-circulating Synthetic Filter control panel.

Control: Main Control "ON/OFF" switch

Function: Turns power ON or OFF

Control: System Setting Switch
"MANUAL ON" and "AUTO ON"

Function: "MANUAL ON" overrides all float switches and time clock switches. "AUTO ON" allows for normal operations dictated by the time clock and float switches.

Control: Timer

"MINUTES ON" and "MINUTES OFF"

Function: Controls run time of re-circulation pump i.e. GPD re-circulated through media

Control: High and Low Water Alarm "ALARM ON", "ALARM AUTO" and "ALARM SILENCE"

Function: "ALARM ON" will manually turn on the audio/visual alarms. "ALARM AUTO" is the normal operational setting and "ALARM SILENCE" turns off the alarms.

2. Check re-circulation pump. Place the system in the manual mode by turning the re-circulation pump switch to "ON". The re-circulation pump should begin to supply effluent to the spray nozzles in the treatment pod.

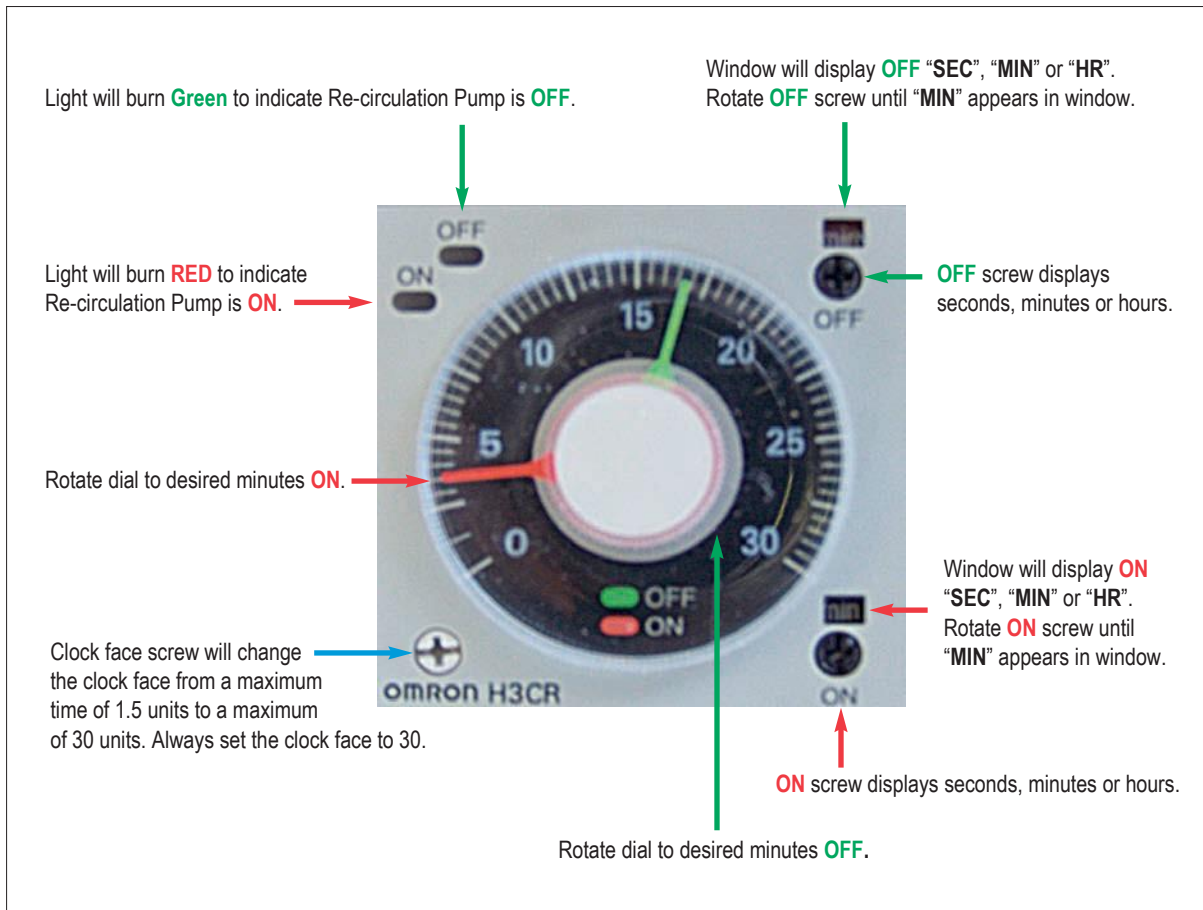
Control Panel/Pumps/Alarms

1. Place the system in the normal operating mode by turning the re-circulation pump switch to "AUTO". Verify the timer ON/OFF set the ON/OFF time to match Table 5 below.
2. Verify the accuracy of the system ON/OFF Timer. To accomplish this use a stop watch and verify the length of time the re-circulation pump is OFF then verify the time the re-circulation pump is ON. Those times should match the ON/OFF Timer settings in the control panel.
3. Confirm the operation of the visual and audible "HIGH" and "LOW" water alarms. The control has an alarm switch clearly marked Alarm "ON", Alarm "AUTO" and Alarm "SILENCE". Place the Alarm Switch in the "ON" position, you will hear a loud buzzer and see a red flashing light. Move the switch to the Alarm "SILENCE" position the red light and buzzer will go dormant. Once the alarms have been triggered return all settings to their original position of Alarm "AUTO"
4. Verify the floats are operational by manually raising and lowering the floats to simulate the systems normal operation. Verify proper operation of "High Level Float" by lifting the float while the system timer is in the "OFF" time mode, the re-circulation pump should turn on over riding the "OFF" timer, the Visual and Audible alarms should activate. Return the float to its normal position the re-circulation pump will turn off. Reset the alarms and manually lower the "Low Water Float" with timer in the "ON" mode, the re-circulation pump will turn off and the visual/audible alarms will activate. Return the float to the normal position and the re-circulation pump will run. Reset the Alarms.
5. Verify all control breakers are in the "ON" position and all control switches are in the "AUTO" position before closing and securing the system.

Timer Settings default settings for 600, 750, 1200 are 2.5 minutes ON , 12 minutes OFF

These settings may need to be adjusted based upon homeowner usage, refer to manufacturer for adjustment of settings.

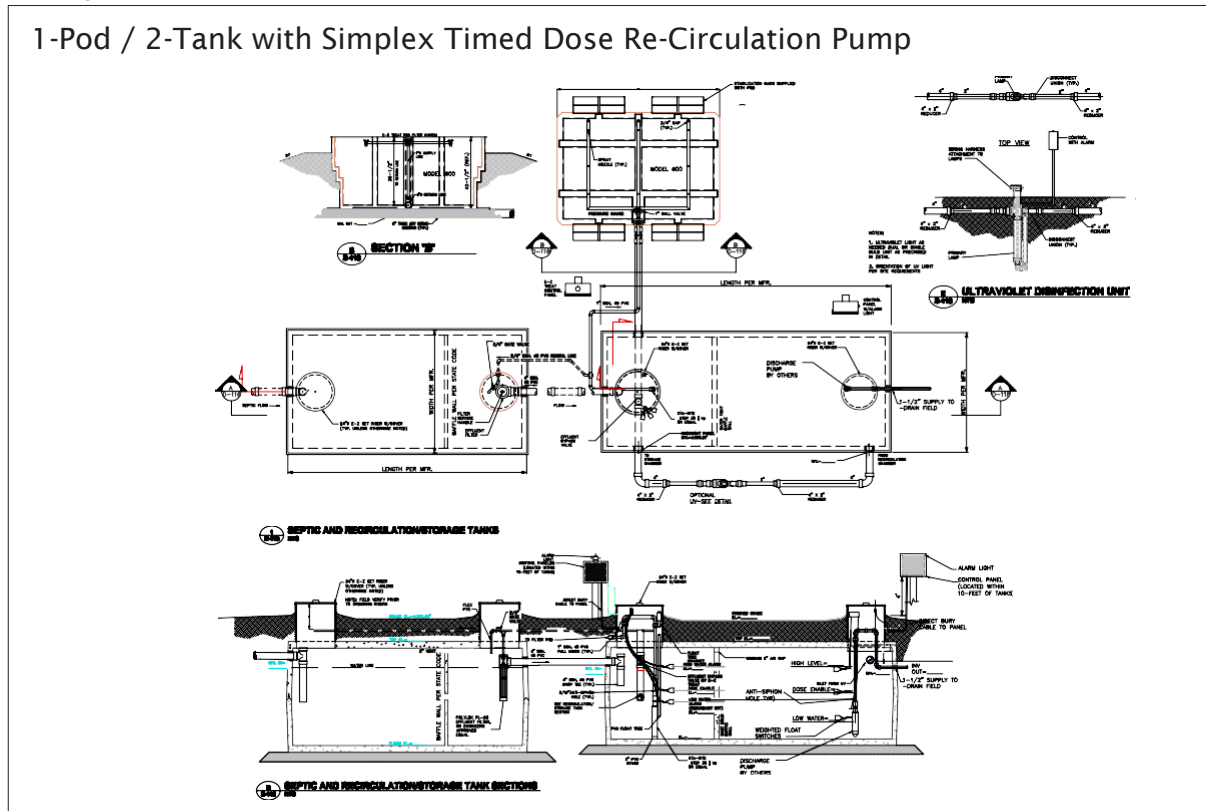
Re-circulation Pump Timer example



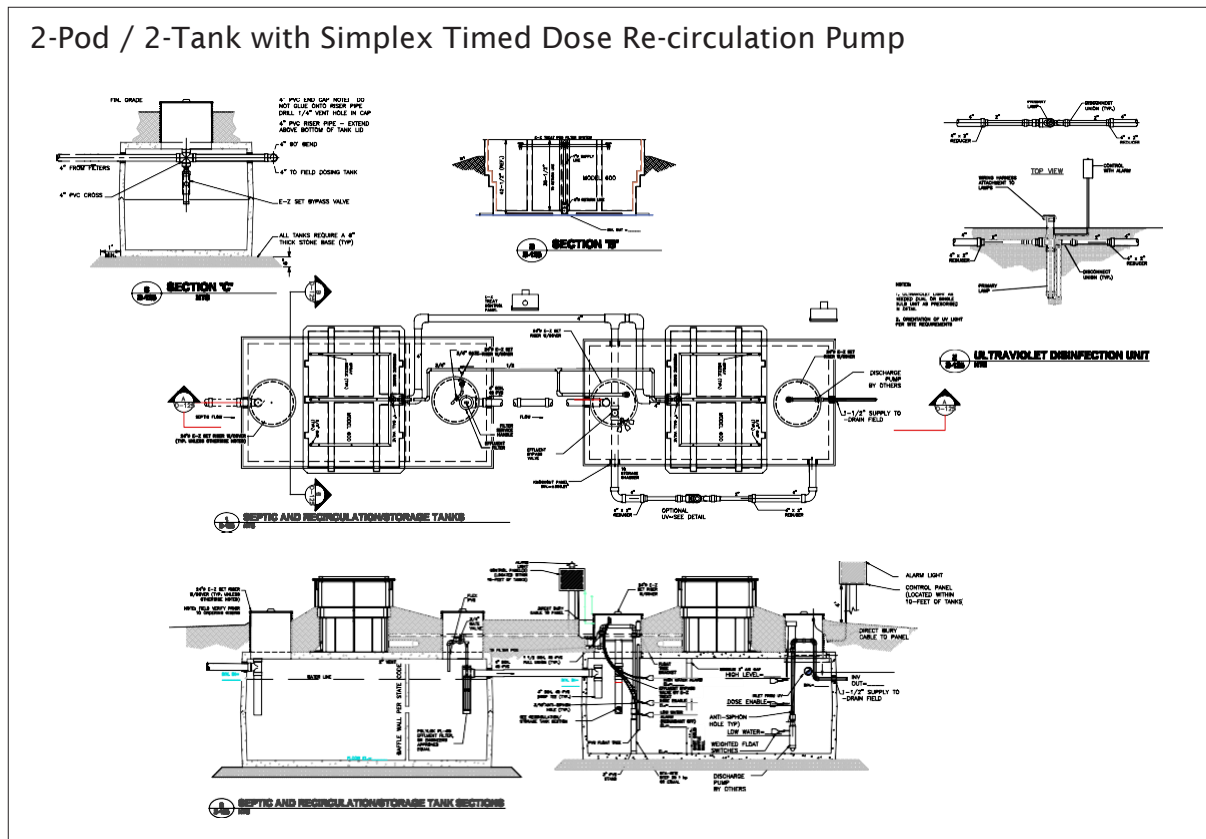
Appendix 1 Model 600 & Model 750 Typical Configurations

Note: Not a complete library of possible configurations. Contact E-Z Treat for more information. Drawings are available in CAD and PDF

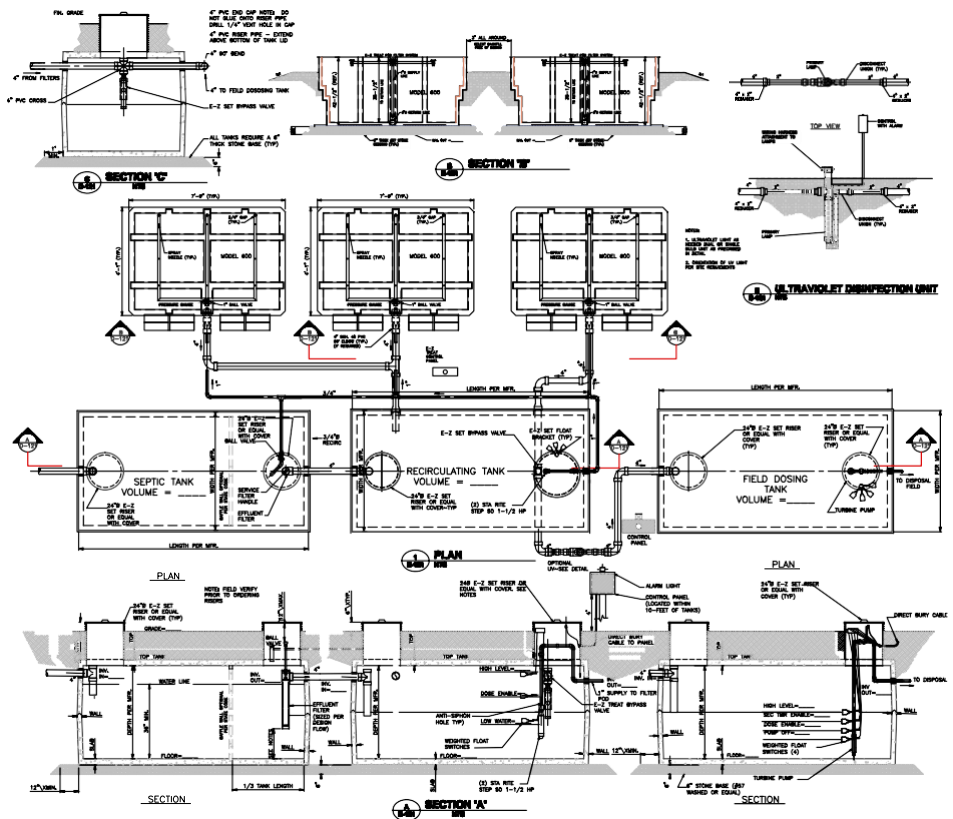
1-Pod / 2-Tank with Simplex Timed Dose Re-Circulation Pump



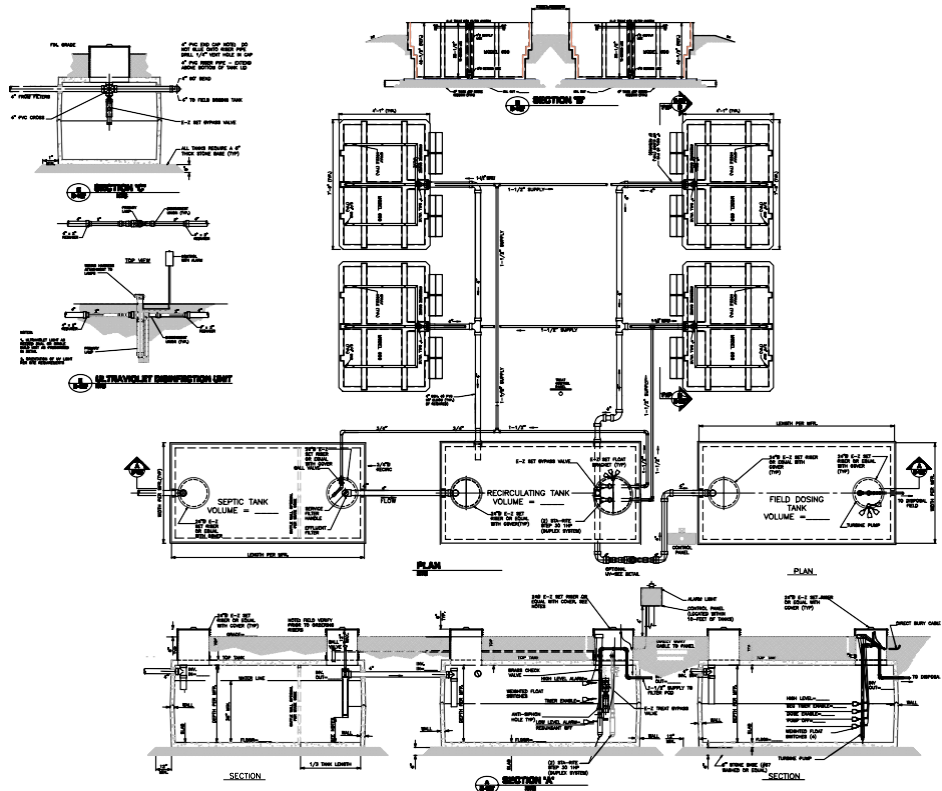
2-Pod / 2-Tank with Simplex Timed Dose Re-circulation Pump



3-Pod / 3-Tank with Simplex Timed Dose Re-circulation Pump



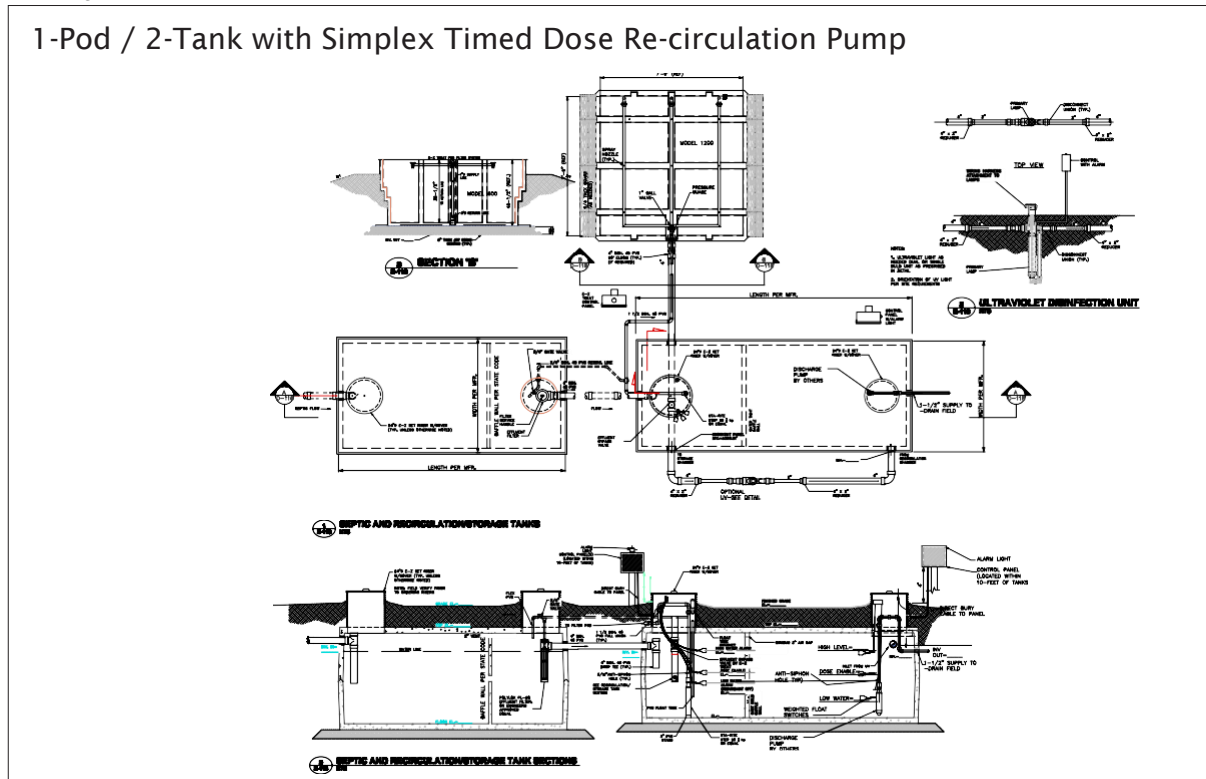
4-Pod / 3-Tank with Duplex Timed Dose Re-circulation Pumps



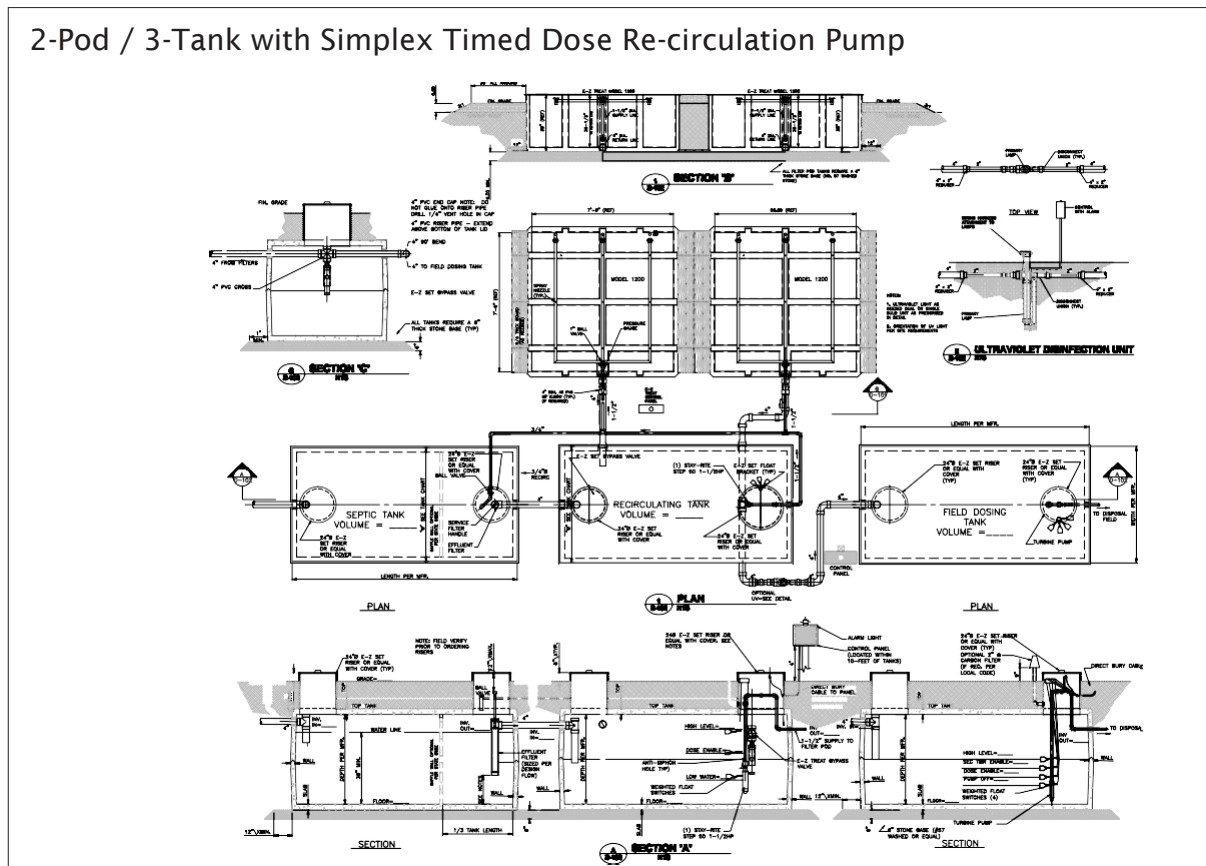
Appendix 2 Model 1200 Typical Configurations

Note: Not a complete library of possible configurations. Contact E-Z Treat for more information. Drawings are available in CAD and PDF.

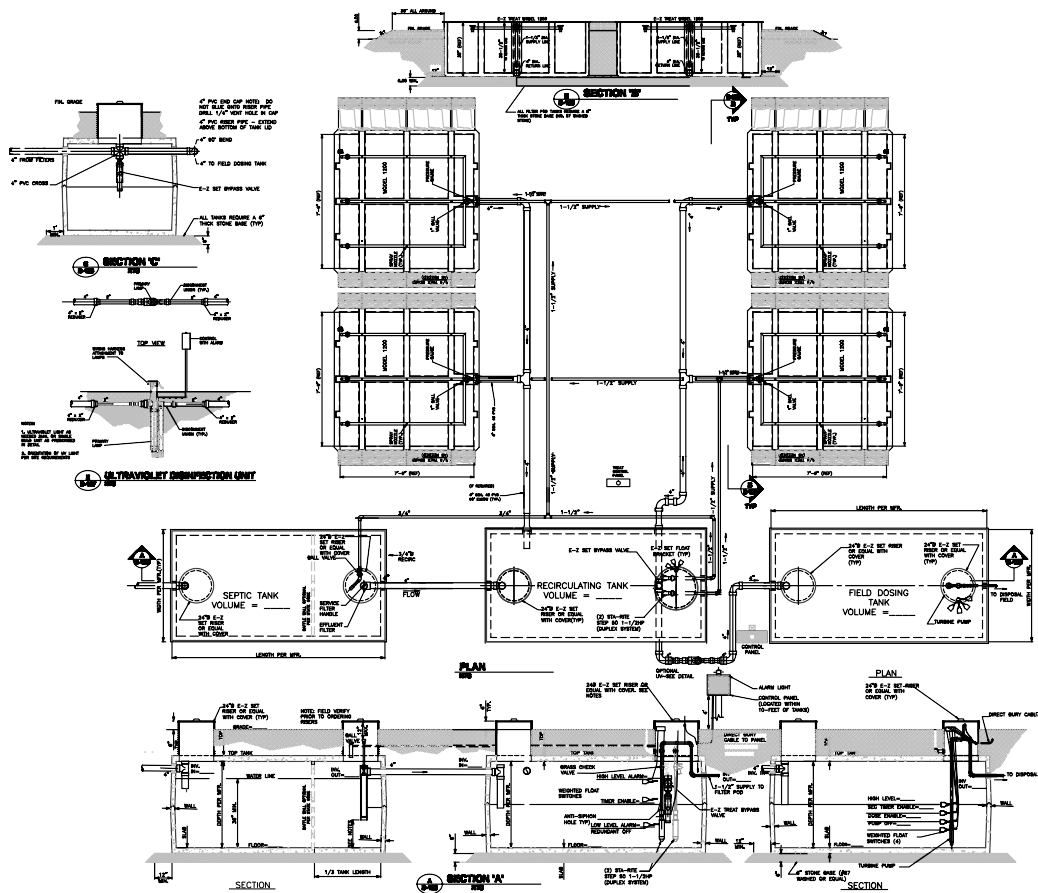
1-Pod / 2-Tank with Simplex Timed Dose Re-circulation Pump



2-Pod / 3-Tank with Simplex Timed Dose Re-circulation Pump



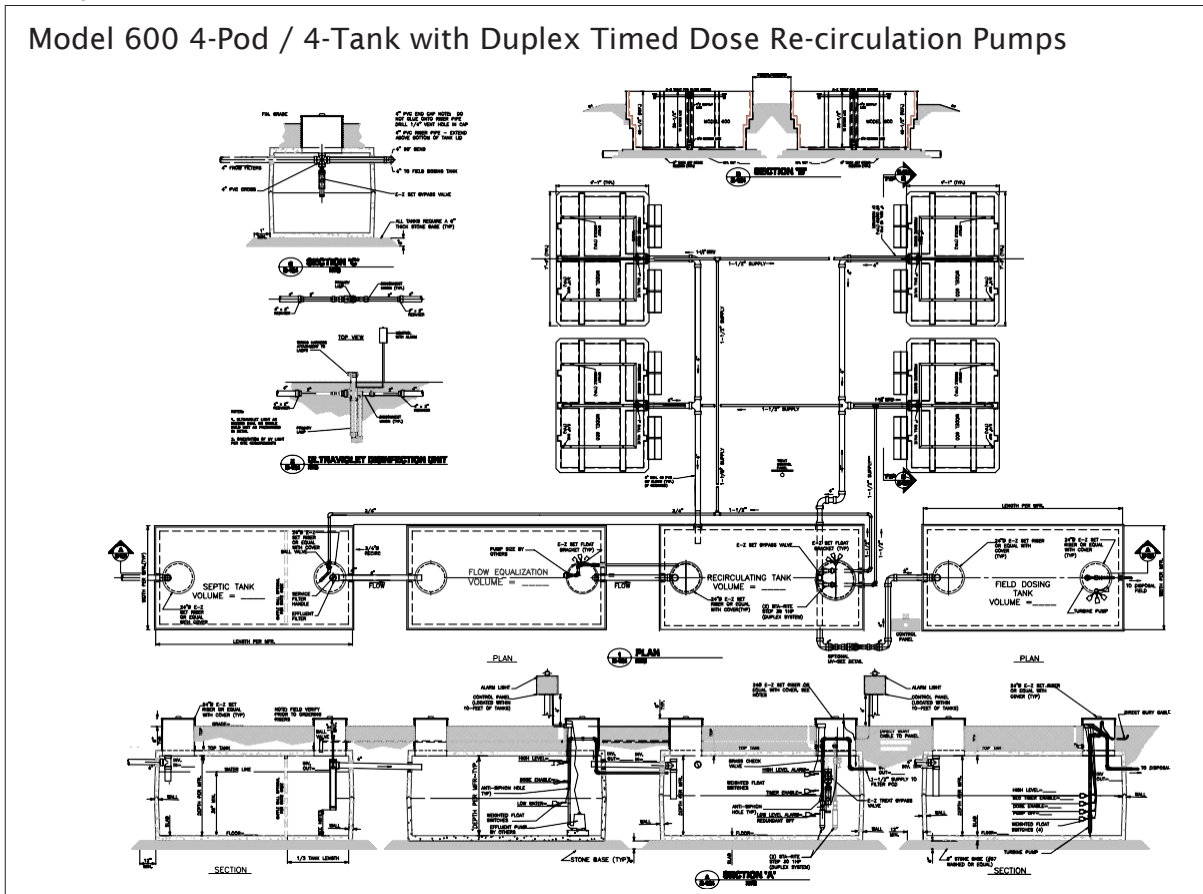
4-Pod / 3-Tank with Duplex Timed Dose Re-circulation Pumps



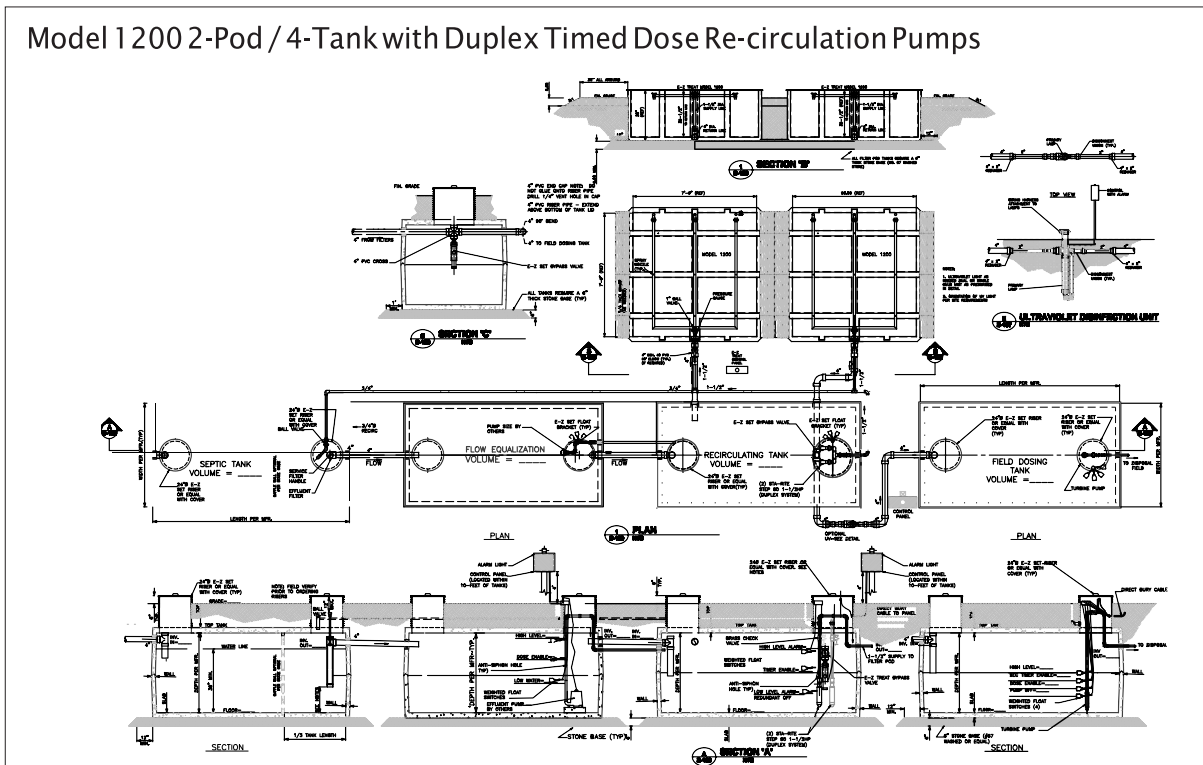
Appendix 3 Typical Commercial Configurations

Note: Not a complete library of possible configurations. Contact E-Z Treat for more information. Drawings are available in CAD and PDF.

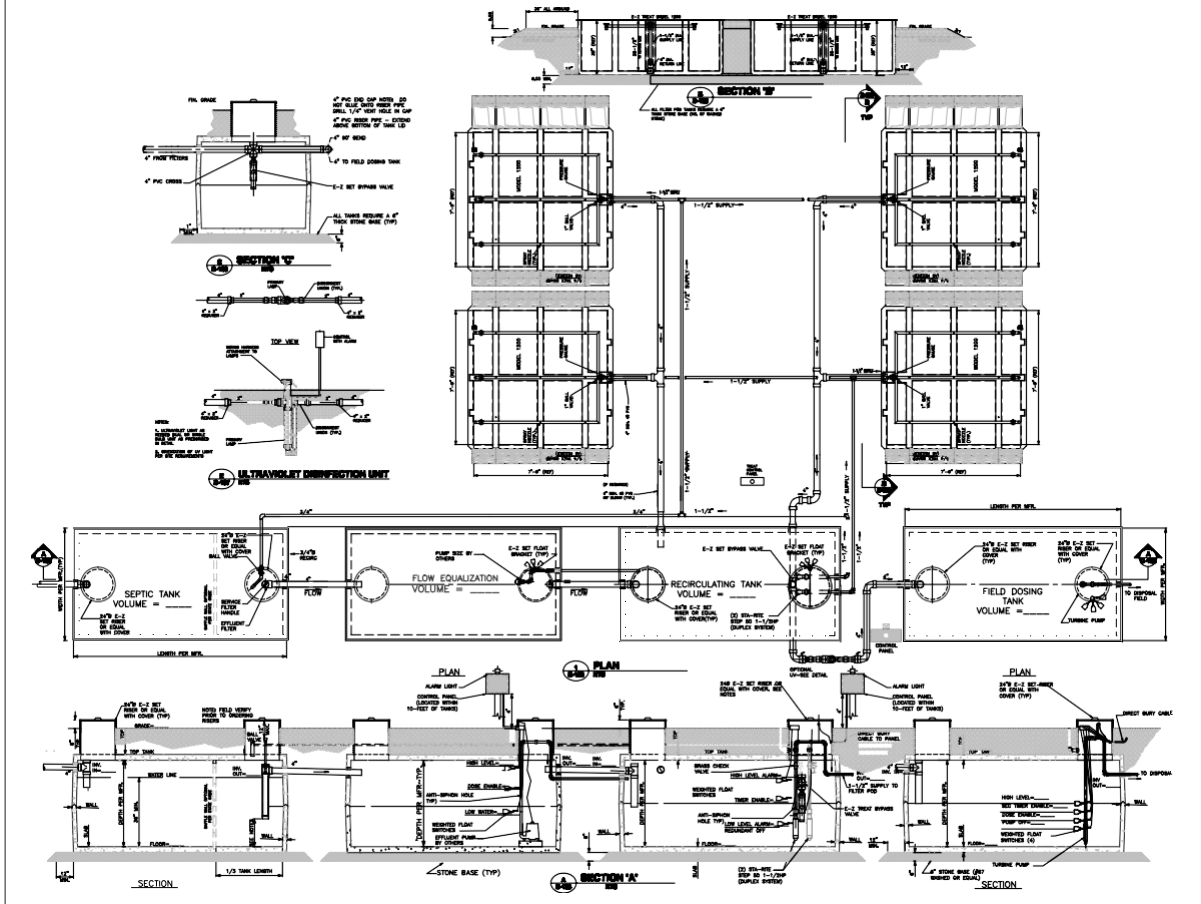
Model 600 4-Pod / 4-Tank with Duplex Timed Dose Re-circulation Pumps



Model 1200 2-Pod / 4-Tank with Duplex Timed Dose Re-circulation Pumps



Model 1200 4-Pod / 4-Tank with Duplex Timed Dose Re-circulation Pumps



Appendix 4 High Strength Waste Case Study

Below are the test results of E-Z Treat Re-Circulating Synthetic Filter system in a high strength waste application. This was a repair of a failed High Strength Aerobic Treatment Unit at a restaurant. The effluent from the ATU plugged the drip field and the tubing had to be replaced. The health department required the effluent to achieve residential strength quality before dispersal to the subsurface drip tubing. The solution was to install two Model 1200 pods. The state required monthly testing the first six months and annual testing thereafter. The average daily flow is 1,500 GPD. The system has been operation since 2009 and the media has not been replaced or cleaned.

Table 6 BOD Loading

Parameter	Effluent, Avg
Daily Flow	1,500
Influent BOD loading	1900 mg/l
Influent BOD mass load	24 lbs/day
BOD mass load per pod	12 lbs/day

Table 7 Commercial Test Results (sample restaurant)

Date	Influent Bod (mg/L)	Effluent Bod (mg/L)	% Reduction	Influent TSS (mg/L)	Effluent TSS (mg/L)	% Reduction
7/9/2009	2100	25	98.8	2670	33	98.8
7/16/2009	2050	50	97.6	3640	32	99.1
8/13/2009	2080	27	98.7	2550	39	98.5
9/17/2009	2030	21	99.0	1670	32	98.1
10/27/2009	2050	58	97.2	1100	75	93.2
11/19/2009	2050	32	98.4	4080	58	98.6
12/17/2009	1050	14	98.7	385	58	84.9
AVG	1916	32	98%	2299	47	96%

Influent sample location: First septictank outlet

Effluent sample location: E-Z Treat outfall

Note: System repairs completed by 7/9/2009



Pump discharge tank BEFORE the repair of a High Strength Aerobic Treatment Unit at a restaurant metered forward flow average of 1,500 GPD.



Sample pulled from the discharge side of the High Strength Aerobic Treatment Unit.



Pump discharge tank AFTER the repair of a High Strength Aerobic Treatment Unit using two Model 1200 pods metered forward flow average of 1,500 GPD.



Sample of treated effluent pulled from the discharge side of the Model 1200 pods.



PO Box 176
Haymarket, Virginia 20168

T 703.753.4770

F 571.248.8837

eztreat.net

©2017 E-Z Treat 2-2017