App# EH2009-0013

Harnett County Department of Public Health

Improvement Permit

A building permit cannot be issued with only an Improvement Permit

PROPERTY LOCATION: _____

ISSUED TO: _____ SUBDIVISION _____ LOT # _____

NEW ☐ REPAIR ☐ EXPANSION ☐ Site Improvements required prior to Construction Authorization Issuance:

Type of Structure: _____

Proposed Wastewater System Type: _____

Projected Daily Flow: _____ GPD

Number of bedrooms: _____ Number of Occupants: _____ max

Basement ☐ Yes ☐ No

Pump Required: ☐ Yes ☐ No ☐ May be required based on final location and elevations of facilities

Type of Water Supply: ☐ Community ☐ Public ☐ Well Distance from well _____ feet

Permit valid for: ☐ Five years ☐ No expiration

Permit conditions: _____

Authorized State Agent:: _____ Date: _____ SEE ATTACHED SITE SKETCH

The issuance of this permit by the Health Department in no way guarantees the issuance of other permits. The permit holder is responsible for checking with appropriate governing bodies in meeting their requirements. This site is subject to revocation if the site plan, plat, or the intended use changes. The Improvement Permit shall not be affected by a change in ownership of the site. This permit is subject to compliance with the provisions of the Laws and Rules for Sewage Treatment and Disposal and to conditions of this permit..

Construction Authorization

(Required for Building Permit)

The construction and installation requirements of Rules .1950, .1952, .1954, .1955, .1956, .1957, .1958, and .1959 are incorporated by references into this permit and shall be met. Systems shall be installed in accordance with the attached system layout.

ISSUED TO: Nick Hemby PROPERTY LOCATION: 2251 Pearidge Rd

SUBDIVISION _____ LOT # _____

Facility Type: Ext SFD ☐ New ☐ Expansion ☒ Repair

Basement? ☐ Yes ☒ No Basement Fixtures? ☐ Yes ☐ No

Type of Wastewater System** _____ (Initial) Wastewater Flow: 360 GPD

(See note below, if applicable ☐)

Pump to Panel Block (Repair)

Installation Requirements/Conditions

Septic Tank Size 1000 gallons

Pump Tank Size 1000 gallons

Number of trenches see

Exact length of each trench proposal feet

Trenches shall be installed on contour at a

Maximum Trench Depth of: _____ inches

(Trench bottoms shall be level to +/-1/4" in all directions)

Trench Spacing: _____ Feet on Center

Soil Cover: _____ inches

(Maximum soil cover shall not exceed 36" above the trench bottom)

Pump Requirements: _____ ft. TDH vs. _____ GPM

_____ inches below pipe

Aggregate Depth: _____ inches above pipe

_____ inches total

Conditions: See attached proposal for all specifications, Call with any questions prior to installation.

WATER LINES (INCLUDING IRRIGATION) MUST BE 10FT. FROM ANY PART OF SEPTIC SYSTEM OR REPAIR AREA.
NO UTILITIES ALLOWED IN INITIAL OR REPAIR DRAIN FIELD AREA.

**If applicable: *I understand the system type specified is different from the type specified on the application. I accept the specifications of this permit.*

Owner/Legal Representative Signature: _____ Date: _____

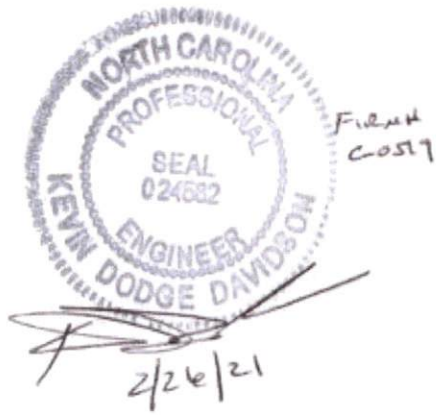
This Construction Authorization is subject to revocation if the site plan, plat, or the intended use changes. The Construction Authorization shall not be transferred when there is a change in ownership of the site. This Construction Authorization is subject to compliance with the provisions of the Laws and Rules for Sewage Treatment and Disposal and to the conditions of this permit. SEE ATTACHED SITE SKETCH

Authorized State Agent: _____ Date: 1/5/22

Construction Authorization Expiration Date: 1/5/27

Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com



February 24, 2021

Mr. Oliver Tolksdorf
Environmental Health Supervisor
Harnett County Environmental Health
307 Cornelius Harnett Blvd.
Lillington, NC 27546

SUBJECT: Septic System Layout & Design – Hemby Property
2251 Pearidge Road, Angier, NC 27501
PIN: 0693-09-6030

Dear Mr. Tolksdorf:

Enclosed please find a layout and design package for a Panel Block septic system for the property located at 2251 Pearidge Road, Angier, NC 27501. The system is designed for a three (3) bedroom single-family residence. The design flow is 360 gallons/day.

The new system will utilize the following components:

- New 1,000-gallon septic tank
- New 1,000 -gallon pump tank
- Control panel
- Prefabricated Permeable Block Panel Drainfield Product

I appreciate your time and efforts in reviewing this application. If you have any questions or comments, please feel free to contact me at 919-859-0669.

Best Regards,

Kevin Davidson, P.E.
V.P. of Engineering

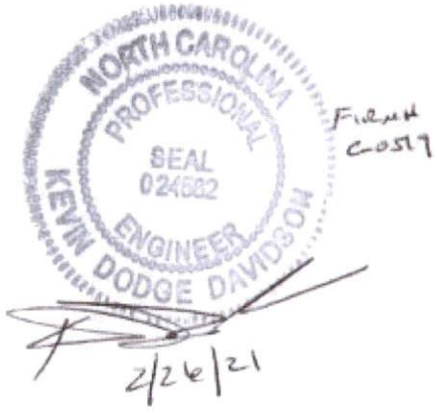
Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

FINAL DESIGN
NOT RELEASED FOR
CONSTRUCTION

Hemby Property
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Plans and Specifications for Wastewater Treatment System



Date: February 24, 2021

Consultants: Kevin D. Davidson, P.E.
V.P. of Engineering
kdavidson@agriwaste.com
Agri-Waste Technology, Inc.
501 N. Salem Street, Ste 203
Apex, NC 27502
Office: 919-859-0669

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Hemby Property
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Plans and Specifications for Wastewater Treatment System

- Narrative Description of System
- Design Spreadsheets
- Drawings of Proposed System
- Tank Specification Sheets
- Access Riser Adapters, Risers, Lids, Splice Box, and Safety Net
- Effluent Filter Specification
- Pump Specification
- Specification for Control Panel
- Pressure Filter
- T and J Panels

Narrative Description
of
Wastewater Treatment System

The Wastewater Treatment System that has been designed considers the following components:

- Septic Tank
- Pump Tank
- Discharge Pump and Filter
- Control Panel and Floats
- Drainfield

Because of the distribution method of this system, it is required that a Certified Operator be contracted to maintain this system.

Septic Tank
A new 1,000-gallon septic tank will be installed for this system. A 4" effluent filter will be installed in the outlet end of the septic tank. Access risers (24") will be installed on both the inlet and outlet ends of the septic tank. To facilitate the installation of the access risers, the tank will have riser adapters cast into the top of the tank during tank construction. Inner lids or safety nets will be included with the risers. Rubber boots (4") shall be cast into the inlet and outlet end of the tank. Waste that exits the septic tank will flow via gravity into the pump tank. It is recommended that Orenco Systems riser-adapting risers, lids, and effluent filter be utilized. Sectional risers are not recommended.

Pump Tank
A new 1,000-gallon pump tank will be installed for this system. A 24" access riser will be installed on the outlet end of the pump tank. To facilitate the installation of the access riser, the tank will have a riser adapter cast into the top of the tank during tank construction. Rubber boots shall be cast into the inlet (4") and outlet (2") ends of the tank. The pump tank will house the discharge pump. It is recommended that Orenco Systems riser-adapting risers and lids be utilized. Sectional risers are not recommended.

Discharge Pump and Filter
The system will pump to a low-pressure pipe system in the drainfield. The discharge pump will be a submersible pump and will be outfitted with a check valve, pressure filter, union, and gate valve on the discharge pipe. The pressure filter will reduce the potential of solids entering the drainfield.

Control Panel and Floats
One control panel will be installed with this wastewater system. This panel will control operation of the discharge pump. Four floats will be installed; "Redundant Off", "Pump Off", "Pump On", and "High Water Alarm". The purpose of the Redundant Off float is to act as a secondary Off or

protection float for the pump. In the event the control panel does not properly stop the pump when the water level drops, the Redundant Off float will drop, thereby ceasing pumping and protecting the pump from running dry. The Pump Off and On floats are set based on the intended field dose volume. When the dose volume is reached in the tank (as the water level rises), the Pump On float will engage (the Pump Off float will also be "up") and pump the tank contents to the drainfield. As the liquid level drops, the Pump On float will drop and then once the Pump Off float drops, the pump will cease pumping. In the event of a power outage, pump failure or extremely high inflow to the system, the effluent level may rise above the Pump On float. If the effluent level rises sufficiently, the high-water alarm will activate. The High Water Alarm float is set approximately 6" above the Pump On float and allows for a minimum of one-day storage in the pump tank and septic tank.

Drainfield

The drainfield will utilize prefabricated permeable block panel drainfield product. Low-pressure pipe distribution will be utilized system. Trench depth will be 26" and trench width will be 36". Note: This property is repair-exempt.

If there are questions, comments, or concerns regarding the operation of the system, please contact AWT at 919-859-0669.

LPP Panel Block System - Design Summary Page

Engineers and Soil Scientists
Agri-Waste Technology, Inc.

Project Manager: Kristy Green, E.I.
(919) 629-6403
kgreen@agriwaste.com
Engineer: Kevin D. Davidson, PE
(919) 623-3538
kdavidson@agriwaste.com

Date: 02/23/21
County: Harnett
EHS:

Project: Hemby Project
Property: 2251 Pearidge Road
Angier, NC 27501
Subdiv.:
Lot #:
PIN: 0693-09-6030

Permit #:

Type of System: IV a
New Construction

Owner: South East Custom Home Builders LLC c/o Michael Hemby
Address: 55 King Avenue
Flanders, NY 11901
Phone: (631) 830-2052
Email: nbryanhemby@gmail.com

Soil Parameters

Soil Evaluation By: Jeff Vaughan, LSS

LTAR: 0.3 gpd/ft^2

Special Conditions/Notes:
Horizontal T&J Panel
26" trench depth.

Design Parameters

Type of Establishment: Residence, 5 or fewer bedrooms
Unit: Bedroom
# of Units: 3

Septic Tank Specifications

Min. Tank Capacity: 900 gal
Actual Tank Volume: 1,000 gal
Tank Manufacturer: Shoaf
Tank Model: TS 1000 STB

	Exterior	Interior	
Length:	108.00	102.00	in.
Width:	58.00	52.00	in.
Depth:	67.50	in.	

Primary Drainfield Specifications

Type of Distribution: LPP
Trench Media: Panel Block, Horizontal
Trench Width: 3 ft
Trench Depth: 26 in.
(or as specified on permit)

Trench Bottom Area: 600 ft^2
Minimum Drain Line: 200 ft
Actual Drain Line: 208 ft
Number of Lines: 8
Minimum Line Spacing: 9 ft O.C.

Wastewater Treatment System Design Calculations

Project	Hemby Project	**Date**	2/23/2021
Location	2251 Pearidge Road Angier, NC 27501	**County**	Harnett

Septic Tank Sizing

Daily Flow Estimate

Establishment Type	Unit	# Units	GPD/Unit	GPD
Residence, 5 or fewer bedrooms	Bedroom	3	120	360
				0
			Q	**360**

Septic Tank Minimum Capacity

Per NCAC T15A:18A .1952(b)(1):

For individual residences with 3 or fewer bedrooms,

V = 900

Required Capacity 900 gal

Septic Tank Specs

Manufacturer	Shoaf	
Model	TS 1000 STB	
Volume	1,000 gal	
Weight	9,500 lbs	
	Exterior	Interior
Length	108.0 in.	102.0 in.
Width	58.0 in.	52.0 in.
Height	67.5 in.	
Shape of Risers	Circular	
Diameter	24.0 in.	

Drainfield Design

Project	Hemby Project	Date	2/23/2021
Location	2251 Pearidge Road Angier, NC 27501	County	Harnett

Drainfield Sizing - Primary

Conventional Trench	
LTAR:	0.300 gpd/ft^2
Daily Design Flow:	360 gpd
Drainfield Area:	1,200 ft^2
Trench Width:	3 ft
Required Drainline:	400 ft

Panel Block Trench		
Required Drainline		
After 50% Reduction:	200 ft	
Utilized Drainline:	**208 ft**	
Minimum Line Spacing:	9 ft (O.C.)	
Trench Width (MIN.):	3 ft	See Drawings
Effective Loading Rate:	0.58 gpd/ft^2	

Benchmark Description: West corner of Lot

Benchmark Elevation: 534.06 ft

Line	Use	Flag Color	Elevation (ft)	Layout Length (ft)	Utilized Primary Length (ft)
1	Layout Line	White	96.0	30	26
2	Layout Line	Pink	96.6	37	35
3	Layout Line	Red	96.7	36	35
4	Layout Line	Blue	97.0	25	22
5	Layout Line	White	97.1	25	22
6	Layout Line	Pink	97.4	29	26
7	Layout Line	Red	97.5	29	26
8	Layout Line	Blue	98.0	19	17
				Total:	208
				Count:	8

Lengths are shown to the nearest foot.

Drainfield Summary

Project	Hemby Project	**Date**	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	**County**	Harnett

Primary System

DRAINFIELD INFO.

Type of System/Distribution: ***Porous Block Panel System w/ LPP Distribution***

Line No.	Line Elev (ft)	Flag Color	Line Length (ft)	Pressure Head (ft)	Number of Panels	Orifice Size (in.)	Lateral Discharge (gpm)	Lateral Diameter (in.)
1	96.0	White	26	4.84	6	9/64	4.11	1
2	96.6	Pink	35	3.92	8	5/32	5.72	1
3	96.7	Red	35	3.53	8	5/32	5.43	1
4	97.0	Blue	22	3.11	5	11/64	4.31	1
5	97.1	White	22	2.95	5	11/64	4.20	1
6	97.4	Pink	26	2.58	6	11/64	4.49	1
7	97.5	Red	26	2.46	6	11/64	4.39	1
8	98.0	Blue	17	2.01	4	3/16	3.53	1
TOTAL			**208**		48		**36.17**	

Determination of Dose Volume - Primary System

Volume per Panel	3.6 gal
Number of Panels	48
Dose Volume (min)	173 gal
Runtime (min)	4.78 min

***Actual Dose and Runtime determined by Float Settings*

LPP Manifold & Laterals Design - Primary

Project	Hemby Project	Date	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	County	Harnett

Manifold Design

Calc. Laterals are numbered from the supply end of the manifold to the distal lateral.

q_{supply} **36.17 gpm** Required flow at manifold inlet

V_{system} **37.31 gal** Volume of manifold, headers, and laterals

Note: The laterals in this system do not drain because there are no downward-facing orifices.

Layout Lateral	Calc. Lateral	Head at Junction (ft)	Dist. To Next Junc. (ft)	Man. Diam. (in.)	Lateral Elev. (ft)	Disch. in Man. Section to Next Lat. (gpm)	Fric. Loss in Sect. to Next Lat. (ft)	Avg q_{orif} (gpm)	Δq_{orif} w/i Lateral	Lateral q_{orif} diff. from lowest lateral		Orifice Diam. (in.)	H_{min} in Lateral (ft)	Lateral Diam. (in.)	Lateral Area (in.^{2})	Lateral Vol. (gal)	Header Vol. (gal)
1	1	4.95	10.00	2	96	32.06	0.212	0.51	0.5%	0.0%		9/64	4.84	1	0.83	2.29	0.17
2	2	4.14	21.00	2	96.6	26.34	0.310	0.57	1.3%	11.4%		5/32	3.92	1	0.83	3.04	0.17
3	3	3.73	22.00	2	96.7	20.90	0.212	0.54	1.3%	5.7%		5/32	3.53	1	0.83	3.04	0.17
4	4	3.22	10.00	2	97	16.60	0.063	0.62	0.6%	19.7%		11/64	3.11	1	0.83	1.92	0.17
5	5	3.05	14.00	2	97.1	12.40	0.051	0.60	0.6%	16.7%	4.20	11/64	2.95	1	0.83	1.92	0.17
6	6	2.70	12.00	2	97.4	7.92	0.019	0.56	1.0%	9.2%	4.49	11/64	2.58	1	0.83	2.29	0.17
7	7	2.58	14.00	2	97.5	3.53	0.005	0.55	1.0%	6.8%	4.39	11/64	2.46	1	0.83	2.29	0.17
8	8	2.08	0.00	2	98	0.00	0.000	0.59	0.6%	14.5%	3.53	3/16	2.01	1	0.83	1.54	0.17
							0.872								6.65	18.32	1.38

Minimum Manifold ID **1.97 in.** Based on 0.7 $\Sigma A_{lateral}$ Min. Manifold Area 4.66

Design Manifold Diameter **2 in.** Nominal pipe size

Lateral Design

Lateral 1L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_n				4.95		0.000		
Header	4.00	1	0.054	4.90	4.1			1.59
Orifice 1	2.42	1	0.009	4.89	2.1	9/64	0.52	0.79
Orifice 2	8.67	1	0.019	4.87	1.5	9/64	0.51	0.59
Orifice 3	8.67	1	0.009	4.86	1.0	9/64	0.51	0.40
Orifice 4	6.75	1	0.000	4.86	0.5	9/64	0.51	0.20
	26.51		0.037					

Lateral 1R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.025	4.87	2.1	9/64	0.51	0.79
Orifice 2	8.67	1	0.019	4.85	1.5	9/64	0.51	0.59
Orifice 3	8.67	1	0.009	4.84	1.0	9/64	0.51	0.40
Orifice 4	2.42	1	0.000	4.84	0.5	9/64	0.51	0.20
	26.51		0.053					

Notes:
H_n is the head at the manifold junction with the lateral (or header). If there is no header, enter "0" for the "Dist. Incr."
The **Header** is the section containing valves, etc., between the manifold and the regular lateral.
Distance Increment to *Orifice 1* is from the header (or manifold junction if there is no header) to the first orifice. Subsequent *Distance Increments* are between successive orifices.

H-W C	150
Equiv Length %	15%

Avg. q_{orif} in the highest lateral should be 10-30% greater than avg. q_{orif} in the lowest lateral.

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	4.89	0.52	4.87	0.51	4.89	0.52
Min	4.86	0.51	4.84	0.51	4.84	0.51
Avg	4.87	0.51	4.85	0.51	4.86	0.51
% Drop	0.6%	0.3%	0.6%	0.3%	0.9%	0.5%

Lateral 2L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				4.14				
Header	4.00	1	0.099	4.04	5.7			2.21
Orifice 1	2.42	1	0.017	4.02	2.9	5/32	0.58	1.11
Orifice 2	8.67	1	0.040	3.98	2.3	5/32	0.57	0.88
Orifice 3	8.67	1	0.023	3.96	1.7	5/32	0.57	0.66
Orifice 4	8.67	1	0.011	3.95	1.1	5/32	0.57	0.44
Orifice 5	6.75	1	0.000	3.95	0.6	5/32	0.57	0.22
	35.18		0.090					

Lateral 2R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.046	3.99	2.9	5/32	0.57	1.10
Orifice 2	8.67	1	0.039	3.95	2.3	5/32	0.57	0.88
Orifice 3	8.67	1	0.023	3.93	1.7	5/32	0.57	0.66
Orifice 4	8.67	1	0.011	3.92	1.1	5/32	0.57	0.44
Orifice 5	2.42	1	0.000	3.92	0.6	5/32	0.57	0.22
	35.18		0.119					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	4.02	0.58	3.99	0.57	4.02	0.58
Min	3.95	0.57	3.92	0.57	3.92	0.57
Avg	3.97	0.57	3.94	0.57	3.96	0.57
% Drop	1.8%	0.9%	1.8%	0.9%	2.6%	1.3%

q_{Lat} 5.72 gpm

Lateral 3L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				3.73				
Header	4.00	1	0.090	3.64	5.4			2.10
Orifice 1	2.42	1	0.015	3.62	2.7	5/32	0.55	1.05
Orifice 2	8.67	1	0.036	3.59	2.2	5/32	0.54	0.84
Orifice 3	8.67	1	0.021	3.57	1.6	5/32	0.54	0.63
Orifice 4	8.67	1	0.010	3.56	1.1	5/32	0.54	0.42
Orifice 5	6.75	1	0.000	3.56	0.5	5/32	0.54	0.21
	35.18		0.082					

Lateral 3R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.042	3.60	2.7	5/32	0.55	1.05
Orifice 2	8.67	1	0.036	3.56	2.2	5/32	0.54	0.84
Orifice 3	8.67	1	0.021	3.54	1.6	5/32	0.54	0.63
Orifice 4	8.67	1	0.010	3.53	1.1	5/32	0.54	0.42
Orifice 5	2.42	1	0.000	3.53	0.5	5/32	0.54	0.21
	35.18		0.108					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	3.62	0.55	3.60	0.55	3.62	0.55
Min	3.56	0.54	3.53	0.54	3.53	0.54
Avg	3.58	0.54	3.55	0.54	3.56	0.54
% Drop	1.8%	0.9%	1.8%	0.9%	2.6%	1.3%

q_{Lat} 5.43 gpm

Lateral 4L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				3.22				
Header	4.00	1	0.059	3.16	4.3			1.66
Orifice 1	2.42	1	0.013	3.15	2.5	11/64	0.62	0.95
Orifice 2	8.67	1	0.026	3.12	1.8	11/64	0.61	0.71
Orifice 3	8.67	1	0.012	3.11	1.2	11/64	0.61	0.47
Orifice 4	2.42	1	0.000	3.11	0.6	11/64	0.61	0.24
	22.18		0.051					

Lateral 4R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.021	3.14	1.8	11/64	0.62	0.71
Orifice 2	8.67	1	0.013	3.12	1.2	11/64	0.62	0.47
Orifice 3	6.75	1	0.003	3.12	0.6	11/64	0.61	0.24
Orifice 4	0.00	1	0.000	3.12	0.0	11/64	0.00	0.00
	22.17		0.036					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	3.15	0.62	3.14	0.62	3.15	0.62
Min	3.11	0.61	3.12	0.61	3.11	0.61
Avg	3.12	0.61	3.13	0.62	3.12	0.62
% Drop	1.2%	0.6%	0.5%	0.2%	1.2%	0.6%

Lateral 5L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				3.05				
Header	4.00	1	0.056	3.00	4.2			1.62
Orifice 1	2.42	1	0.012	2.99	2.4	11/64	0.60	0.92
Orifice 2	8.67	1	0.025	2.96	1.8	11/64	0.60	0.69
Orifice 3	8.67	1	0.012	2.95	1.2	11/64	0.60	0.46
Orifice 4	2.42	1	0.000	2.95	0.6	11/64	0.60	0.23
	22.18		0.049					

Lateral 5R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.020	2.98	1.8	11/64	0.60	0.69
Orifice 2	8.67	1	0.012	2.97	1.2	11/64	0.60	0.46
Orifice 3	6.75	1	0.003	2.96	0.6	11/64	0.60	0.23
Orifice 4	0.00	1	0.000	2.96	0.0	11/64	0.00	0.00
	22.17		0.034					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	2.99	0.60	2.98	0.60	2.99	0.60
Min	2.95	0.60	2.96	0.60	2.95	0.60
Avg	2.96	0.60	2.97	0.60	2.96	0.60
% Drop	1.2%	0.6%	0.5%	0.2%	1.2%	0.6%

Lateral 6L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				2.70				
Header	4.00	1	0.063	2.64	4.5			1.73
Orifice 1	2.42	1	0.011	2.63	2.2	11/64	0.56	0.87
Orifice 2	8.67	1	0.022	2.61	1.7	11/64	0.56	0.65
Orifice 3	8.67	1	0.011	2.60	1.1	11/64	0.56	0.43
Orifice 4	6.75	1	0.000	2.60	0.6	11/64	0.56	0.22
	26.51		0.044					

Lateral 6R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.030	2.61	2.2	11/64	0.56	0.86
Orifice 2	8.67	1	0.022	2.59	1.7	11/64	0.56	0.65
Orifice 3	8.67	1	0.010	2.58	1.1	11/64	0.56	0.43
Orifice 4	2.42	1	0.000	2.58	0.6	11/64	0.56	0.22
	26.51		0.062					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	2.63	0.56	2.61	0.56	2.63	0.56
Min	2.60	0.56	2.58	0.56	2.58	0.56
Avg	2.61	0.56	2.59	0.56	2.60	0.56
% Drop	1.3%	0.6%	1.3%	0.6%	2.0%	1.0%

Lateral 7L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				2.58				
Header	4.00	1	0.061	2.52	4.4			1.69
Orifice 1	2.42	1	0.010	2.51	2.2	11/64	0.55	0.85
Orifice 2	8.67	1	0.021	2.49	1.6	11/64	0.55	0.63
Orifice 3	8.67	1	0.010	2.48	1.1	11/64	0.55	0.42
Orifice 4	6.75	1	0.000	2.48	0.5	11/64	0.55	0.21
	26.51		0.042					

Lateral 7R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.028	2.49	2.2	11/64	0.55	0.84
Orifice 2	8.67	1	0.021	2.47	1.6	11/64	0.55	0.63
Orifice 3	8.67	1	0.010	2.46	1.1	11/64	0.55	0.42
Orifice 4	2.42	1	0.000	2.46	0.5	11/64	0.55	0.21
	26.51		0.060					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	2.51	0.55	2.49	0.55	2.51	0.55
Min	2.48	0.55	2.46	0.55	2.46	0.55
Avg	2.49	0.55	2.47	0.55	2.48	0.55
% Drop	1.3%	0.6%	1.3%	0.6%	2.0%	1.0%

Lateral 8L	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
H_o				2.08				
Header	4.00	1	0.041	2.04	3.5			1.36
Orifice 1	2.42	1	0.007	2.03	1.8	3/16	0.59	0.68
Orifice 2	8.67	1	0.012	2.02	1.2	3/16	0.59	0.45
Orifice 3	6.75	1	0.000	2.02	0.6	3/16	0.59	0.23
	17.84		0.018					

Lateral 8R	Dist. Incr. (ft)	Nom. Lateral Diam. (in.)	Friction Loss in Pipe (ft)	Head in Pipe (ft)	Flow in Pipe (gpm)	Orifice Diam. (in.)	Orifice Disch. (gpm)	Flow Vel. in Pipe (ft/s)
Orifice 1	6.75	1	0.019	2.02	1.8	3/16	0.59	0.68
Orifice 2	8.67	1	0.011	2.01	1.2	3/16	0.59	0.45
Orifice 3	2.42	1	0.000	2.01	0.6	3/16	0.59	0.23
	17.84		0.030					

	Left		Right		Overall	
	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm	H, ft	q_{orif}, gpm
Max	2.03	0.59	2.02	0.59	2.03	0.59
Min	2.02	0.59	2.01	0.59	2.01	0.59
Avg	2.02	0.59	2.01	0.59	2.02	0.59
% Drop	0.6%	0.3%	0.6%	0.3%	1.2%	0.6%

Pump Tank Float Levels & Storage

Project	Hemby Project	**Date**	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	**County**	Harnett

Daily Flow	360	gpd
Dose Volume	173	gal
Pump Tank	Shoaf	TS 1000 PT
Storage Rate	20.16	gal/in. (avg., per manufacturer)
Interior Height	50	in.

Required Storage

Pump Submergence	17.0	in.	343 gal
RO to Pump OFF	3.0	in.	60 gal
Drainfield Dose Storage	8.57	in.	173 gal
Pump Tank Emer. Storage	13.0	in.	262 gal
			17.5 hr
Septic Tank Emer. Storage	10.0	in.	198 gal
			13.2 hr
System Emergency Storage	460	gal	30.7 hr

Float Heights - Measured from Interior Tank Floor

Redundant OFF / LWA	17.0 in.	*allows pump to remain submerged*
Pump OFF	20.0 in.	*3" above RO Float*
Pump ON	31.0 in.	
HWA	37.0 in.	

Elevation Calculations

Project	Hemby Project	Date	2/24/2021	Benchmark:	IP at SW Right of Way
Location	2251 Pearidge Road Angier, NC 27501	County	Harnett	Elevation:	100.00 ft

Septic Tank

Ground Elev @ Stub-out (Approx.)	95.90	
Drain Invert @ House	94.05	ft
Pipe Length to Septic Tank	10.00	ft
Ground Surface @ Septic Tank	95.50	ft
Cover over Septic Tank	12.00	in.
Top of Septic Tank (Exterior)	94.50	ft
External Height of Septic Tank	67.50	in.
Tank Bottom to 4" inlet invert	57.00	in.
Tank Bottom to 4" outlet invert	55.00	in.
Inlet invert	93.63	ft
Slope of Pipe to Septic Tank	4.21%	
Outlet Invert	93.46	ft
Bottom of Septic Tank (Exterior)	88.88	ft
Gravel Bed Thickness	6.00	in
Bottom of Excavation	88.38	ft

Pump Tank

Pipe Length to Pump Tank	4.00	ft
External Height of Pump Tank	57.00	in.
Tank Bottom to 4" inlet invert	46.00	in.
Ground Surface @ Pump Tank	95.20	ft
Cover over Pump Tank	22.0	in
Top of Pump Tank (Exterior)	93.37	ft
Elevation at Inlet invert	92.45	ft
Slope of Pipe to Pump Tank	25.21%	
Bottom of Pump Tank (Exterior)	88.62	ft
Tank Bottom Thickness	4.00	in.
Elevation of Tank Floor	88.95	ft
Gravel Bed Thickness	6.00	in.
Bottom of Excavation	88.12	ft

Riser Heights (approx)

Septic Tank	18	in.
Pump Tank	28	in.

Pump Tank Float Settings

	Elevation (ft)	Ht. Above Tank Floor (in.)
Pump OFF	90.62	20.00
Pump ON	91.53	31.00
High Water Alarm	92.03	37.00

PUMP DESIGN

System (initial/repair): **Primary**

Project	Hemby Project	Date	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	County	Harnett

Suction Head	0 ft	*(submersible 0)*
Elev of Pump Intake	89.71 ft	
Elev of Highest Lateral	98.00 ft	
Req. Head At Far End of Lateral	2.01 ft	

Friction Losses

Supply Line - *Schedule 40 PVC*

Pipe Diam., Nominal	2	in.	H-W C	150
Pipe Diameter (ID)	2.047	in.	Flow	36.17 gpm
Pipe Length	300	ft	Velocity	3.53 ft/sec
Pipe Length for Fittings	30	ft		
Friction Loss	7.64	ft		
Pressure Filter Friction Loss	0.92	ft	95% clogged screen	

Primary Manifold - *Schedule 40 PVC*

Friction Loss	0.872 ft	Calculated in LPP Primary worksheet

Primary Lateral, Distal - *Schedule 40 PVC*

Friction Loss	0.108 ft	Calculated in LPP Primary worksheet
TOTAL	**9.54 ft.**	

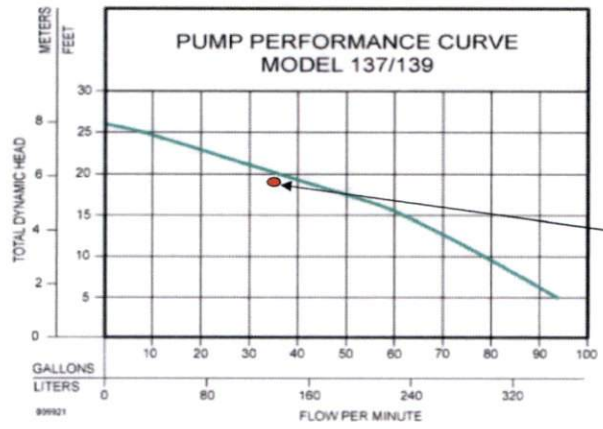
Flow for Anti-Siphon Hole

Hole Diameter	1/8	in.
Hole Flowrate	0.82	gpm

Pump Efficiency	0.7	*(assumed, typical)*
Motor Efficiency	0.9	*(assumed for electric pumps)*
Flow	**36.99**	**gpm**
Required Horsepower	0.29	hp
TDH	**19.84**	**ft.**

Pump Selection

Manufacturer:	**Zoeller**
Model:	**N137**
Horsepower:	**0.50**



Note: A gate valve is used to meter the flow at the drainfield.

Operating Point

Septic Tank Buoyancy Calculation

Project	Hemby Project	**Date**	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	**County**	Harnett

Tank Size (nominal) 1,000 gal

Properties/Assumptions:

Min. liquid level to be maintained in tank at all times after initial installation.

Assume groundwater table is equal to or higher than top of chamber.
(Buoyancy is the same as long as water table is higher than top of tank.)

Effluent Density	62.4	lb/ft^3 (Specific Weight of Water)
Concrete Density	142.56	lb/ft^3
Soil App Sp Grav	1.25	*(typical value)*
Soil Cover Over Tank	1.00	ft

Tank Dimensions (from supplier):

	Exterior	*Interior*
Length	9.00 ft	8.50 ft
Width	4.83 ft	4.33 ft
Total Tank Depth	5.63 ft	5.04 ft
Permanent Liquid Depth in Tank	0 in.	
Area of Riser Openings	6.28 ft^2	
Tank Weight (est.)	10500 lb. (based on manufacturer)	

Buoyancy Force Calculation:

Buoyancy Force = Specific Weight of Water x Displaced Volume

Buoyancy Force	**15,269**	**lb**

Weight Calculation:

Tank Weight	10,500	lb
Water Weight in Tank	0	lb
Soil Weight Over Tank	2,899	lb
Soil Tension Force	4,227	lb
Total Weight	**17,625**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

Pump Tank Buoyancy Calculation

Project	Hemby Project	**Date**	2/24/2021
Location	2251 Pearidge Road Angier, NC 27501	**County**	Harnett

Tank Size (nominal) 1,000 gallons

Properties/Assumptions:

Min. liquid level to be maintained in tank at all times after initial installation.

Assume groundwater table is equal to or higher than top of chamber.
(Buoyancy is the same as long as water table is higher than top of tank.)

Effluent Density	62.4	lb/ft^3 (Specific Weight of Water)
Concrete Density	142.56	lb/ft^3
Soil App Sp Grav	1.25	*(typical value)*
Soil Cover Over Tank	1.92	ft

Tank Dimensions (from supplier):

	Exterior	*Interior*
Length	8.00 ft	7.50 ft
Width	5.17 ft	4.67 ft
Total Tank Depth	4.75 ft	4.17 ft
Permanent Liquid Depth in Tank	0 in.	
Area of Riser Openings	6.28 ft^2	
Tank Weight (est.)	9,000 lb (based on manufacturer)	

Buoyancy Force Calculation:

Buoyancy Force = Specific Weight of Water x Displaced Volume

Tank Displacement	196.3	ft^3
Buoyancy Force	**12,251**	**lb.**

Weight Calculation:

Tank Weight	9,000	lb
Water Weight in Tank	0	lb
Soil Weight Over Tank	5,232	lb
Soil Tension Force	2,869	lb
Total Weight	**17,101**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

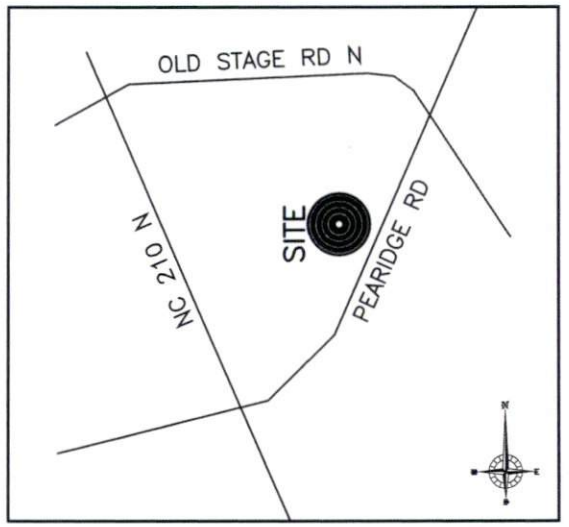
Hemby Property WWTS

Project Location
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
631-830-2052
nbryanhemby@gmail.com

Project Consultant
Kevin Davidson, P.E.
(919) 367-6310
Jeff Vaughan, L.S.S
(919) 367-6313
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, NC 27502
(919) 859-0669
(919) 233-1970 Fax

System Overview
Single Family Residence
Three (3) Bedroom, 360 gpd
Horizontal Porous Block Panel Dispersal
System with Low Pressure Distribution



VICINITY MAP

Sheet Index

Sheet 1	Cover Sheet
Sheet 2	Property Layout
Sheet 3	Component Layout
Sheet 4	Primary Drainfield
Sheet 5	Detail Sheet 1
Sheet 6	Detail Sheet 2
Sheet 7	Detail Sheet 3
Sheet 8	Excavation Safety

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

Hemby Property WWTS

Project Location:
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

NORTH CAROLINA PROFESSIONAL SEAL 034082 ENGINEER KEVIN DODGE DAVIDSON

4/24/21

FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

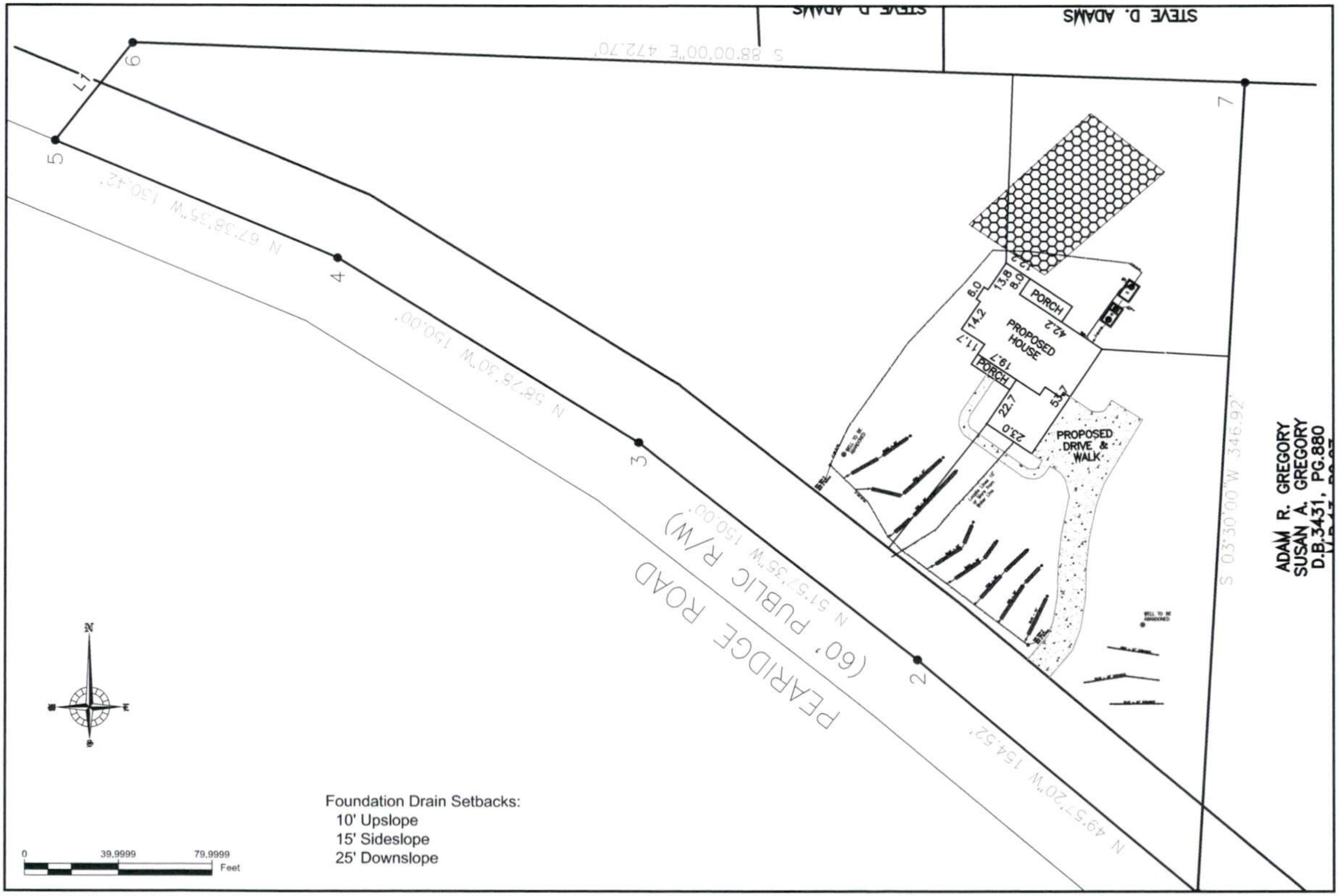
REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Cover Sheet

DRAWN BY:	CREATED ON:
K. Green	2/23/2021
REVISED BY:	REVISED ON:
----	----
RELEASED BY:	RELEASED ON:
----	----

DRAWING NUMBER
WW-1

North Carolina 811 www.nc811.org



PROPERTY LAYOUT

1 WW-2 N.T.S. SOURCE: AWT, Inc.

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

Hemby Property WWTS

Project Location:
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL KEVIN DODGE DAVIDSON
4/26/21

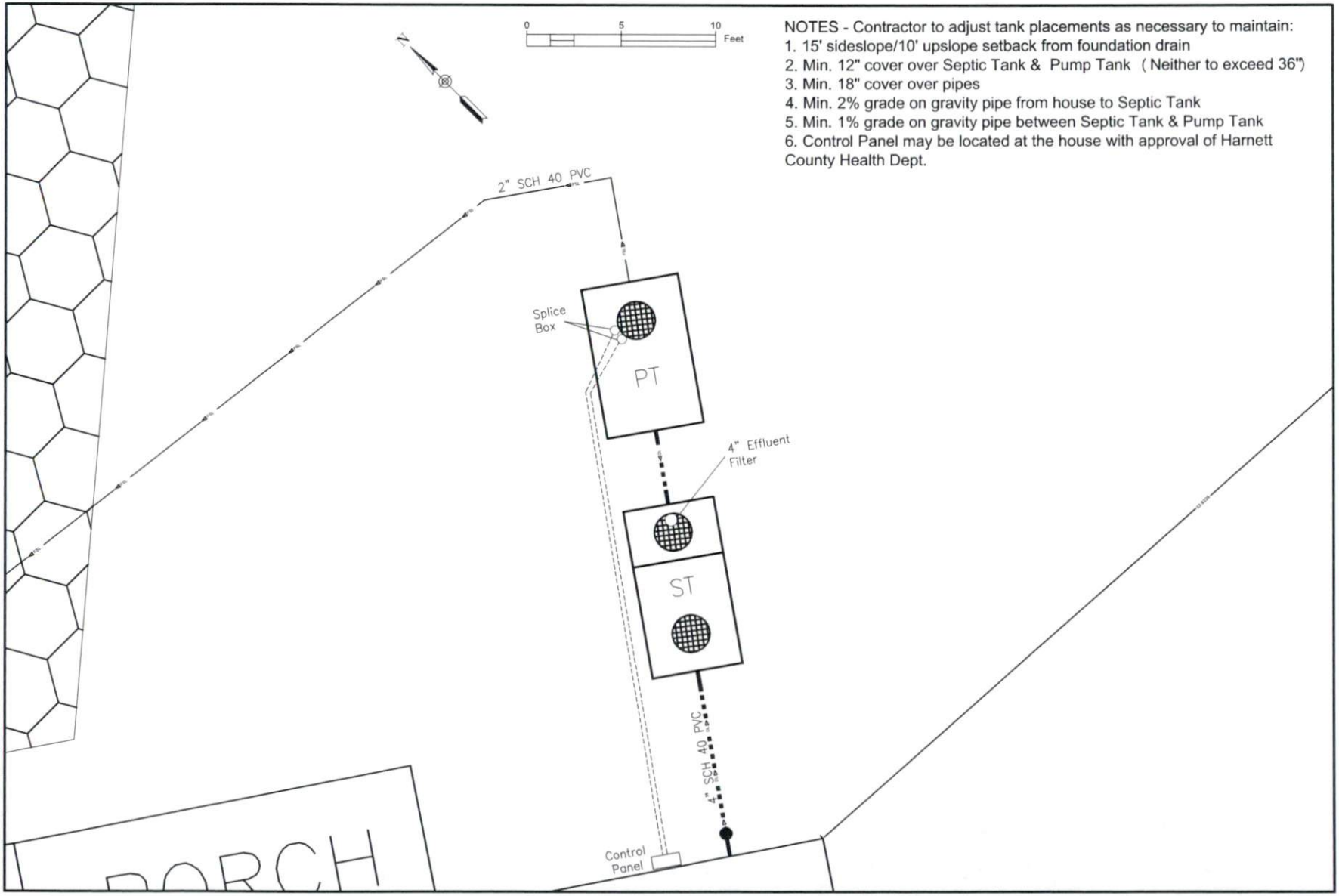
FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Property Layout

DRAWN BY: K. Green	CREATED ON: 2/23/2021
REVISED BY: ----	REVISED ON: ----
RELEASED BY: ----	RELEASED ON: ----

DRAWING NUMBER
WW-2



NOTES - Contractor to adjust tank placements as necessary to maintain:
1. 15' sideslope/10' upslope setback from foundation drain
2. Min. 12" cover over Septic Tank & Pump Tank (Neither to exceed 36")
3. Min. 18" cover over pipes
4. Min. 2% grade on gravity pipe from house to Septic Tank
5. Min. 1% grade on gravity pipe between Septic Tank & Pump Tank
6. Control Panel may be located at the house with approval of Harnett County Health Dept.

1 WW-3 N.T.S. **COMPONENT LAYOUT**
SOURCE: AWT, Inc.

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

Hemby Property WWTS

Project Location:
2251 Pisgahgo Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

NORTH CAROLINA PROFESSIONAL SEAL 034322 ENGINEER KEVIN DODGE DAVIDSON

2/24/21

PRELIMINARY NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Component Layout

DRAWN BY:	CREATED ON:
K. Green	2/23/2021
REVISED BY:	REVISED ON:
---	---
RELEASED BY:	RELEASED ON:
---	---

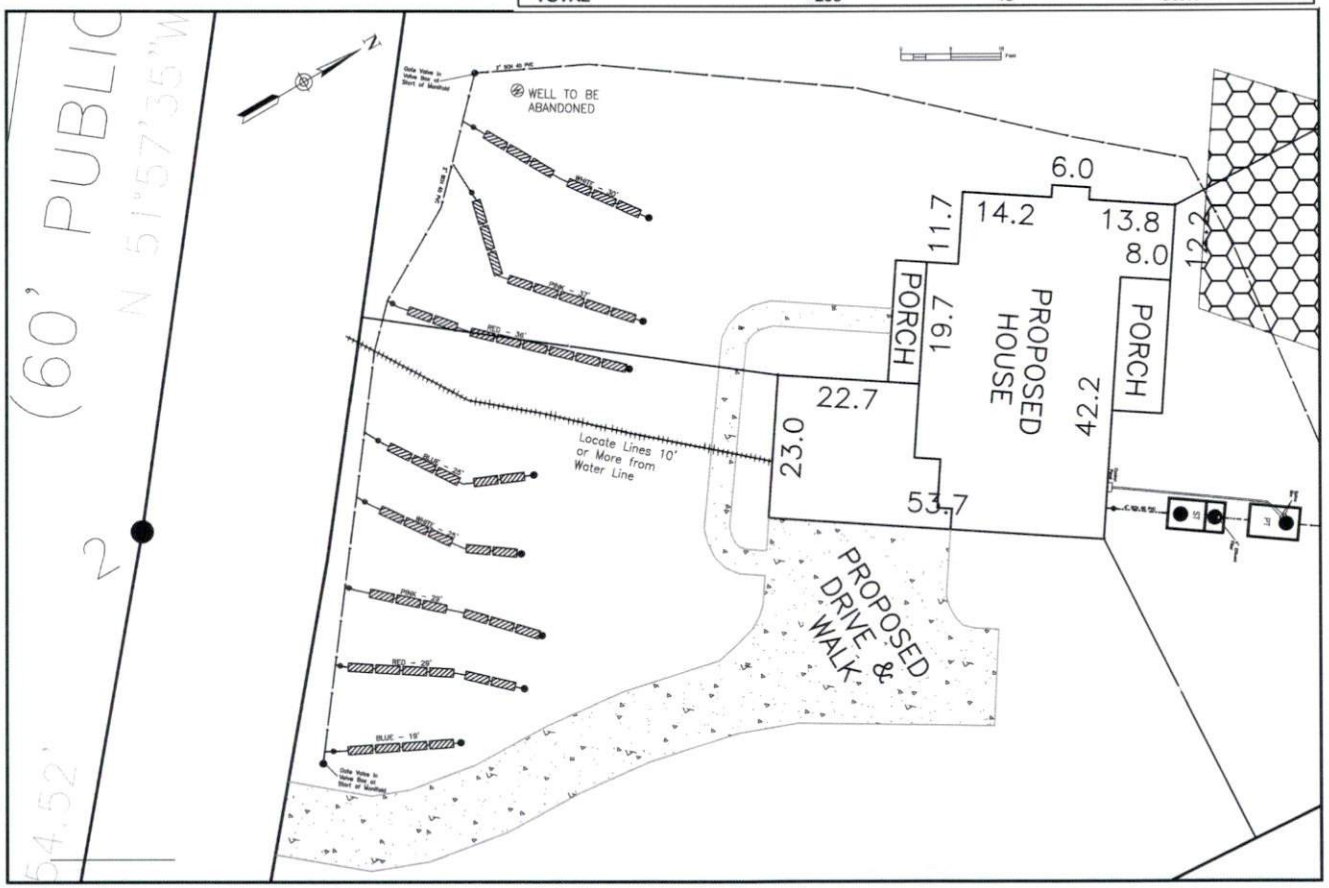
DRAWING NUMBER
WW-3

General Drainfield Notes:

1. Clear all trees less than 8" in diameter (measured at a height 3' from soil surface) from the drainfield.
2. Vegetation that will re-grow from a cut stump shall be stumped or pulled from the ground. Stumps shall not be pushed over.
3. Drainfield area shall be cleared of all leaves, pine straw, debris, etc. The accumulated material shall be removed from the drainfield.
4. In clayey soils, sides of trenches shall be raked and limed per panel manufacturer's instructions.
5. Orifices of the specified sizes shall be drilled in the distribution pipes, one per panel, midway between the ends of the panel. Orifices alternate between the 10 o'clock and 2 o'clock positions on the pipe in each panel, while also alternating between left and right chambers within the panel.
6. Manifold supply lines shall be installed with a minimum of 18" cover.
7. The trenches shall be backfilled appropriately so that no low areas are present.
8. Apply lime over the drainfield area as needed. Seed fine fescue over the drainfield at the rate recommended by the seed manufacturer. Hand rake the seed into the soil surface. Straw the seeded area at the rate of 1.5-2 bales per 1000 sq. ft.

LINE SUMMARY - PRIMARY

DRAINFIELD INFO.								
Type of System/Distribution:			Porous Block Panel System w/ LPP Distribution					
Line No.	Line Elev (ft)	Flag Color	Line Length (ft)	Pressure Head (ft)	Number of Panels	Orifice Size (in.)	Lateral Discharge (gpm)	Lateral Diameter (in.)
1	96.0	White	26	4.84	6	9/64	4.11	1
2	96.6	Pink	35	3.92	8	5/32	5.72	1
3	96.7	Red	35	3.53	8	5/32	5.43	1
4	97.0	Blue	22	3.11	5	11/64	4.31	1
5	97.1	White	22	2.95	5	11/64	4.20	1
6	97.4	Pink	26	2.58	6	11/64	4.49	1
7	97.5	Red	26	2.46	6	11/64	4.39	1
8	98.0	Blue	17	2.01	4	3/16	3.53	1
TOTAL			208		48		36.17	



Primary Drainfield

SOURCE: Agri-Waste Technology, Inc.

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0869
www.agriwaste.com

Hemby Property WWTS

Project Location:
2251 Pleasridge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

NORTH CAROLINA PROFESSIONAL SEAL 034001 ENGINEER KEVIN DODGE DANIEL
2/24/21

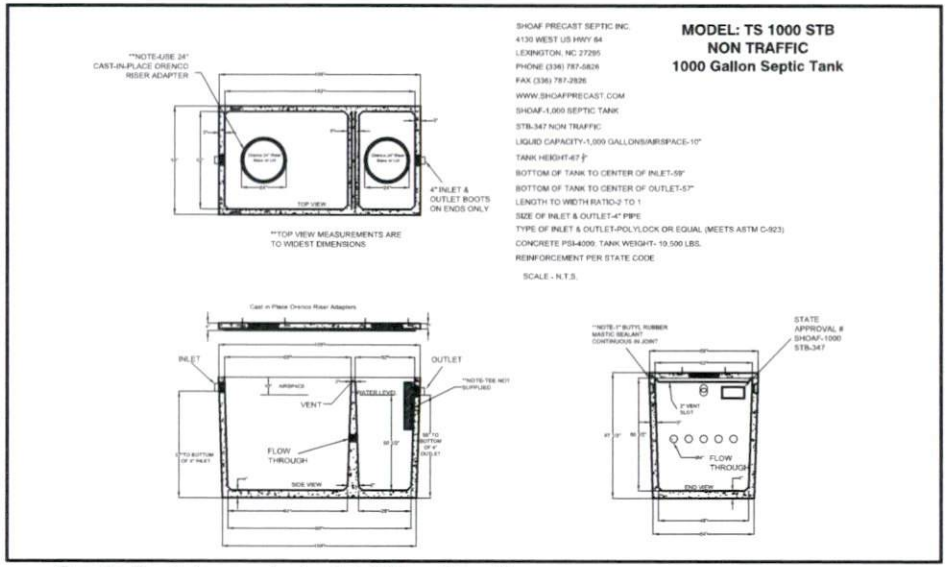
FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Primary Drainfield

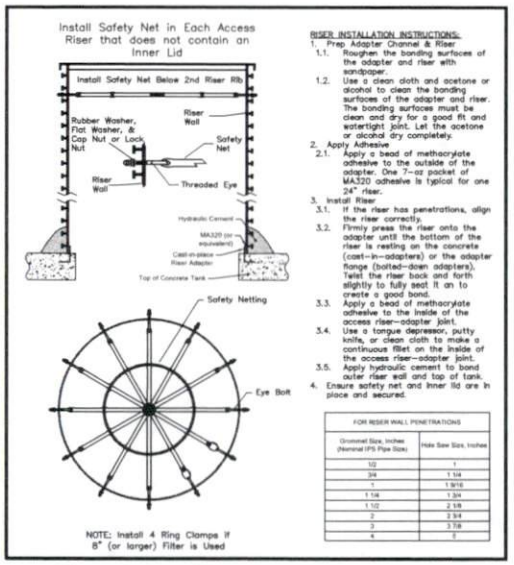
DRAWN BY: K. Green	CREATED ON: 2/23/2021
REVISED BY: ----	REVISED ON: ----
RELEASED BY: ----	RELEASED ON: ----

DRAWING NUMBER
WW-4



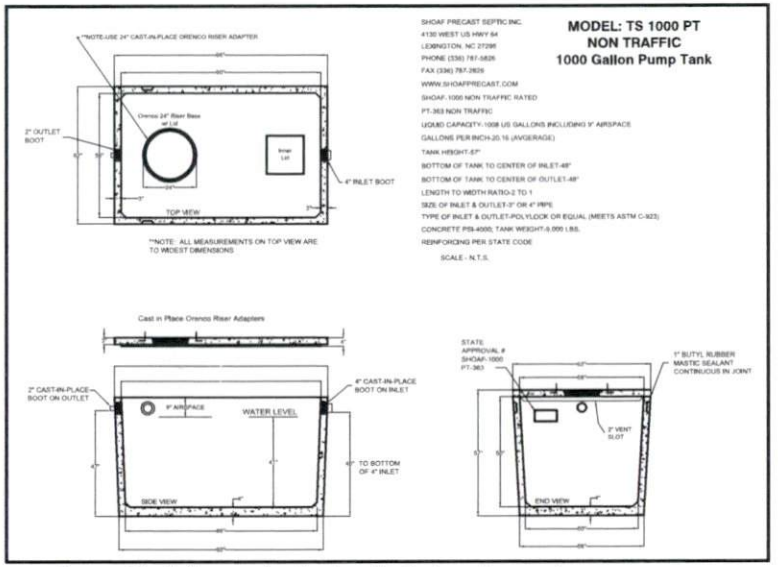
1 WW-6 **Septic Tank (or equivalent 1,000-gal tank)**

SOURCE: Shoaf Precast Septic, Inc.



3 WW-6 **Riser Safety Nets**

SOURCE: SIM-TECH, Inc.



2 WW-6 **Pump Tank (or equiv. tank with 1-day storage)**

SOURCE: Shoaf Precast Septic, Inc.

NOTES

1. Boundary information survey by Mauldin – Watkins Surveying, P.A.
2. Installation to follow all NC DHHS and Harnett County applicable rules and regulations.
3. Harnett County to perform construction inspections and final system certification.
4. Septic Tank to have approved effluent filter.
5. Contractor to abide by all safety regulations during system installation.
6. Contractor shall backfill around all access areas such that storm water is shed away from potential entry points.
7. Invert elevations of all components to be verified in field by contractor to insure proper operation.
8. All system piping to be SCH40 PVC (except where noted).
9. All gravity elbows to be long radius or long sweeping type elbows.
10. Actual installation and placement of treatment system to be overseen by Contractor.
11. Tanks to be set on 6" minimum gravel base. Use #5 or #57 stone for base.
12. Contractor to seed and/or mulch disturbed areas to coincide with existing landscape. Area shall not be left with uncovered soil.
13. Mount Control Panel a minimum of 24" above grade.
14. Power to panel to be installed by licensed electrician per code. Two 20-amp circuits with individual neutrals to be run from house to control panel.
15. All risers to have cast-in-place tank adapters and be single-piece riser. Risers to extend 6" above soil surface and be designed to prevent surface water inflow.
16. Backfill around tank(s) shall be gravel or tank hole shall be over-excavated a minimum of 2' in all directions to allow for mechanical tamping of backfill.
17. All penetrations to be sealed.
18. Spigot to be located on outside of building within 50' of tanks.
19. All pressure lines to maintain 18" min. cover.
20. Contractor to adjust tank placement to meet site constraints.

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

Hemby Property WWTS

Project Location:
3251 Pearidge Road
Anger, NC 27501
Harnett County
PIN: 0663-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

NORTH CAROLINA PROFESSIONAL SEAL 024501 ENGINEER KEVIN DODGE DAVIDSON

4/26/21

PRELIMINARY NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Detail Sheet 1

DRAWN BY:	CREATED ON:
K. Green	2/23/2021
REVISED BY:	REVISED ON:
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RELEASED BY:	RELEASED ON:
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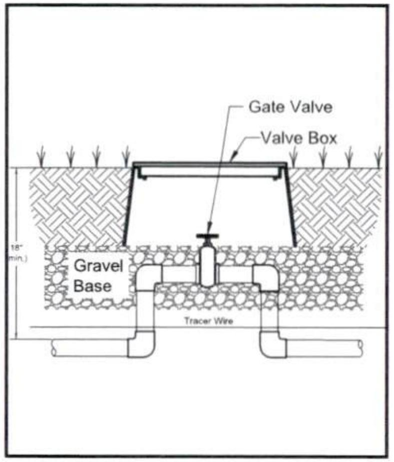
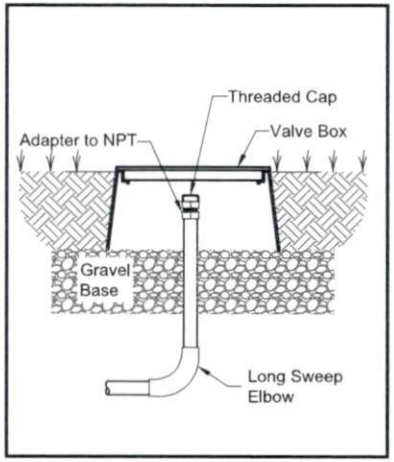
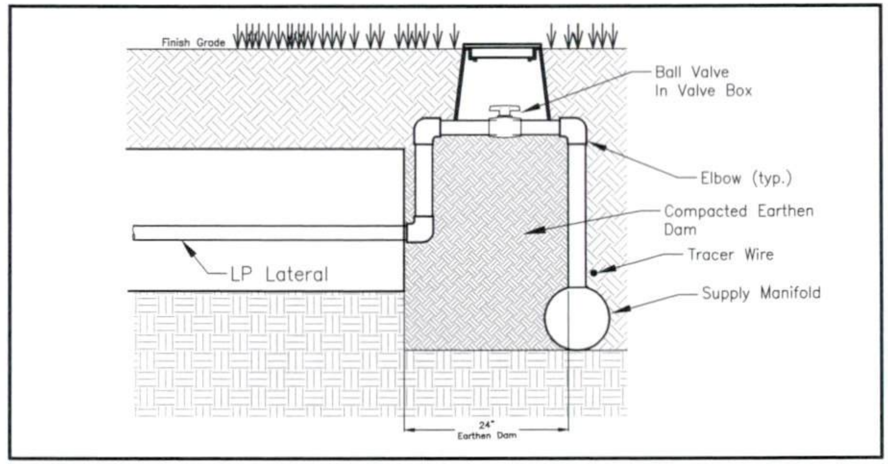
DRAWING NUMBER
WW-5



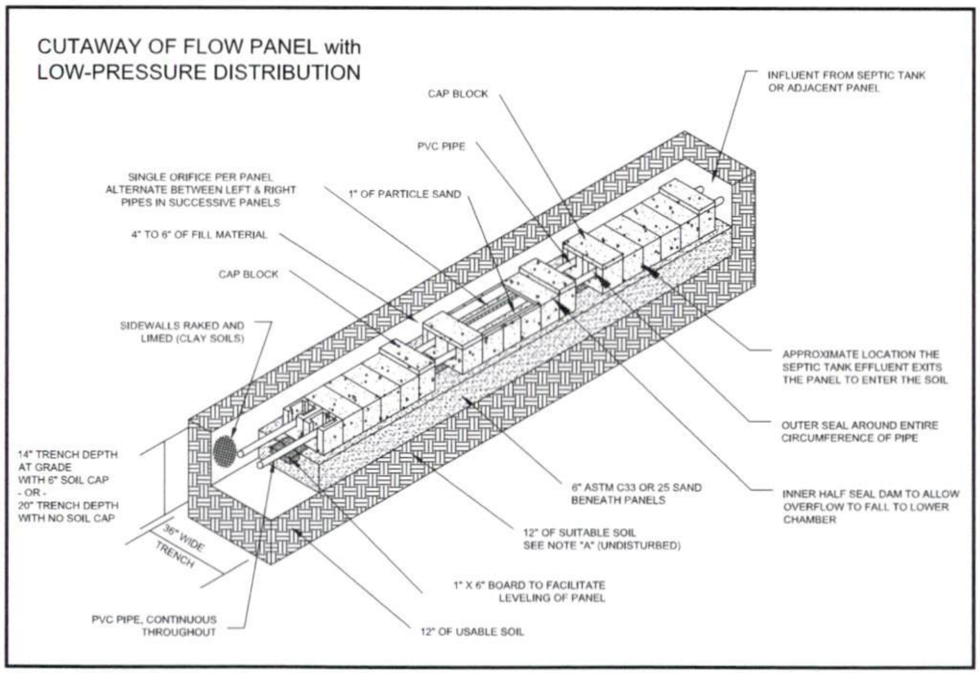
1 WW-7 **GATE VALVE IN VALVE BOX**
N.T.S. (or equivalent)



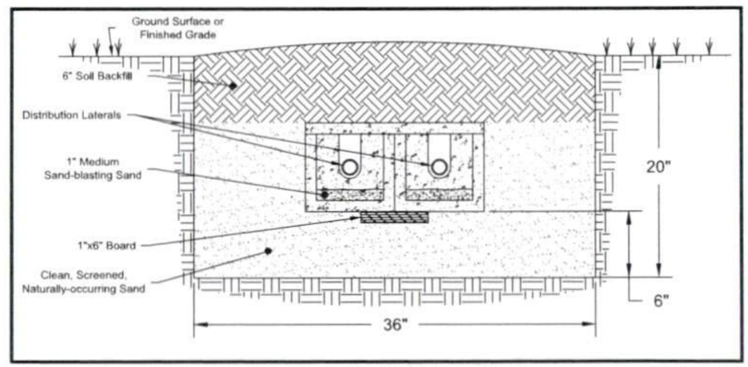
2 WW-7 **TURN-UP/CLEANOUT**
N.T.S.



3 WW-7 **LP LATERAL - MANIFOLD CONNECTION**
N.T.S. (or equivalent)



4 WW-7 **HORIZONTAL PANEL INSTALLATION (Typical) - For Illustration Only**
N.T.S. SOURCE: T & J Panel Systems



5 WW-7 **HORIZONTAL PANEL PLACEMENT (Typical)**
N.T.S. Source: AWT

NOTES:

1. Installation uses Low Pressure distribution system. See Line Summary for lateral diameters and orifice diameters.
2. Drill one orifice per panel at the middle of the panel (23" from either end) .
3. Alternate orifice location between left & right pipes in successive panels.
4. Drill orifices at alternating 10 & 2 o'clock positions. NO downward-facing orifices are to be used.
5. Distribute sand into both sides of the panel interiors.
6. Follow manufacturer's instructions for digging trench, raking and liming trench walls, sand base, leveling boards, panel placement, sealing ports, and backfill.

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Hemby Property WWTS

Project Location:
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
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(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

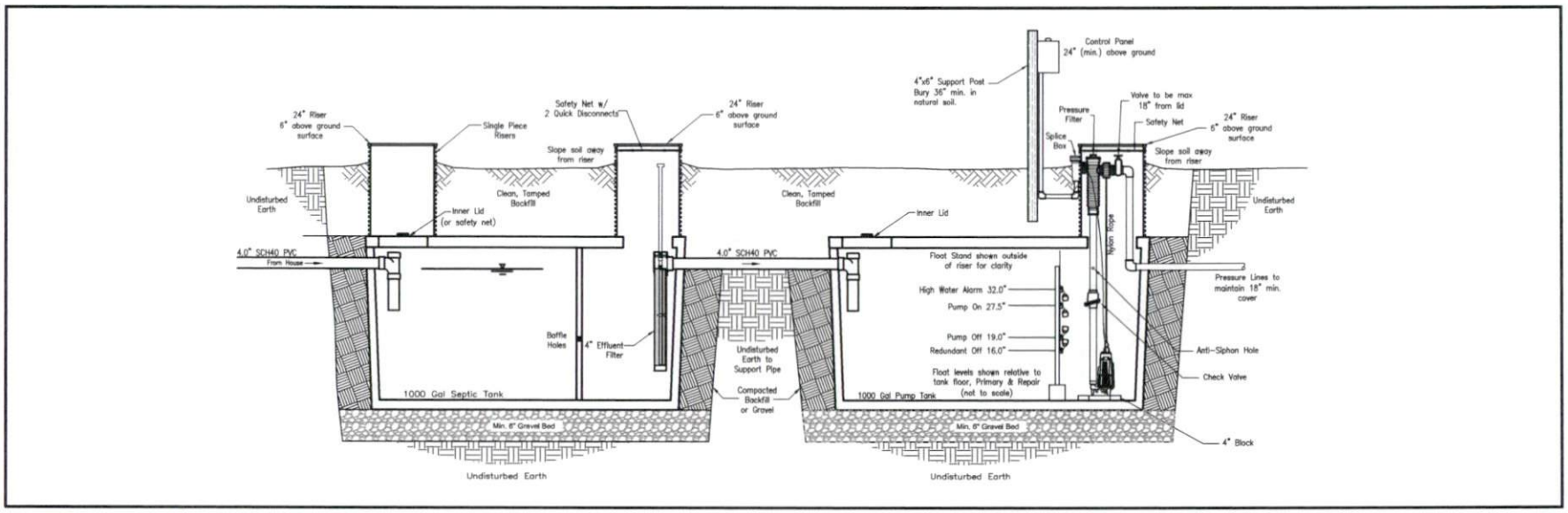
FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE: Detail Sheet 2

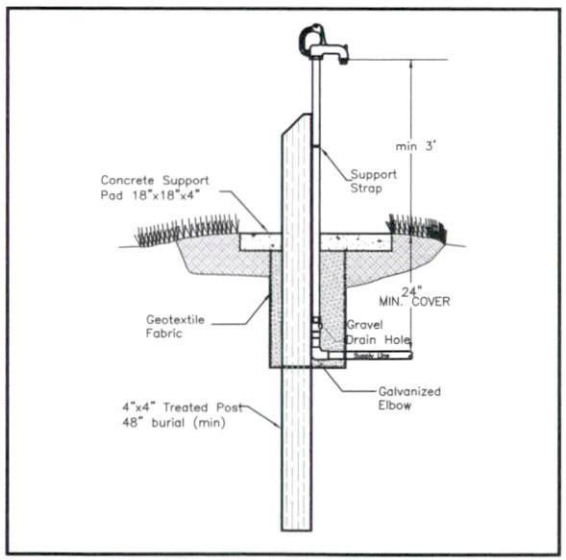
DRAWN BY: K. Green	CREATED ON: 2/23/2021
REVISED BY: —	REVISED ON: —
RELEASED BY: —	RELEASED ON: —

DRAWING NUMBER: **WW-6**



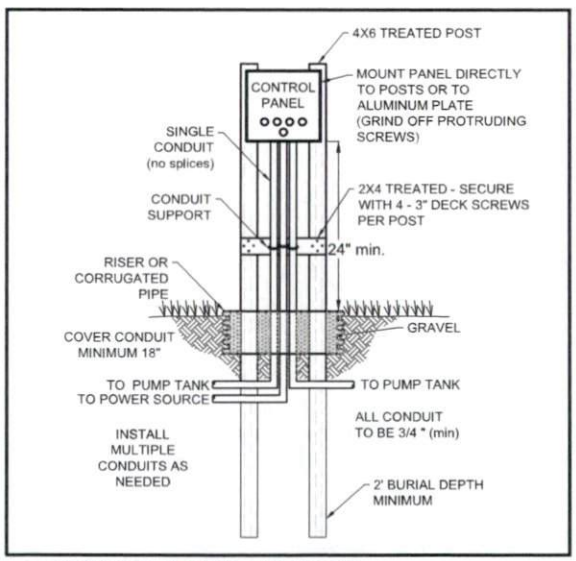
1 WW-8 N.T.S.

SYSTEM PROFILE VIEW



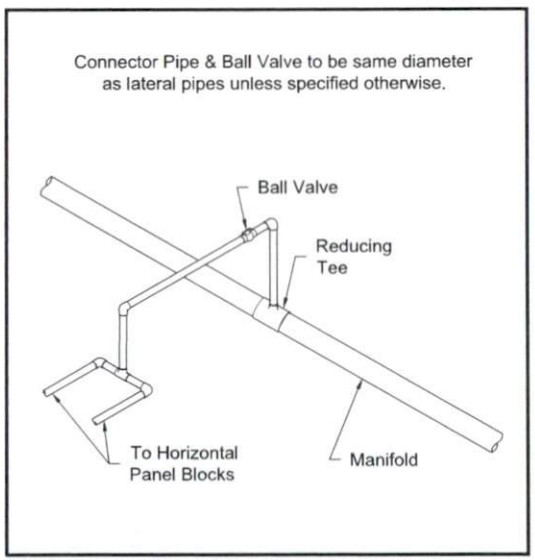
2 WW-8 N.T.S. SOURCE: AWT

YARD HYDRANT (if no spigot w/i 50' of system)



3 WW-8 N.T.S. SOURCE: AWT

CONTROL PANEL SUPPORT



4 WW-8 N.T.S.

LP LATERAL - MANIFOLD, HOR. PANELS

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Flanders, NY 11901
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PROFESSIONAL ENGINEER SEAL

NORTH CAROLINA PROFESSIONAL SEAL 040622 ENGINEER KEVIN DODGE DAVIDSON

4/24/21

plans, details
NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Detail Sheet 3

DRAWN BY:	CREATED ON:
K. Green	2/23/2021
REVISED BY:	REVISED ON:
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RELEASED BY:	RELEASED ON:
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DRAWING NUMBER
WW-7

Trenching and Excavation Safety

The employer must comply with the trenching and excavation requirements of 29 CFR 1926.651 and 1926.652 or comparable OSHA-approved state plan requirements.

Inspection of Excavations

OSHA standards require that a competent person inspect trenches daily and as conditions change before worker entry to ensure elimination of excavation hazards. A competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions.

Access and Egress

OSHA standards require safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet (1.22 meters) or deeper. These devices must be located within 25 feet (7.6 meters) of all workers.

Recommendations

Heavy equipment and trucks should stay as far as possible from the edge of any trench.
Always use pads under stabilizers to minimize ground pressures that could lead to failures.

(b) Definitions

"Cemented soil" means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.
"Cohesive soil" means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.
"Dry soil" means soil that does not exhibit visible signs of moisture content.
"Fissured" means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.
"Granular soil" means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.
"Layered system" means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.
"Moist soil" means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.
"Plastic" means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.
"Saturated soil" means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

"Soil classification system" means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.
"Stable rock" means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.
"Submerged soil" means soil which is underwater or is free seeping.

"Type A" means cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.
However, no soil is Type A if:
- (i) The soil is fissured; or
- (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (iii) The soil has been previously disturbed; or
- (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- (v) The material is subject to other factors that would require it to be classified as a less stable material.

"Type B" means:
- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.
- (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (v) Dry rock that is not stable; or
- (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

"Type C" means:
- (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- (ii) Granular soils including gravel, sand, and loamy sand; or
- (iii) Submerged soil or soil from which water is freely seeping; or
- (iv) Submerged rock that is not stable, or
- (v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

"Unconfined compressive strength" means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.
"Wet soil" means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) Requirements

(1) Classification of soil and rock deposits. Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.
(2) Basis of classification. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.
(3) Visual and manual analyses. The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.
(4) Layered systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.
(5) Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) Acceptable visual and manual tests

(1) Visual tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

- (i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
- (ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- (iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- (iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- (v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- (vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- (vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

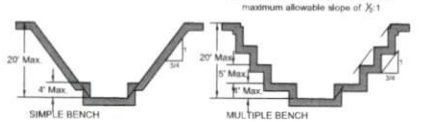
(2) Manual tests. Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil property.

- (i) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- (ii) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
- (iii) Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences.If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.
- (iv) Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.
- (v) Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:
  - (A) If the sample develops cracks as it dries, significant fissures are indicated.
  - (B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.
  - (C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures.If they pulverize easily into very small fragments, the material is granular.

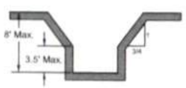
EXCAVATIONS IN TYPE A SOILS

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of ¾:1.

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1



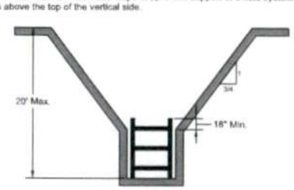
All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾:1 and maxium bench dimensions as follows:



All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.

All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.

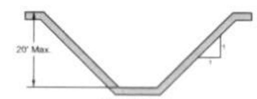
All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side.



All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

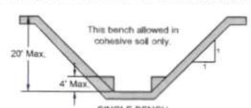
EXCAVATIONS IN TYPE B SOILS

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

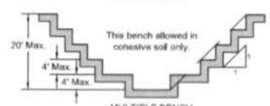


SIMPLE SLOPE

All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maxium bench dimensions as follows:

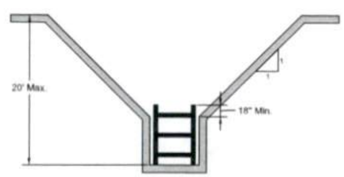


SINGLE BENCH



MULTIPLE BENCH

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 1:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

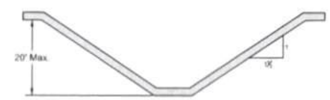


VERTICALLY SIDED LOWER PORTION

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

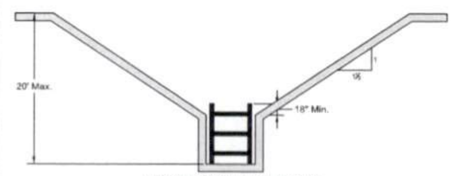
EXCAVATIONS IN TYPE C SOILS

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



SIMPLE SLOPE

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 1½:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

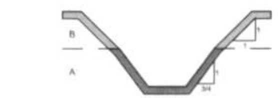


VERTICALLY SIDED LOWER PORTION

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

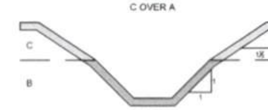
EXCAVATIONS IN LAYERED SOILS

All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



B OVER A

C OVER A



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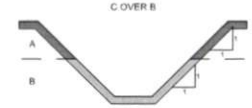

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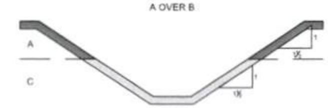

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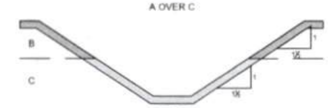


B OVER C

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

AWT
Engineers and Soil Scientists
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, North Carolina 27502
919-859-0669
www.agriwaste.com

Hemby Property WWTS

Project Location:
2251 Pearidge Road
Angier, NC 27501
Harnett County
PIN: 0693-09-6030

Project Owner:
South East Custom Home Builders LLC
c/o Michael Hemby
55 King Avenue
Flanders, NY 11901
(631) 830 - 2052

PROFESSIONAL ENGINEER SEAL

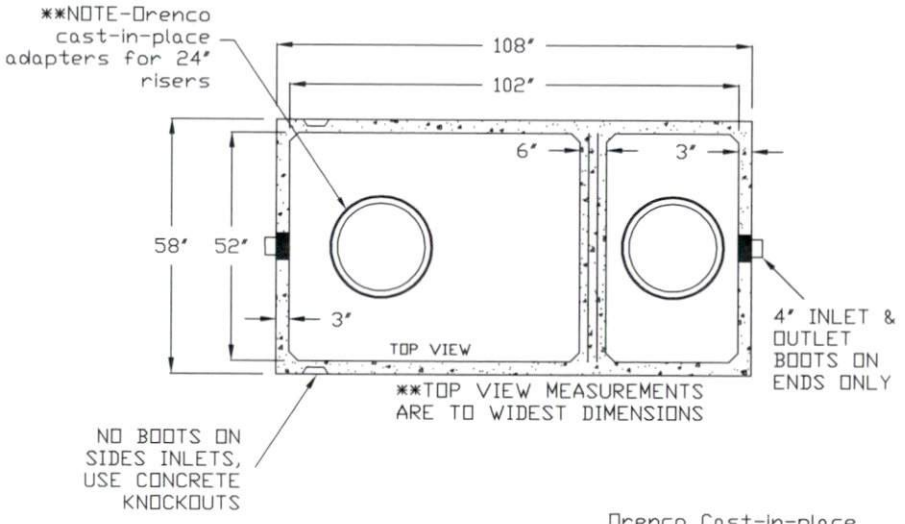
FINAL DESIGN
NOT RELEASED FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION

SHEET TITLE
Excavation Safety

DRAWN BY: K. Green	CREATED ON: 2/23/2021
REVISED BY: ----	REVISED ON: ----
RELEASED BY: ----	RELEASED ON: ----

DRAWING NUMBER
WW-8

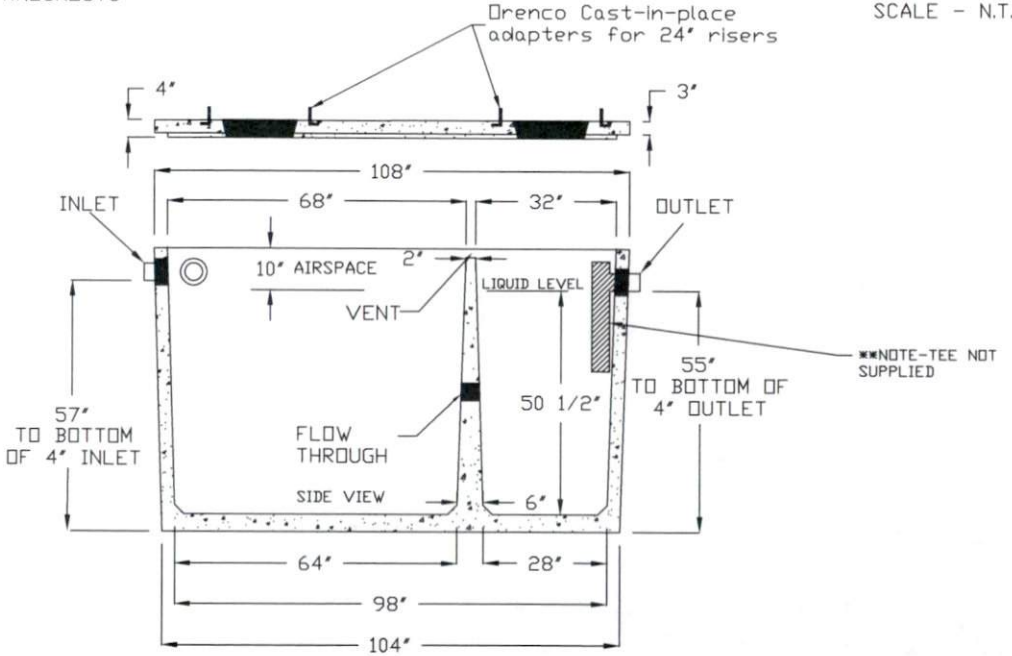


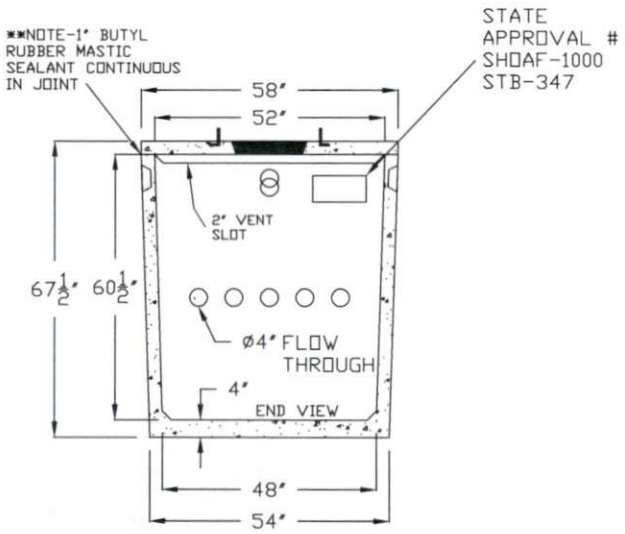
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
WWW.SHOAFPRECAST.COM

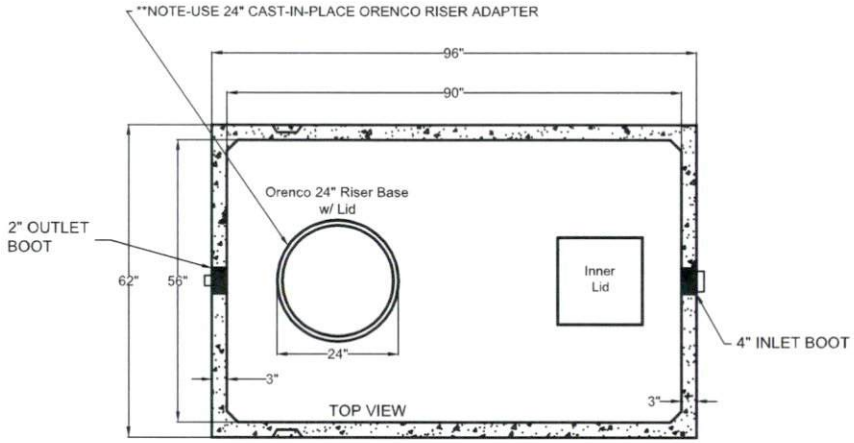
MODEL: TS 1000 STB
NON TRAFFIC
1000 Gallon Septic Tank

SHOAF-1,000 SEPTIC TANK
STB-347 NON TRAFFIC
LIQUID CAPACITY-1,000 GALLONS/AIRSPACE-10"
TANK HEIGHT-67 ½"
BOTTOM OF TANK TO CENTER OF INLET-59"
BOTTOM OF TANK TO CENTER OF OUTLET-57"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-3" OR 4" PIPE
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-4000; TANK WEIGHT- 10,500 LBS.
REINFORCEMENT PER STATE CODE

SCALE - N.T.S.







**NOTE: ALL MEASUREMENTS ON TOP VIEW ARE TO WIDEST DIMENSIONS

SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
WWW.SHOAFPRECAST.COM

MODEL: TS 1000 PT
NON TRAFFIC
1000 Gallon Pump Tank

SHOAF-1000 NON TRAFFIC RATED

PT-363 NON TRAFFIC

LIQUID CAPACITY-1008 US GALLONS INCLUDING 9" AIRSPACE

GALLONS PER INCH-20.16 (AVGERAGE)

TANK HEIGHT-57"

BOTTOM OF TANK TO CENTER OF INLET-48"

BOTTOM OF TANK TO CENTER OF OUTLET-48"

LENGTH TO WIDTH RATIO-2 TO 1

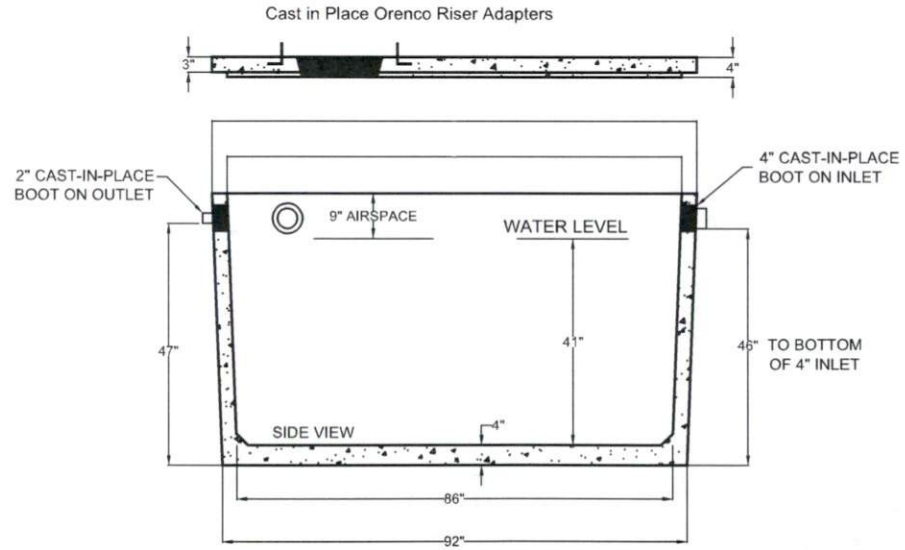
SIZE OF INLET & OUTLET-3" OR 4" PIPE

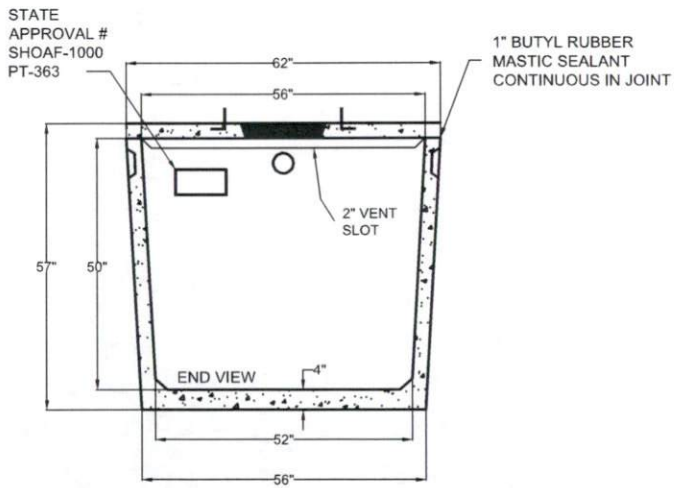
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)

CONCRETE PSI-4000; TANK WEIGHT-9,000 LBS.

REINFORCING PER STATE CODE

SCALE - N.T.S.



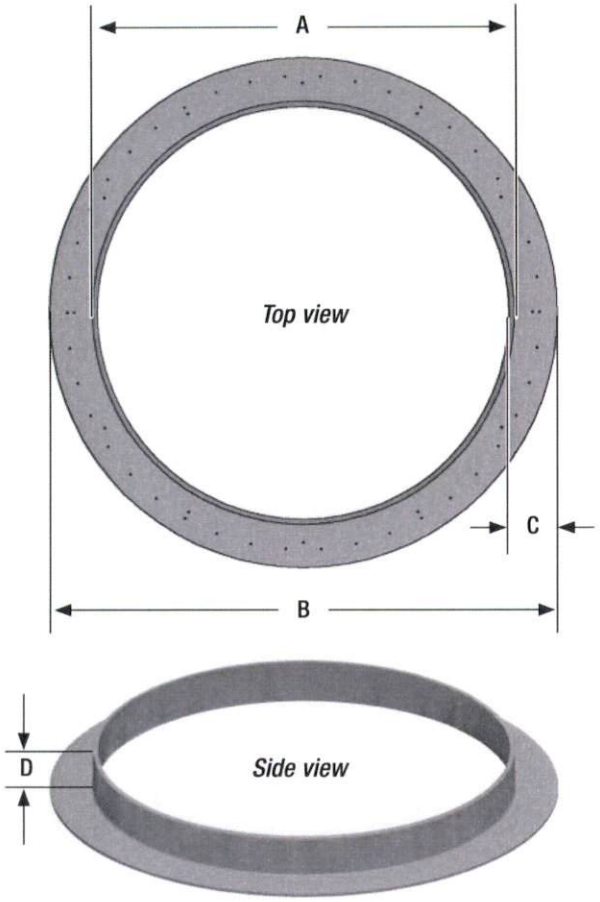


Orenco® SYSTEMS *Technical Data Sheet*

PRTA ABS Tank Adapters

Applications

PRTA tank adapters are used to provide a structural, watertight method of installing a 24-or 30-inch (600- or 750-mm) access riser over a tank opening.



General

Orenco's PRTA tank adapters are molded plastic products and therefore have excellent part-quality and consistency. PRTA tank adapters can be cast into a tank or fastened to the top of the tank with a bolt-down kit. The bolt-down kit consists of either six or twelve (depending on model) stainless steel concrete anchors and a roll of butyl tape.

The O.D. of the vertical flange matches the I.D. of Orenco's ribbed risers, which provides a suitable joint to seal with MA320, ADH100, SS115, or SS140 adhesive.

Cast in Place Tank Adapters.
PRTA24
Septic Tank (2)
Pump Tank (1)

Standard Models

PRTA24, PRTA30

PRTA24BDKIT (6 anchors), PRTA30BDKIT (12 anchors)

Product Code Diagram

PRTA □

Riser diameter
24 = 24" riser (Perma-Loc, Ultra-Rib, KOR FLO)
30 = 30" riser (Perma-Loc, Ultra-Rib)

ABS riser tank adapter

Materials of Construction

Tank adapter	ABS
Concrete anchors	Stainless steel anchor bolts
Sealant	Butyl tape

Specifications

Dimensions*	PRTA24	PRTA30
A - Outside dia., in. (mm)	23.38 (594)	29.25 (743)
B - Flange dia., in. (mm)	26.75 (679)	34.25 (870)
C - Horizontal flange width, in. (mm)	2.00 (51)	2.50 (64)
D - Vertical flange height, in. (mm)	3.50 (89)	3.25 (83)

**The tank adapter has a nominal 0.25 inch (6 mm) thickness.*

Orenco SYSTEMS® *Technical Data Sheet*

Access Risers – Ultra-Rib™

Applications

Orenco's Access Risers provide access to septic tank openings and can be cast into the tops of concrete tanks, bonded in place, or bolted down using a riser tank adaptor. They can also be used as valve enclosures.

General

Orenco Ultra-Rib™ Access Risers are constructed of ribbed PVC pipe and are available in 12-, 18-, 21-, and 24-in. diameters. They can be ordered in 3-in. (76.2-mm) increments in lengths up to 13 ft (3.96 m) for 12- and 18-in. diameter risers, and up to 14 ft (4.27 m) for 21- and 24-in. diameter risers. Orenco Ultra-Rib riser pipe is also available in truckload quantities. A complete line of Orenco pipe-cutting tools makes it easy to fabricate risers in your shop or in the field

Risers: RR24 XX
Adjust riser height to allow for minimum 6" above ground.

Standard Models

RR12XX, RU18XX, RR21XX, RR24XX

Product Code Diagram

R □ □ □ + □ + □

Discharge grommet option, in. (mm):
Blank = no discharge grommet
10 = 1 (25)
12 = 1¼ (32)
15 = 1½ (38)
20 = 2 (50)

Splice box grommet or splice box options (choose one):
Blank = no grommet or splice box
or
S = grommet installed,1-in. (25-mm), fits SB1-SB4
L = grommet installed,1¼-in. (32-mm), fits SB5-SB6
SX = hole drilled for Orenco® external splice box†
or
S1 = grommet and SB1 internal splice box installed
S2 = grommet and SB2 internal splice box installed
S3 = grommet and SB3 internal splice box installed
S4 = grommet and SB4 internal splice box installed
L5 = grommet and SB5 internal splice box installed
L6 = grommet and SB6 internal splice box installed
or
XS = grommet and simplex explosion-proof splice box installed‡
XD = grommet and duplex explosion-proof splice box installed‡
XT = grommet and triplex explosion-proof splice box installed‡

Riser height in inches (3-in. increments standard)

Riser diameter:
12 = 12-in. (300-mm)*
18 = 18-in. (450-mm)*
21 = 21-in. (525-mm)
24 = 24-in. (600-mm)

Riser type code:
R = 12-in. (300-mm), 21-in. (525-mm), and 24-in. (600-mm) diameters
U = 18-in. (450-mm) diameter
PU = bulk Ultra-Rib™ pipe, all diameters

Riser, Ultra-Rib™

* Not intended for use over pump vaults
† Requires minimum 18-in. (457-mm) riser height
‡ For Class I Division I environments

Materials of Construction

Ultra-Rib™ PVC Pipe:	PVC

Specifications

Model	RR12XX	RU18XX	RR21XX	RR24XX
I.D., in. (mm)	11.74 (298)	17.65 (448)	20.50 (521)	23.50 (597)
Wall Thickness - excluding ribs, in. (mm)	0.10 (3)	0.19 (5)	0.25 (6)	0.25 (6)
O.D. - including ribs, in. (mm)	13.13 (334)	19.44 (494)	22.63 (575)	25.63 (651)
Weight, lbs per ft (kg per m)	5 (7.4)	11 (16.4)	15 (22.3)	19 (28.3)

Orenco SYSTEMS® *Instructions*

PVC Riser Installation

Installing PVC Access Risers onto Cast-In Orenco® Riser-Tank Adapters

Access risers provide access to septic tank openings, simplifying inspection and maintenance procedures. Access riser-to-tank connections must be watertight for the proper functioning of an onsite septic system or effluent sewer system. Orenco strongly recommends watertightness testing of all access riser-to-tank connections after installation.

Following are instruction sets for prepping and installing access risers, installing grommets, and selecting adhesives for riser installations. Refer to the chart below to determine which instruction set to use.

Instruction Set ..... Page

1. Riser Preparation 1
2. Grommet Installation 2
3. Riser Installation — PRTA24-2 Adapters 3
4. Riser Installation — RRFTA24, RRFTA30, PRTA24, PRTA30, FRTA24-RVF, and FRTA30-FRP Adapters 4
5. Riser Installation — Orenco FRP Tanks with 24-inch-Diameter (600-mm) Risers 5
6. Riser Watertightness Testing 6
7. Adhesive Selection and Quantities 7

Instruction Set 1: Riser Preparation

Step 1: Determine Riser Height

Determine how high the riser needs to be.

- The top of the riser should be about 3 inches (75 mm) above finished grade after installation and backfilling — This allows 2 inches (50 mm) for tank settling and 1 inch (25 mm) for ensuring drainage away from the riser.

Step 2: Cut Riser to Size (if Necessary)

If the riser needs to be cut to size, cut it with a circular saw or table saw.

- Always cut excess length from the bottom of the riser.
- For square, even cuts, a good fit, and a watertight joint between the riser and the adapter, use an Orenco riser-cutting saw guide.
- To install risers less than 30 inches (760 mm) wide onto 500-gallon (2000-L) Orenco FRP tanks, cut the riser so it fits into the tank and the lowest rib rests on the tank's top, as shown.

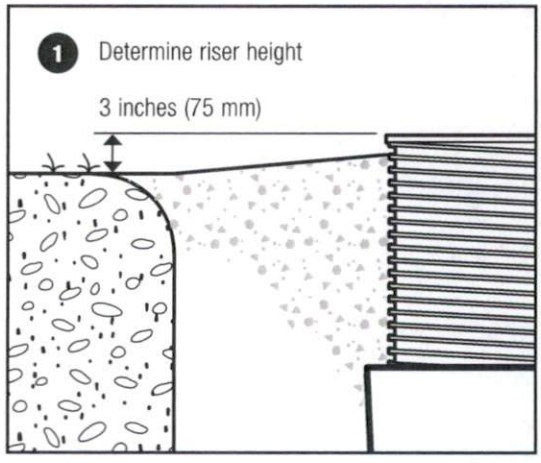
Step 3: Dry Fit Riser to Adapter

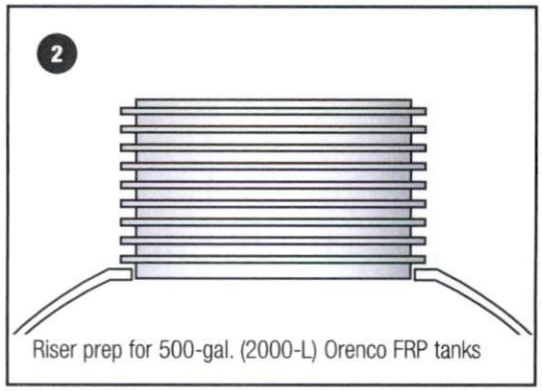
Step 3a: Dry fit the riser to the adapter.

- Make sure riser penetrations are the right sizes and in the correct locations.

Step 3b: If the riser is higher than 3 inches (75 mm) above the estimated final grade, cut it to size per the instructions in Step 2.

Step 3c: If the riser is too short, use an Orenco grade ring to extend it.





Riser prep for 500-gal. (2000-L) Orenco FRP tanks

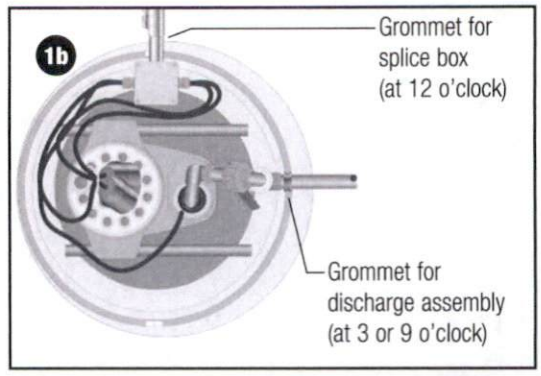
Instruction Set 2: Grommet Installation

Step 1: Mark Access Riser

Step 1a: Use the site plans or drawings to find out if riser penetrations are needed.

Step 1b: Use the plans or drawing to mark the locations of the penetrations.

- If plans or drawings aren't available, use Drawing 1b as a general guide for locating riser penetrations.



Step 2: Drill Holes and Clean Access Riser

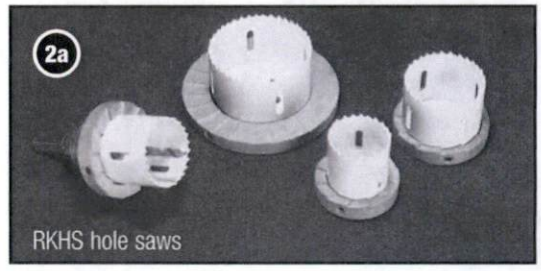
Step 2a: Drill holes for riser penetrations.

- If you have questions about where to locate various riser penetrations, contact your Distributor for more information.

Using Orenco® RKHS Hole Saws ...

Cut the hole and grind the ribs down to make a flat, smooth surface for installing the grommet.

- Make sure your hole saw is the correct size and your drill is at least 18 volts.
- Don't grind too deeply — about 1⁄16 inch (1.6 mm) is deep enough.



Using Standard Hole Saws ...

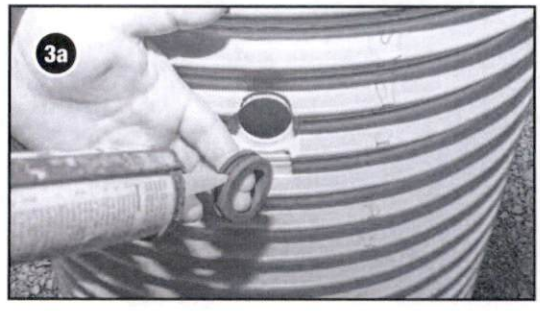
1: Use the correctly sized hole saw to cut a hole, centered on the mark.

2: Trim the riser ribs back 1 inch (25 mm) from around the hole.

- Use a grinder or cutting tool to notch the ribs through to the riser wall.
- Use a hammer and chisel to break off the notched rib sections.
- Use a grinder to make a flat, smooth surface around the hole.

Step 2b: Clean and deburr the hole and flat surface with a wire brush and deburring knife or tool.

- Be careful not to enlarge the penetration.

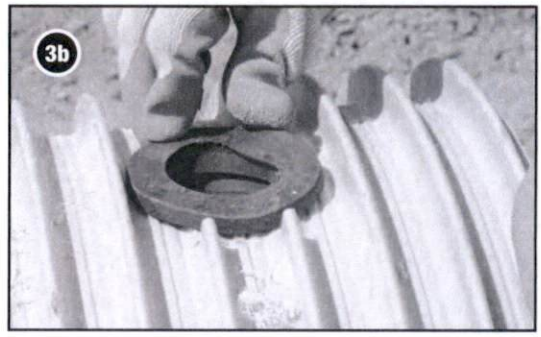


Step 3: Install Grommet

Step 3a: Apply a bead of adhesive to the groove in the grommet's outer diameter.

- For adhesive recommendations, see Instruction Set 7.

Step 3b: Firmly press the grommet into the penetration.



Grommet Hole Sizing Guide

Grommet size, inches (nominal IPS pipe size)	Hole saw size
1/2	1
3/4	1-1/4
1	1-9/16
1-1/4	1-3/4
1-1/2	2-1/8
2	2-3/4
3	3-7/8
4	5

For more information on grommet dimensions and actual pipe O.D., see the Orenco Technical Data Sheet for grommets, NTD-RLA-PG-1

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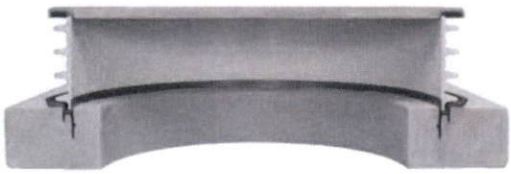
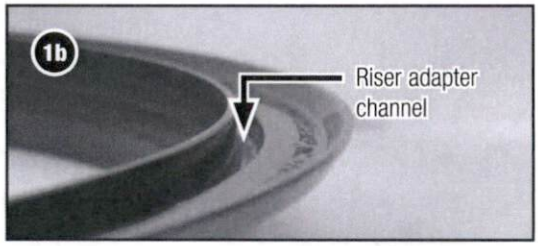
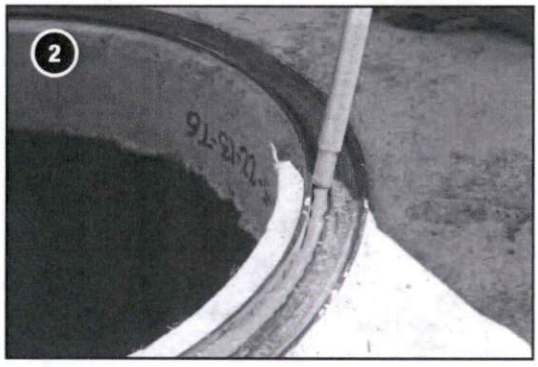


Cutaway view of Orenco® PRTA24-2, cast into concrete tank with 24-inch (600-mm) access riser attached





Instruction Set 3: Riser Installation — PRTA24-2 Adapters

Step 1: Prep Adapter Channel and Riser

Step 1a: Roughen the adapter channel and the bottom surfaces of the riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the channel and the bottom surfaces of the riser.

- The channel must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Adhesive

Fill the channel with methacrylate adhesive.

- For adhesive recommendations, see Instruction Set 7.

Note: *If you're using a methacrylate adhesive that's non-self-leveling, use enough to fully fill the channel, with no voids in the adhesive.*

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Firmly press the bottom of the riser into the channel.

- Twist the riser back and forth slightly to fully seat it and to create a good bond.
- If the inside seam is not completely filled, add adhesive to form a complete fillet.

Step 3c: Use a tongue depressor, putty knife, or clean cloth to make a good fillet over the inside seam.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

Step 4: Test Riser Watertightness

Follow Instruction Set 6 of this document for testing the riser's watertightness.

Note: *Watertight connections are critical for the wastewater system to function effectively and efficiently.*

Instruction Set 4: Riser Installation — RRFTA24, RRFTA30, PRTA24, PRTA30, FRTA24-RVF, and FRTA30-FRP Adapters

Step 1: Prep Adapter and Riser

Step 1a: Roughen the bonding surfaces of the adapter and riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the bonding surfaces of the adapter and the riser.

- The bonding surfaces must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Methacrylate Adhesive

Apply a bead of methacrylate adhesive to the outside of the adapter.

- For adhesive recommendations, see Instruction Set 7.

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Firmly press the riser onto the adapter until the bottom of the riser is resting on the concrete (cast-in adapters) or the adapter flange (bolted-down adapters).

- Twist the riser back and forth slightly to fully seat it and to create a good bond.

Step 3c: Apply a bead of methacrylate adhesive to the inside of the access riser-adapter joint.

Step 3d: Use a putty knife, tongue depressor, or clean shop rag to make a continuous fillet on the inside of the access riser-adapter joint.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

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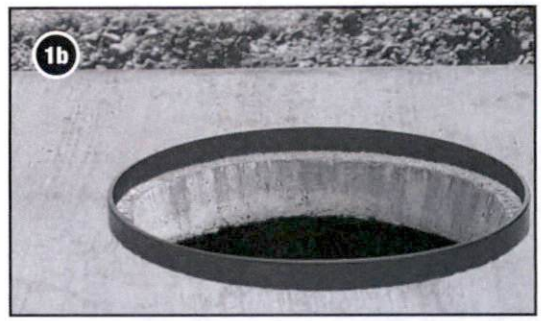

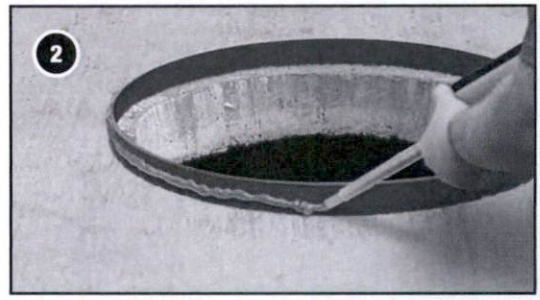

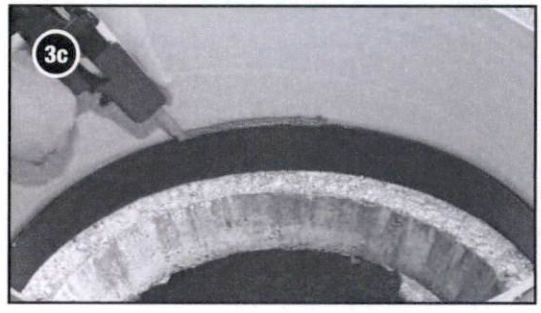

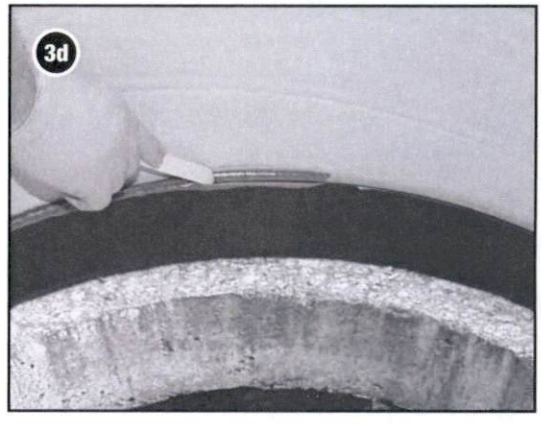

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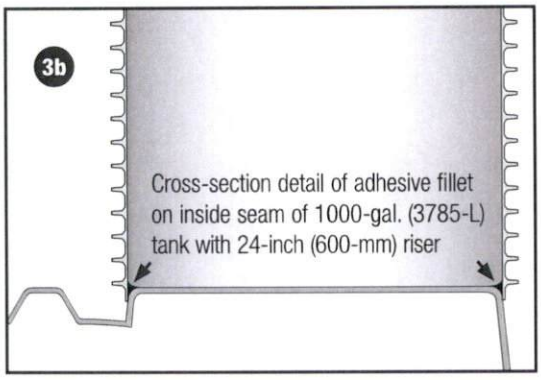
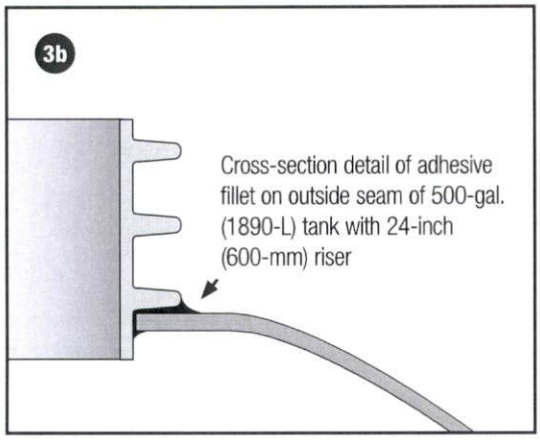




Instruction Set 5: Riser Installation — Orenco FRP Tanks with 24-inch-Diameter (600-mm) Risers

Step 1: Prep Tank and Riser

Step 1a: Roughen the bonding surfaces of the tank and the riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the roughened tank surface and the bottom surfaces of the riser.

- The surfaces must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Methacrylate Adhesive

Apply methacrylate adhesive to the bonding surfaces of the tank and the riser.

- For adhesive recommendations, see Instruction Set 7.

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Press the riser into position

- For 1000-gal. through 2000-gal. tanks (3785-L through 7570-L), firmly press the riser onto the tank opening
- For 500-gal. (1890-L) tanks, firmly press the riser into the tank opening.
- Twist the riser back and forth slightly to fully seat it and create a good bond.
- If the seams aren't completely filled, add adhesive to form a complete fillet.

Step 3c: Use a tongue depressor, putty knife, or clean cloth to make a good fillet over the seams.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

Step 4: Test Riser Watertightness

Follow Instruction Set 6 of this document for testing the riser's watertightness.

Note: *Watertight connections are critical for the wastewater system to function effectively and efficiently.*

Instruction Set 6: Riser Watertightness Testing

IMPORTANT: *A watertight tank and watertight riser-to-tank connections are critical for the wastewater system to function effectively and efficiently.*

Step 1: Prep for Test

Step 1a: Make sure the adhesive seams have set and the tank has been backfilled according to the manufacturer's instructions – typically to the tank's midpoint.

Step 1b: Plug the inlet (and outlet, if present) of the tank with watertight plugs.

Step 1c: Fill the tank with water to a level 2 inches (51 mm) into the riser.

Step 2: Test Watertightness

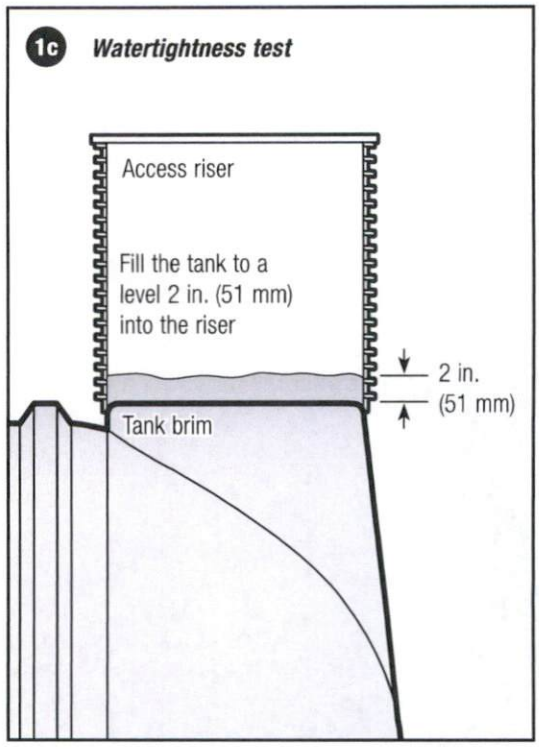
Step 2a: Wait for the required time before inspecting the riser-to-tank connections for leakage.

- Follow the tank manufacturer's recommendations (or applicable local regulations) for wait times before inspecting the tank for leaks.
- Orenco recommends at least 30 minutes for its fiberglass tanks.

Step 2b: Check for any drop in the liquid level inside of the riser and any visible leakage from the riser-to-tank connections.

- At the end of the test, there should be no drop in liquid level and no visible leakage from seams, pinholes, or other imperfections.
- If leaks are found during the test, seal the leaks and repeat the test.

Step 2c: Once the riser-to-tank connections are proven watertight, remove the plug(s) and drop the water level in the tank to just below the invert of the inlet or outlet, whichever is lower.



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Instruction Set 7: Adhesive Selection and Quantities

Use the table below to select the correct adhesive and quantity for your grommet or riser installation(s). Be sure to check the expiration date on the adhesive package. If the adhesive is expired, do not use it to install Orenco components.

Note: *Before installing a riser on an Orenco riser-tank adapter with an adhesive not recommended in the table below, contact your Distributor or Orenco.*

Component		Adhesive Type and Approximate Usage				
		MA8120 300/300-mL cartridge (600-mL total)	**SA510** 300/300-mL cartridge (600-mL total)	**MA320** 7-oz (200-mL) packet	**IPS 810** 1-pint (473-mL) 1-quart (946-mL)	**ADH100** 10.2-oz (300-mL) tube
Grommets		n/a	n/a	n/a	n/a	various quantities
Riser Tank Adapters	FRTA36	1 cartridge*	1 cartridge*	n/a	n/a	n/a
	PRTA24	½ cartridge*	½ cartridge*	1 packet	n/a	1 tube
	PRTA24-2	≥ ½ cartridge*	≥ ½ cartridge*	n/a	< 1 pint	n/a
	PRTA30	< 1 cartridge*	< 1 cartridge*	2 packets	n/a	2 tubes
	RRFTA24	½ cartridge*	½ cartridge*	1 packet	n/a	1 tube
	RRFTA30	1 cartridge*	1 cartridge*	2 packets	n/a	n/a

* Indicates preferred adhesive for this application

Orenco SYSTEMS **Technical Data Sheet**

DuraFiber™ Access Lids

Applications

Orenco® DuraFiber™ Access Lids provide a secure, damage-resistant covering for ribbed PVC and HDPE risers, pump basins, and access ports. They are not recommended for vehicular traffic. 24-inch (600-mm) DuraFiber lids require an RLA24 adapter to mate to 24-inch (600-mm) Perma-Loc™ pipe. 30-inch (750-mm) DuraFiber lids are not compatible with 30-inch (750-mm) RLA Riser-Lid-Adapters or 30-inch (750-mm) Perma-Loc pipe. For these products, use Orenco's FLF-Series lids.

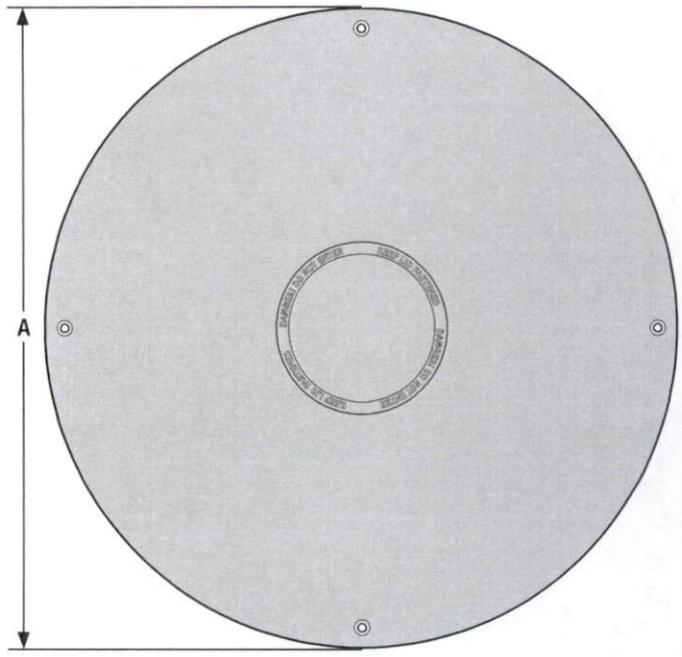
General

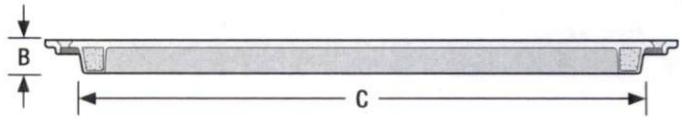
DuraFiber Access Lids are constructed of resin-infused fiberglass fabrics for extreme durability and damage resistance, with breaking strengths in excess of 20,000 pounds (9,000 kg).

They feature flat-style flanges for easier access, allowing clean, flush-to-grade installations. They have cored centering rings for aligning lids with risers. They also have urethane gaskets to help provide watertight seals.

DuraFiber Lids feature a non-skid surface for better grip and aesthetics, a molded-in caution statement, and room for a customer logo. They come with four 5/16-inch stainless steel flathead socket cap screws and a hex key wrench.

Durafiber Lids are available with optional insulation, installed at the factory or in kits that can be installed in the field.





Standard Models

FLD24G, FLD24GATX, FLD24GW, FLD30G, FLD30GATX, FLD30GW

Product Code Diagram

FLD ☐ ☐ ☐ ☐ ☐

Riser Lids: FLD 24G
Septic Tank (2)
Pump Tank (1)

- Color and logo options:
  - Blank = green color lid
  - B = brown color lid
  - C = custom logo
  - ATX = AdvanTex® logo
  - W = warning label
- Insulation:*
  - Blank = no insulation
  - I2 = 2-inch (50-mm) insulation installed
  - I4 = 4-inch (100-mm) insulation installed
- Vent and filter options:
  - Blank = no vent or filter options
  - V = vent
  - CF = carbon filter
- Gasket options:
  - G = gasket (standard)
  - Blank = no gasket
- Lid diameter, in. (mm):
  - 24 = 24 (600)
  - 30 = 30 (750)
- DuraFiber™ fiberglass lid

* Insulation has an R-value of 10 per 2-inch (50-mm) increment.

Materials of Construction:

Lid	Fiberglass reinforced polyester
Gasket	Urethane
Centering ring core	Structural foam
Mounting hardware	Stainless steel
Insulation (optional)	Closed-cell foam
Insulation mounting hardware	Stainless steel

Specifications

Model	FLD24XX	FLD30XX
A in. (mm)	26 (660)	33 (838)
B, in. (mm)	1½ (38)	1½ (38)
C, in. (mm)	23¼ (590)	29¼ (743)
Gasket width, in. (mm)	¾ (19)	¾ (19)
Bolt hole diameter, in. (mm)	5/16 (8)	5/16 (8)
Weight, lbs (kg)	11 (5)	20 (9)
Bolt holes, per lid	4	4

Orenco SYSTEMS

Technical Data Sheet

External Splice Box

Applications

The Orenco® External Splice Box attaches outside the access riser of an underground tank. It is engineered specifically for water and wastewater treatment systems and is especially suited for use in locations prone to high groundwater and other wet conditions. Its separate conduit hubs, large volume, and optional dividers make it useful for maintaining isolation of high and low voltage wires where needed. It has four cord grips which accommodate power cords for floats and pumps of 0.170 - 0.470 inches (4.3 - 11.9 mm) in diameter. Unused cord grips can be plugged watertight with the supplied cord grip plugs. Each External Splice Box is provided with a hole-cutting template to simplify installation on the riser and a 4-inch (100-mm) diameter grommet for the riser penetration.

General

To specify the Orenco External Splice Box for your installation, require the following:

- Watertight for prolonged submergence per UL listing (Type 6P)
- Attachment external to access riser to allow inspection with no need to open the riser lid
- Volume of 100 $in.^3$ (1639 cm^3) for easy wiring access and to accommodate multiple wiring configurations
- Bottom entry, so conduit or direct-bury cable always remains below minimum burial depth
- Molded of UL (f1) rated plastic, resistant to cold and UV exposure, suitable for external applications
- Optional divider plates available for isolating high and low voltage wires from separate conduits or direct-bury cable

Standard Models

SBEX1-4, SBEX1-4-P

Product Code Diagram

SBEX1-4 - ☐

- ☐: Blank = no divider plates; P = divider plates
- SBEX1-4: External splice box

The External Splice Box is molded of a UL (f1) rated PVC alloy. It has a UL Type 6P listing for prolonged submergence.

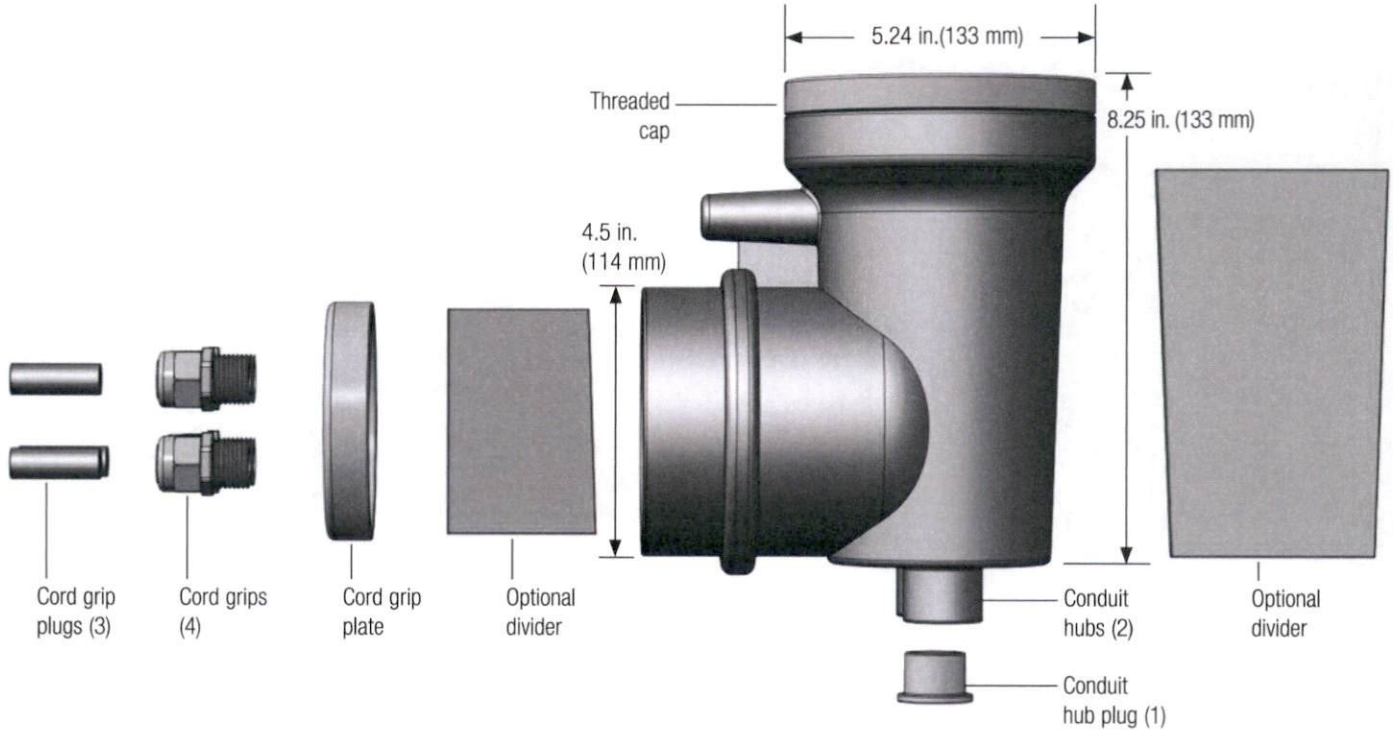
Physical Specifications

Volume	100 in.3 (1639 cm^3)
Cord grips	4 per SBEX
Cord grip plugs	3 per SBEX
Cord diameters accommodated	0.170- 0.470 in. (4.3 - 11.9 mm)
Conduit hubs	2
Conduit hub plug	1
Conduit sizes accommodated	¾ in., 1 in. (with coupling), ½ in. (with fitting or bell end)
Dia. of hole into riser	5 in. (127 mm), hole-cutting template included

Materials of Construction

Splice box	PVC alloy
Cord grips	Nylon
Cord grip plugs	EPDM rubber
O-rings	Buna rubber
Conduit hub plug	PVC per ASTM D-1784
4-in. (100-mm) grommet*	EPDM rubber

** Grommet not shown in illustration below*



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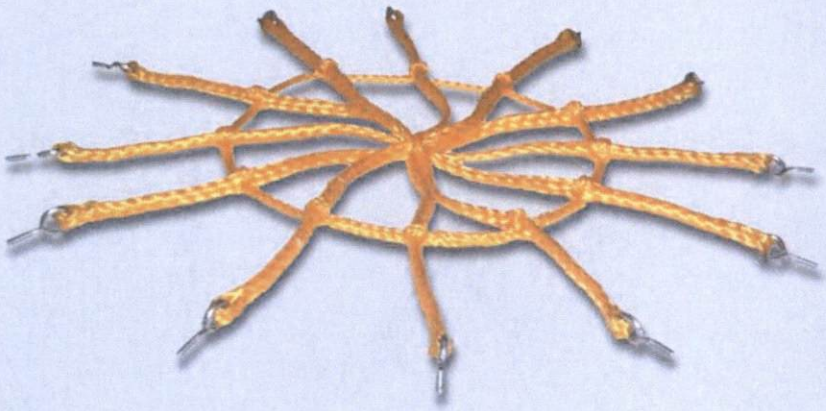
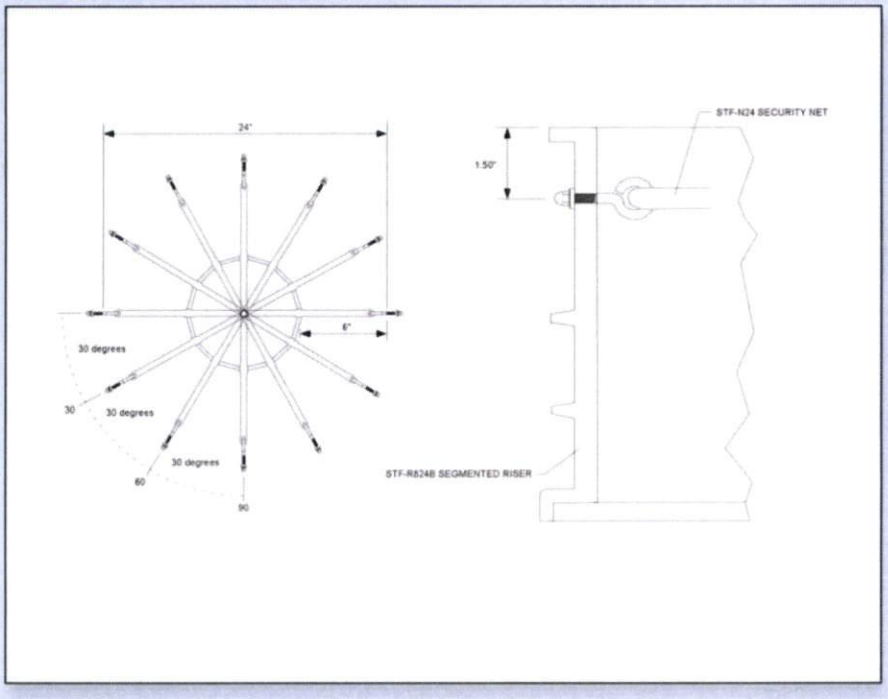
Locate in every riser that does not have an inner lid.



FEATURES

- Use as a security measure to keep persons, especially children, from accidental entry while systems are being serviced or any other instance where a cover is removed
- Available to fit 18", 24", and 30" diameter risers
- Open areas in web are large enough to allow tanks to be pumped without having to remove the security net
- Installs easily in our segmented riser and others



Order part No. STF-N18
STF-N24
STF-N30

CAD detail drawing available in DXF format

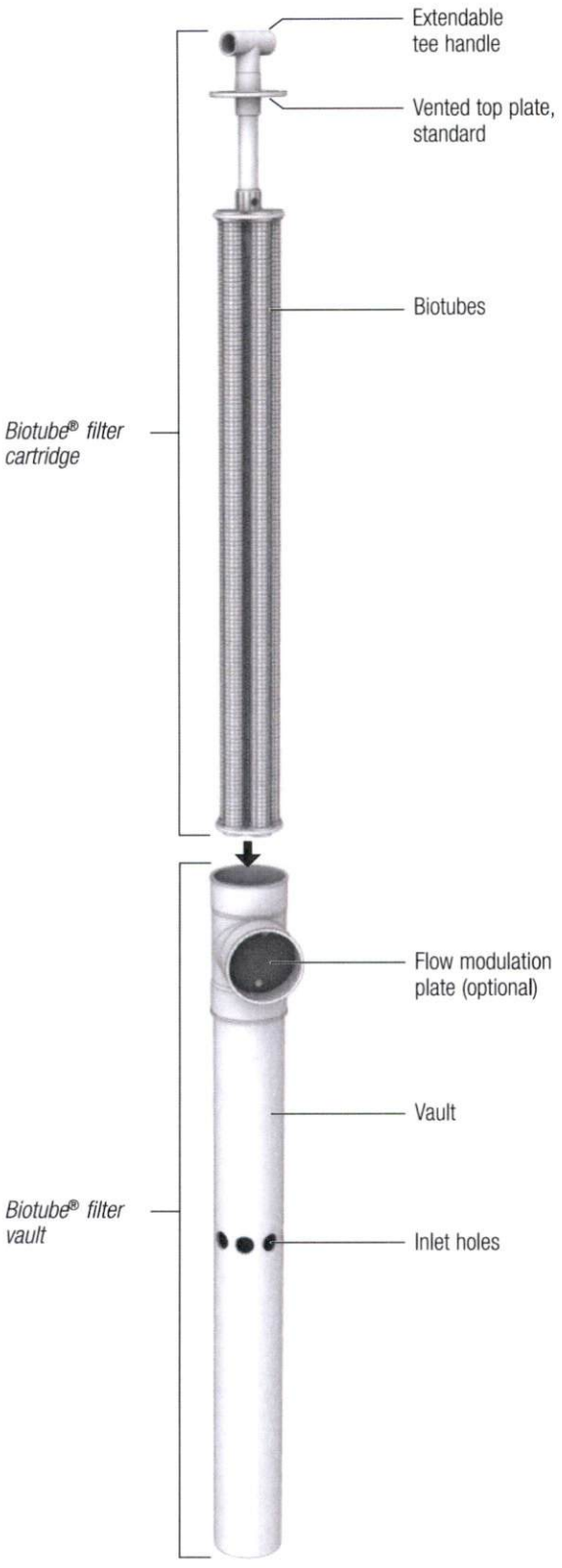
U.S. Patent Pending

RELATED PRODUCTS

STF-CI24 page 5
STF-APC24G page 6
STF-APC24B page 6
STF-R824B page 9
STF-AR24 page 9
STF-APC24GI-075 page 14
STF-APC24BI-075 page 14
STF-APC24GI-100 page 14
STF-APC24BI-100 page 14
STF-APL24G page 14
STF-APL24B page 14

Orenco SYSTEMS **Technical Data Sheet**

4-in. (100-mm) Biotube® Effluent Filters



Applications

Orenco® 4-inch Biotube® Effluent Filters are designed to remove solids from effluent leaving residential septic tanks. They can be used in new and existing tanks at flows of up to 1200 gpd.

General

Orenco 4-inch Biotube Effluent Filters (U.S. Patents No. 4,439,323 and 5,492,635) are used to improve the quality of effluent exiting a septic tank in a residential septic system. Increased effluent quality improves system performance and extends drainfield life.

The Biotube cartridge fits tightly in the vault and is removable for maintenance. The tee handle can be extended for easy removal of the cartridge.

Standard Models

FTS0444-36, FTS0444-36M, FTW0436-28, FTW0436-28M

FTW0444-36, FTW0444-36M

Product Code Diagram

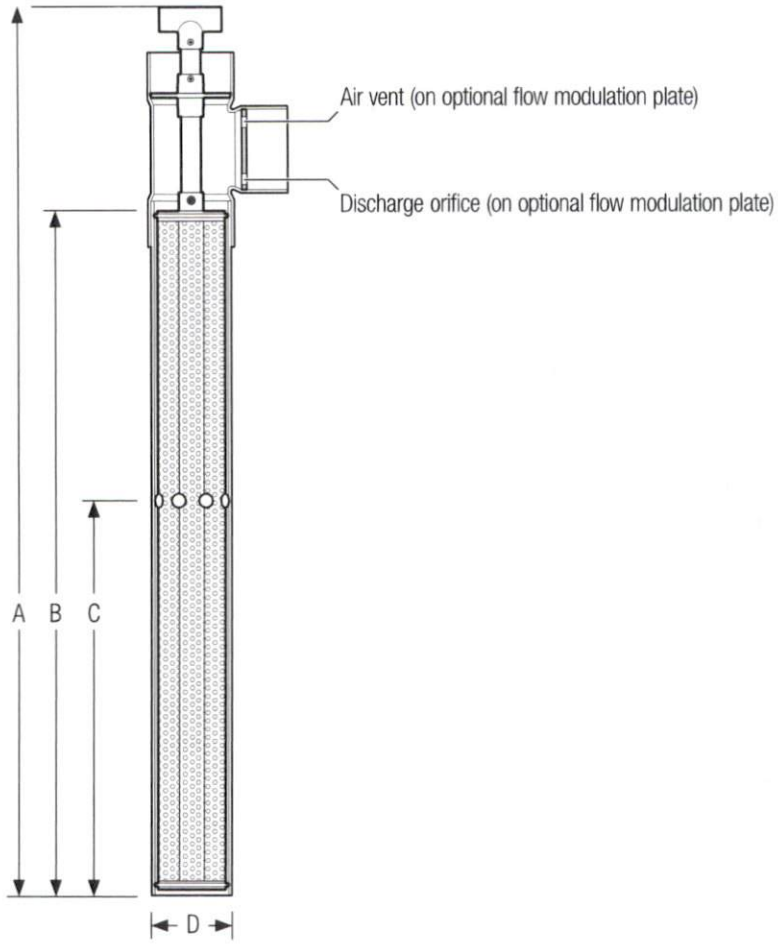
FTP-0444-36-NC
Install in Septic Tank

FT □ □ **04** □ - □ - □

- Biotube® effluent filter
- Filter mesh option: Blank = 1/8-in. (3-mm) filter mesh; P = 1/16-in. (1.6-mm) filter mesh
- Outlet tee: W = fits Type 3034 outlet tee; S = fits Schedule 40 outlet tee
- 4-in. (100-mm) filter diameter
- Filter housing height, in. (mm): 36 = 36 (914), standard; 44 = 44 (1118), standard
- Cartridge height, in. (mm): 28 = 28 (711), standard; 36 = 36 (914), standard
- Flow modulator and float switch bracket options: Blank = no options selected; M = flow modulation plate installed; A = float switch bracket installed

Materials of Construction

Vault	PVC
Biotube® cartridge	Polypropylene and polyethylene
Handle components	PVC, polyethylene, stainless steel



Specifications

Model	FTS0444-36/FTS0444-36MFTW0436-28/FTW0436-28M FTW0444-36/FTW0444-36M	
A - Vault height, in. (mm)	44.00 (1118)	36.00 (914)
B - Cartridge height, in. (mm)	36.00 (915)	28.00 (710)
C - Inlet hole height,* in. (mm)	21.25 (540)	19.25 (489)
D - Nominal diameter, in. (mm)	4.00 (100)	4.00 (100)
Number of inlet holes	8	8
Inlet hole diameter, in. (mm)	1.13 (29)	1.13 (29)
Number of discharge orifices	1 or 2†	1 or 2†
Discharge orifice diameter, in. (mm)	4.00 or 0.25 (100 or 6)†	4.00 or 0.25 (100 or 6)†
Discharge coupling diameter, in. (mm)	4.00 (100)	4.00 (100)
Number of air vents	1	1
Air vent diameter, flow modulation plate, in. (mm)	0.50 (13)	0.50 (13)
Filter surface area,‡ ft^2 (m^2)	5.1 (0.50)	3.9 (0.40)
Flow area,** ft^2 (m^2)	1.5 (0.15)	1.2 (0.12)

** Inlet hole height can vary depending on the configuration of the tank. Optimum hole height is 70% of the minimum liquid level.*

† Available on optional flow modulation plate.

‡ Filter area is defined as the total surface area of all individual Biotubes® within the filter cartridge.

*** Flow area is defined as the total open area (or area of the mesh openings) of all the individual Biotubes within the filter cartridge.*

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Orenco® SYSTEMS *Instructions*

4-in. Biotube® Effluent Filter

Installation and Maintenance Instructions

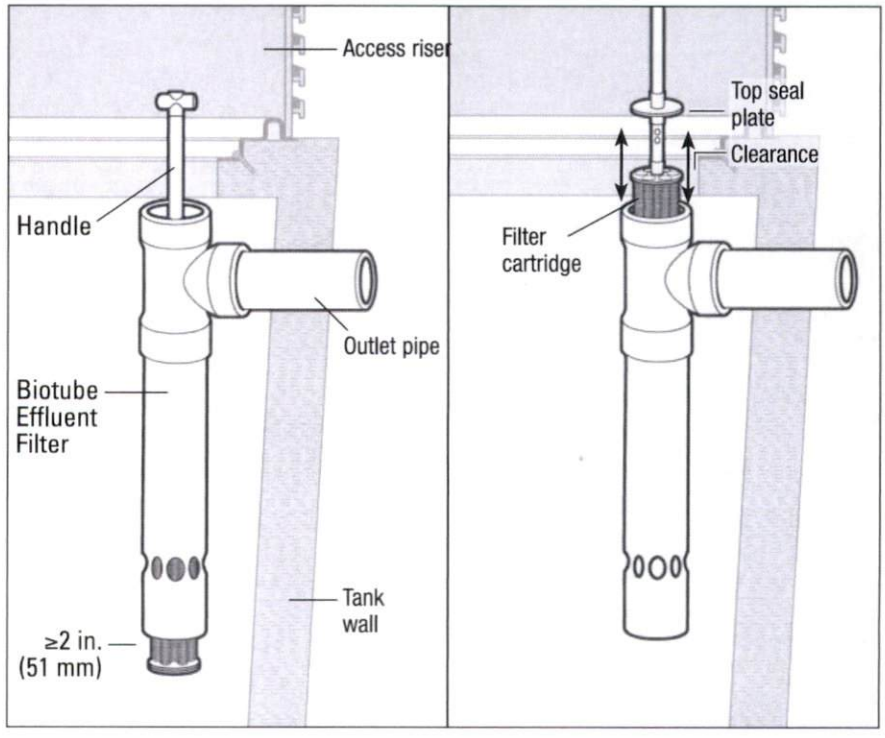
Biotube Effluent Filters* extend drainfield life by preventing solids from leaving the septic tank. Our 4-in. (nominal size) filter comes in its own housing, in both 44-in. (1118-mm) and 36-in. (914-mm) lengths. Our Jr. insert filter is 18 in. (457 mm) long, fits in a nominal 4-in. outlet tee, and comes with or without its own housing. Biotube Effluent Filters install in minutes, inside new or existing tanks.

Installation Instructions

Step 1: Test-Fit the Effluent Filter

Test-fit the effluent filter on the septic tank's outlet pipe without gluing. Make sure it fits plumb. Install the assembly as snug as possible to the tank wall, but ensure sufficient clearance for removing the filter cartridge.

If using the 4-in. Biotube Insert Filter, adjust the length of the outlet tee so that the bottom of the Insert Filter extends at least 2 in. (51 mm) below the bottom of the outlet tee.



*Protected by U.S. Patent Numbers 5,492,635 and 4,439,323

Installation Instructions (continued)

Step 2: Attach Filter to Tank

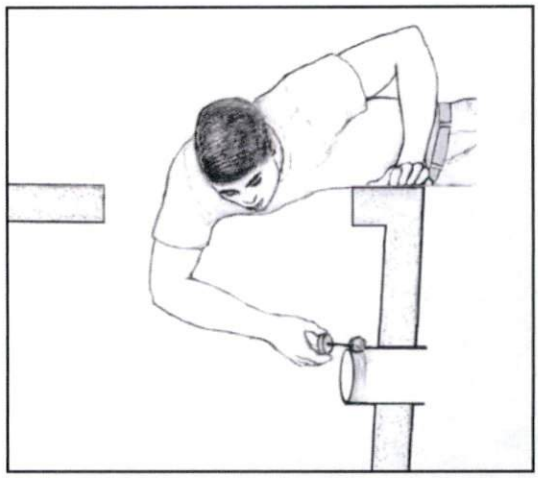
Two attachment methods can be used:

1) Glue the filter onto the tank outlet pipe using appropriate primer and glue.

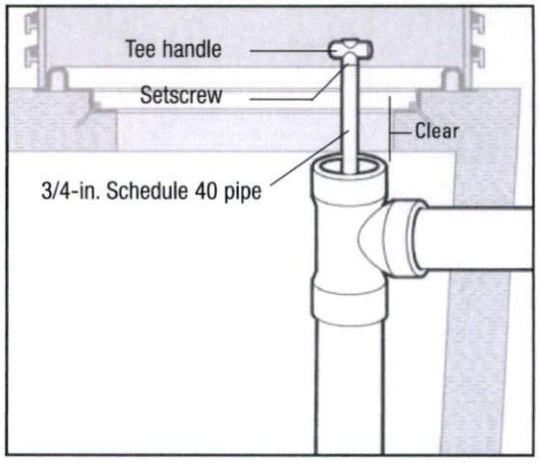
2) A stainless steel setscrew can be used to secure the filter instead of glue.

Step 3: Extend Cartridge Handle

For easier access when servicing, the cartridge handle may be extended using a longer length of 3/4-in. Schedule 40 PVC pipe.



This illustration shows the gluing technique for installing a filter into a new septic tank. Installing a filter into an existing tank is a custom, site-specific job.



Cartridge handles can be extended for easier access.

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Maintenance Instructions

To ensure the effluent filter is functioning properly, inspect it every year. Under normal conditions, your effluent filter will function for several years before cleaning is necessary. Clean the filter when it becomes clogged enough to restrict normal flows out of the septic tank. At a minimum, clean the filter whenever the tank is pumped. High-level alarms, which activate when the filter is clogged, are recommended to prevent backups.

Be sure to dress properly when inspecting and cleaning the filter. Wear full-length pants and shirt, shoes, gloves, and goggles or glasses.

Step 1

Remove the access lid to your septic tank by unscrewing the stainless steel lid bolts with the hex head wrench provided. If your lid is above ground, it will be easy to find. If it is buried below ground, find the marker that indicates its location.

Step 2

Remove the filter cartridge by grasping the tee handle and lifting it out of its housing.

Step 3

Spray the cartridge tubes with a hose to remove any material sticking to them. Ensure that the three orifices in the optional flow modulation plate inside the filter are clear of any debris. Make sure the rinse water runs back into the tank, but do not allow solids material to fall into the open filter housing.

Step 4

Firmly place the cartridge back into the housing.

Step 5

Some effluent filters come with an alarm that activates when the filter needs cleaning. If you have an alarm, check to make sure it is working by lifting the float with a stick. An audible horn should sound. The alarm panel is normally mounted on the side of the house or in the garage.

Note: If your effluent filter doesn't have an alarm system and you would like one, call your local septic system installer.

Step 6

Record the date that you inspected and/or cleaned your filter on the form that follows this page. If you checked the alarm or made any other observations about the tank or system, include that information under "Notes."

Step 7

Attach the access lid by placing it on the riser, matching the holes in the lid with the holes in the riser. Insert each lid bolt through the lid and the hole in the riser and tighten with hex head wrench provided. Before leaving, pull up firmly on the lid to make sure it is secure.

quality . service
innovation . integrity

N137

130 Series

"The color green is a registered trademark of Zoeller Pump Co."

Features

The Flow-Mate series of submersible pumps is designed for use in residential or light commercial dewatering applications and can be used to transfer groundwater or effluent. These durable cast iron pumps include a powder coated epoxy finish to prevent corrosion and are designed to provide great heat dissipation from the motor, ensuring a long service life. As with every Zoeller® pump, each one is 100% pressure-tested, submerged and run to ensure quality and reliability for years of trouble-free performance! This attention to detail is an inherent feature of every pump in this series, making it one of the most reliable in the industry.

- Automatic models include a float-operated, 2-pole mechanical switch, a stainless steel float guard and switch arm, and a solid, buoyant polypropylene float, which prevents water from filling the float and causing a malfunction.
- For nonautomatic pumps, variable level control systems and containers of various sizes are available for longer cycles.
- Includes a stainless steel handle for easy installation and removal.
- All models are hermetically sealed to be watertight, dust-tight, and completely submersible.

Reserve Powered Design: For unusual conditions, a reserve safety factor is engineered into the design of every pump.

Specifications

Motor Characteristics

Motor	1/2 HP
Voltage	115 - 460 V
Phase	1 or 3 Ph
Hertz	60 Hz
RPM	1750 RPM
Type	Split phase or 3 phase
Insulation	Class B
Amps	1.4 - 10.7 Amps

Pump Characteristics

Operation	Automatic or nonautomatic
Auto On/ Off Points	10" / 2-3/4" (25.4 cm / 7 cm)
Discharge Size	1-1/2" NPT
Solids Handling	5/8" (15 mm) spherical solids
Cord Length	10' (3 m) auto, 15' (5 m) nonauto
Cord Type	UL listed, 3-wire neoprene cord
Max Head	26' (8 m)
Max Flow Rate	93 GPM (352 LPM)
Max Operating Temp	130 °F (54 °C)
Cooling	Oil filled
Motor Protection	Auto reset thermal overload (1 Ph)

Materials Characteristics

Cap	Cast iron or bronze
Motor Housing	Cast iron or bronze
Pump Housing	Cast iron or bronze
Base	Cast iron or bronze
Upper Bearing	Sleeve bearing or bronze
Lower Bearing	Sleeve bearing or bronze
Mechanical Seals	Carbon and ceramic
Impeller Type	Non-clogging vortex
Impeller	Cast iron or bronze
Hardware	Stainless steel
Motor Shaft	AISI 1215 cold roll steel
Gasket	Neoprene

60 Hz

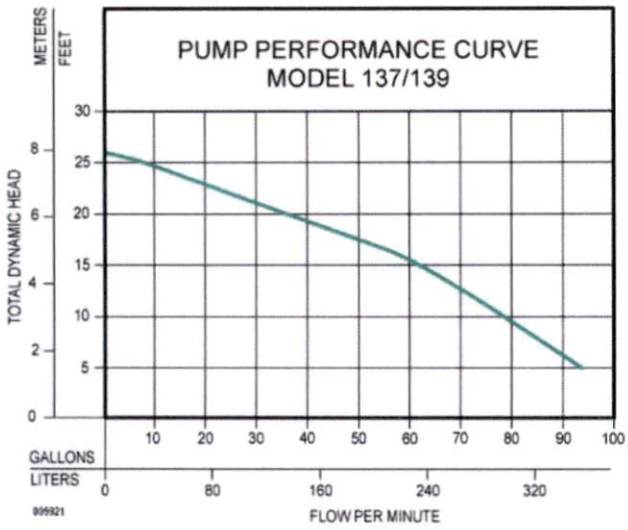
ZOELLER® PUMP COMPANY

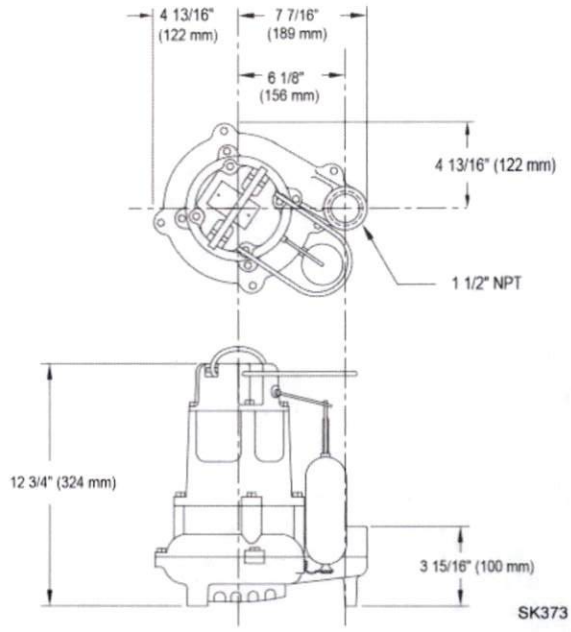
Zoeller Family of Water Solutions

FM0411_Ea

130 Series

N137





Model

Model Number	Seal	Mode	Volts	Phase	Amps	HP	Hz	Lbs	Kg
M137	Single	Auto	115	1	10.7	1/2	60	47	21
N137	Single	Non	115	1	10.7	1/2	60	46	21
BN137	Single	Auto	115	1	10.7	1/2	60	48	22
D137	Single	Auto	230	1	5.8	1/2	60	47	21
E137	Single	Non	230	1	5.8	1/2	60	48	22
H137	Single	Auto	200	1	6.2	1/2	60	48	22
I137	Single	Non	200	1	6.2	1/2	60	48	22
J137	Single	Non	200	3	2.6	1/2	60	46	21
F137	Single	Non	230	1	2.6	1/2	60	48	22
G137	Single	Non	460	3	1.4	1/2	60	48	22
BE137	Single	Non	230	1	5.8	1/2	60	48	22
M139	Single	Auto	115	1	10.7	1/2	60	51	23
N139	Single	Non	115	1	10.7	1/2	60	51	23
D139	Single	Auto	230	1	5.8	1/2	60	47	21
E139	Single	Non	230	1	5.8	1/2	60	48	22
H139	Single	Auto	200	1	6.2	1/2	60	48	22
I139	Single	Non	200	1	6.2	1/2	60	48	22
J139	Single	Non	200	3	2.6	1/2	60	50	23
F139	Single	Non	230	3	2.6	1/2	60	48	22
G139	Single	Non	460	3	1.4	1/2	60	48	22

Model 137 features all cast iron construction, and model 139 features all bronze construction.
BN and BE models include a 20' (6 m) piggyback variable level pump switch.

Additional cord lengths are available in 15' (5 m), 25' (8 m), 35' (11 m) and 50' (15 m).

Your Peace of Mind is Our Top Priority®
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"Quality Pumps Since 1939"

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

N137

SECTION: 5.10.280
FM0531
1009/2
Supersedes
1009

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SPECIFICATIONS
EFFLUENT/SUMP SIMPLEX SYSTEM
ZOELLER SUBMERSIBLE DEWATERING OR EFFLUENT PUMPS

SEAL	SOLIDS	DISCHARGE	MATERIAL	MODELS							
Single	1/2"	1½" NPT	Cast Iron	53	57	98	140	151			
Single	1/2"	1½" NPT	Cast Bronze	55	59						
Single	5/8"	1½" NPT	Cast Iron	137	191						
Single	5/8"	1½" NPT	Cast Bronze	139							
Single	3/4"	1½" NPT	Cast Iron	145	152	153					
Single	3/4"	1½", 2", or 3 NPT	Cast Iron	161	163	165	185	186	188	189	
Double	1/2"	1½"	Cast Iron	4140							
Double	3/4"	1½", 2", or 3 NPT	Cast Iron	4145	4161	4163	4165	4185	4186	4188	4189

SIMPLEX SYSTEM

Furnish a Zoeller Submersible Pump Model N137 Single Seal or Model _____ Double Seal, with a capacity of 35.5 GPM against a Total Dynamic Head of 19.2 feet. Motor Specification: 115 Voltage, 60 Cycles, 1 Phase, 0.5 HP. Discharge to be X 1½ inch NPT. Optional _____ 2 inch NPT or _____ 3 inch NPT (161/4161 - 189/4189). Cord length to be 20 feet. Pumps will pass _____ ½ inch solids (53,55,57,59, 98, 140/4140 & 151 Series) or X 5/8 inch solids (137 & 139 Series) or _____ 3/4 inch solids (145/4145, 152, 153, 161/4161, 163/4163, 165/4165, 185/4185, 186/4186, 188/4188 & 189/4189 Series.) Pumps shall be _____ UL Listed, X CSA Certified, X SSPMA certified, _____ State of Wisc. approved, _____ other (Specify _____ _____).

SINGLE PHASE PUMPS

GENERAL

Pump motor shall be hermetically sealed, submersible type operating in a high quality dielectric oil for cooling the windings and for lubrication of the motor bearings and ceramic-carbon shaft seal. Single phase motor shall have internal automatic resetting, thermal overload protection. Construction shall be of _____ cast iron with 100% baked-on powder coated epoxy finish for corrosion resistance and longer casting durability (or _____ cast bronze). All fasteners and external metal parts shall be of stainless steel. Impeller shall be of vortex non-clog design. (Addition noted below.) Check applicable series:

_____ 53 (cast iron) _____ 55 (cast bronze) series pump shall have a shaded pole motor. Impeller, with metal insert, and base shall be of glass reinforced molded material. Switch case shall be of cast or molded material. Guard and handle shall be of stainless steel.

_____ 57 (cast iron) _____ 59 (cast bronze) series pump shall have a shaded pole motor. Guard and handle shall be of stainless steel.

_____ 98 (cast iron) series pump shall have ½ HP PSC motor.

X 137 (cast iron) _____139 (cast bronze) series pump shall have ½ HP split phase motor with current sensing, starting relay enclosed in switch housing.

_____ 151 (.33 HP) _____ 152 (.4 HP) _____153 (½ HP) series pump shall have a permanent split capacitor motor. The impeller shall be "glass reinforced thermoplastic." Motor housing shall be cast iron.

_____ 145 (¾ HP) _____ 140 (1 HP) series pump shall have a permanent split capacitor motor with capacitor in the switch housing attached to the pump. The impeller shall be "glass reinforced thermoplastic." Motor housing shall be cast iron. Discharge shall be a permanently affixed 1½ inch female NPT hub.

_____ 4140 (1 HP cast iron) _____ (4145 (¾ HP cast iron) series pump with double carbon/ceramic shaft seals shall have a 1 HP permanent split capacitor motor with capacitor in the switch housing attached to the pump. The impeller shall be "glass reinforced thermoplastic." Motor housing shall be cast iron. Discharge shall be a permanently affixed 1½ inch female NPT hub. The lower seal cavity shall be oil-filled.

_____ 161 (½ HP) _____163 (½ HP) _____165 (1 HP) cast iron series pump shall have a permanent split capacitor motor with run capacitor and magnetic contactor enclosed

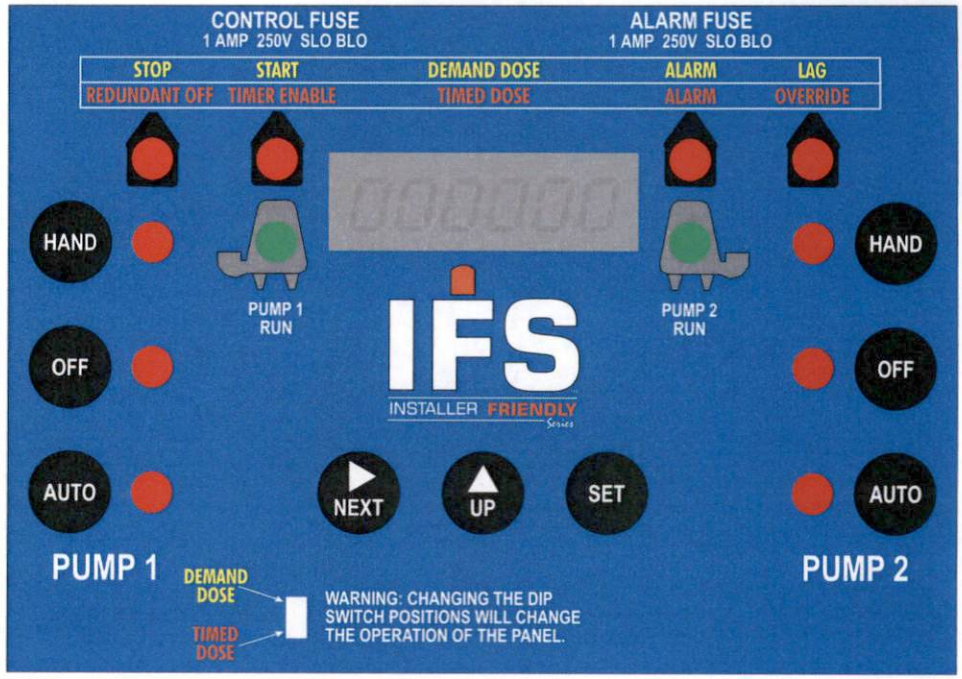
Installer Friendly Series® Control Panels

The innovative **Installer Friendly Series®** control panels from SJE-Rhombus® feature an **easy-to-use touch pad** on the inner door for programming and monitoring on-site installations.

- IFS Single Phase Simplex Demand/Timed Dose Panel
- IFS Single Phase Duplex Demand/Timed Dose Panel

IFS PANEL FEATURES:

- **NEMA 4X** weatherproof enclosure for indoor/outdoor use
- Inner door for added safety
- New innovative circuit board design offers a clean installation
- Separate control and alarm fuses
- Digital display board is standard
- Alarm beacon and horn (85 decibel rating) provides audio/visual warning of alarm condition
- Test / normal / silence switch
- Panel can be easily converted to either demand dose to timed dose in the field
- Easy to read float/pump wiring diagram
- Instruction label on inside cover for viewing and programming digital display
- Includes float switches
- Includes step-by-step installation instructions



TOUCH PAD/DISPLAY FEATURES:

- Easy-to-use touch pad for programming pump control
- Pump run indicator(s)
- Float status indicators, including float out-of-sequence alarm
- HAND/OFF/AUTO pump control switch(es)
- Hand mode safety feature
- Six digit LED display (now a standard feature) includes:
  - Elapsed time meter(s)
  - Cycle counter(s)
  - Alarm counter
  - Lead/Lag Selector toggles pump operation (duplex models)
  - Float error counter
  - Override counter (timed dose)

c UL us LISTED

3 YEAR LIMITED WARRANTY

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INSTALLER FRIENDLY SERIES® - IFS Single Phase Simplex (Demand/TD)

Single phase, simplex demand dose or timed dose, float or C-Level™ controlled system for pump control and system monitoring.

The IFS simplex control panel is designed to control one 120, 208, 240 VAC single phase pump in water and sewage installations. The panel features an easy-to-use touch pad with display on the inner door for programming and system monitoring. The panel configuration can be easily converted in the field to either a timed dose or demand dose.

The optional C-Level™ sensor is a pressure transducer that senses the liquid level in the tank and sends a signal to the IFS panel. Pump activation levels can be adjusted by using the panel touch pad. C-Level™ CL40 sensor operating range is 3-39.9 inches (7.6-101.3 cm). C-Level™ CL100 operating range is 3-99.5 inches (7.6-252.7 cm).

TOUCH PAD FEATURES

A. **Level Status Indicators** illuminate when floats or set points are activated. Alarm will activate if a float operates out of sequence.

B. **HOA (Hand-Off-Automatic) Buttons** control pump mode with indication. Hand mode defaults to Automatic when stop level or redundant off level is reached.

C. **Pump Run Indicator** illuminates when pump is called to run.

D. **LED Display** shows system information including: level in inches or centimeters (C-Level™ only), mode, pump elapsed time (hh:mm), events (cycles), alarm counter, float error count, timed dose override counter (timed dose only), and ON/OFF times (timed dose only).

E. **NEXT Push Button** toggles display.

F. **UP and SET Push Buttons** set pump ON/OFF times (timed dose only) or activation levels (C-Level™ only).

PANEL COMPONENTS

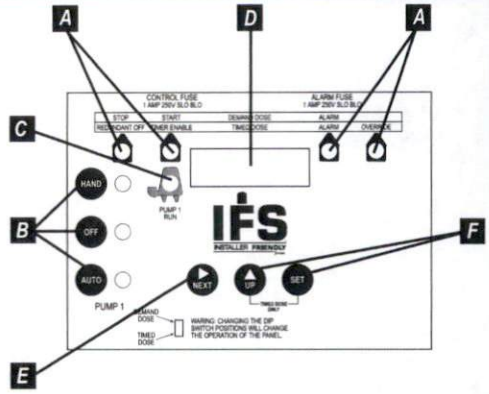
1. **Enclosure** base measures 10 X 8 X 4 inches (25.4 X 20.32 X 10.16 cm). NEMA 4X (ultraviolet stabilized thermoplastic with removable mounting feet for outdoor or indoor use). **Note:** Options, voltage, and amp range selected may change enclosure size and component layout.
2. **Red Alarm Beacon** provides 360° visual check of alarm condition.
3. **Exterior Alarm Test/Normal/Silence Switch** allows horn and light to be tested and horn to be silenced in an alarm condition. Alarm automatically resets once alarm condition is cleared.
4. **Alarm Horn** provides audio warning of alarm condition (83 to 85 decibel rating).
5. **Circuit Breaker** (optional) provides pump disconnect and branch circuit protection.
6. **Power Relay** controls pump by switching electrical lines. Definite purpose contactor used when pump full load amps are above 15.
7. **Float Connection Terminal Block**
8. **Incoming Control/Alarm Power & Pump Terminal Block**
9. **Control Power Indicator/Fuse** indicator light illuminates if control power is present in panel. Alarm will activate if control fuse is blown.
10. **Alarm Power Indicator/Fuse** indicator light illuminates if alarm power is present in panel.
11. **Ground Lug**

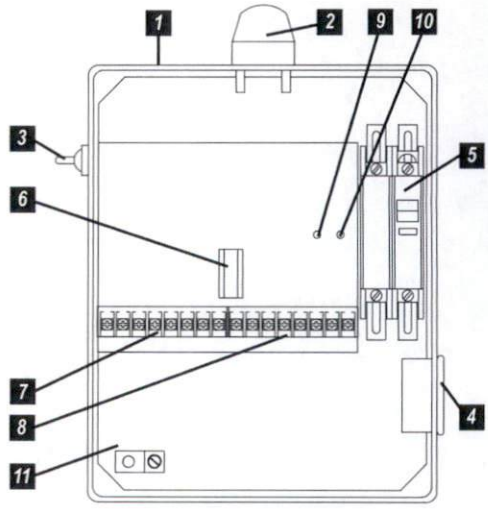
NOTE: Schematic/Wiring Diagram and Pump Specification Label are located inside the panel on enclosure cover

OPTIONAL FEATURE

- **34" (86.36cm) Panel Mounting Post** (Factory Installed). Includes Duplex Installation Kit (Enclosure upsized to 10" x 8" x 6" (25.4 x 20.32 x 15.24 cm). Max. Enclosure size14" x 12" x 6" (35.56 x 30.48 x 15.24 cm)

SEE BACKSIDE FOR COMPLETE LISTING OF AVAILABLE OPTIONS.





Model Shown IFS11W114X8AC

Reg. Cdn Pat. & TM Off
C-Level™ Sensor US Patent 8,336,385. Other patents pending.

FEATURES

- Entire control system is UL Listed to meet and/or exceed industry safety standards
- Dual safety certification for the United States and Canada
- Standard package includes:
  Demand Dose - three 20' SJE MilliAmpMaster™ control switches
  Timed Dose - two 20' SJE MilliAmpMaster™ control switches
- Complete with step-by-step installation instructions
- Three-year limited warranty

c UL us LISTED

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1-218-847-4617 Fax
email: sje@sjerhombus.com
www.sjerhombus.com

IFS	2	1	W	9	1	4	H	8AC 17G 10E 15A 4A 4D

MODEL IFS

MODEL TYPE

- [ ] 1 = SPLX TIMED DOSE (includes option 8AC standard) $824.00
- [X] 2 = SPLX DEMAND DOSE (includes option 8AC standard) $852.00

ALARM PACKAGE

- [✔] 1 = alarm package (includes test/normal/silence switch, fuse, red light & horn) ..... Base

ENCLOSURE RATING

- [✔] W = NEMA 4X ..... Base

STARTING DEVICE

- [ ] 1 = 120/208/240 VAC ..... Base
- [X] 9 = 120 VAC ..... Base

PUMP FULL LOAD AMPS

- [ ] 0 = 0-7 FLA ..... Base
- [X] 1 = 7-15 FLA ..... Base
- [ ] 2 = 15-20 FLA $80.00

PUMP DISCONNECTS

- [ ] 0 = no pump disconnect ..... Base
- [X] 4 = circuit breaker
  - 120 VAC (must select starting device option 9) $35.00
  - 120/208/240 VAC (must select starting device option 1) $70.00

SWITCH APPLICATIONS

- [X] H = floats (Timed dose = timer enable and alarm / Demand dose = stop, start, and alarm) (select 17 option) ..... Base
- [ ] X = no floats
  - timed dose ..... -$50.00
  - demand dose ..... -$75.00
- [ ] C = C-Level™ sensor (must select 24 or 29 option)
  (select option 3E and/or 4A & 4D for high water alarm and/or redundant off floats)
  - timed dose ..... -$50.00
  - demand dose ..... -$75.00

Note: Pump down applications only.

Industry practices suggest that a secondary device, such as a float switch, be used for redundant activation of the high level alarm and pump shut off.

OPTIONS *Listed below*

Total Options _____

TOTAL LIST PRICE _____

	CODE	DESCRIPTION	LIST PRICE
[ ]	1J	Duo alarm inputs	$25.00
[ ]	3A	Alarm flasher	$50.00
[ ]	3B	Manual alarm reset	$90.00
[ ]	3E	High water alarm float *(must select 17 option)*	$25.00
		(Available only when Switch Applications = C)	
[X]	4A	Redundant off *(select option 4D if floats are required)*	
		Demand Dose	$55.00
		Timed Dose	$0.00
[X]	4D	Redundant off float *(must select 4A option) (must select 17 option)*	$25.00
[ ]	6A	Auxiliary alarm contacts, form C	$40.00
[✔]	8AC	Display board includes: ETM counter, events (cycles) counter, alarm counter, and override counter (timed dose only). *(Included as standard.)*	$0.00
[X]	10E	Lockable latch - NEMA 4X	$40.00
[ ]	10F	Lightning arrestor *(must select pump circuit breaker, control and alarm power combined)*	$230.00
[ ]	10K	Anti-condensation heater	$100.00
[ ]	10P	Panel Mounting Post (Factory Installed.Includes Duplex Install. Kit)(Enclosure upsized to 10"x8"x6".Max 14"x12"x6")	$110.00
[ ]	11C	NEMA 1 alarm panel *(must select option 6A)*	$80.00

	CODE	DESCRIPTION	LIST PRICE
[ ]	11D	NEMA 4X alarm panel *(must select option 6A)*	$250.00
[X]	15A	Control / Alarm circuit breaker	$85.00
[ ]	16A	10' cord in lieu of 20' *(per float)*	-$2.00
[ ]	16B	15' cord in lieu of 20' *(per float)*	-$1.00
[ ]	16C	30' cord in lieu of 20' *(per float)*	$5.00
[ ]	16D	40' cord in lieu of 20' *(per float)*	$15.00
[ ]	17C	Sensor Float® / internally weighted ▲ *(per float)*	$5.00
[ ]	17D	Sensor Float® / externally weighted ▲ *(per float)*	$7.00
[X]	17G	MilliAmpMaster™/ pipe clamp ● *(per float)*	$0.00
[ ]	17H	MilliAmpMaster™/ externally weighted ● *(per float)*	$7.00
[ ]	17J	Sensor Float® / pipe clamp ▲ *(per float)*	$0.00
[ ]	18A	Timer override float (timed dose float panel only)	$25.00
[ ]	24E	C-Level™ CL40 sensor with 4' vent tube & 20' cord.	$280.00
[ ]	24F	C-Level™ CL40 sensor with 4' vent tube & 40' cord.	$310.00
[ ]	24G	C-Level™ CL40 sensor with 8' vent tube & 20' cord.	$285.00
[ ]	24H	C-Level™ CL40 sensor with 8' vent tube & 40' cord.	$315.00
[ ]	24X	No C-Level™ CL40 sensor	$0.00
[ ]	29A	C-Level™ CL100 sensor w/10' vent tube & 20' cord.	$290.00
[ ]	29B	C-Level™ CL100 sensor w/10' vent tube & 40' cord.	$320.00
[ ]	29X	No C-Level™ CL100 sensor	$0.00

● Mechanically-activated ▲ Mercury-activated

If additional features are required, call the factory for a quote on an Engineered Custom control panel.

SAMPLE

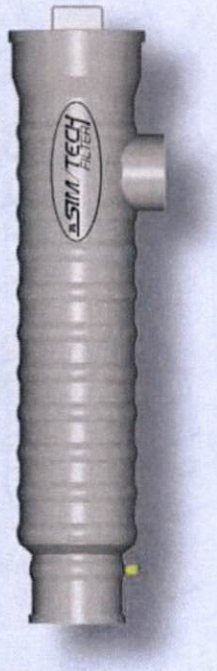
MODEL	IFS	1	1	W	9	1	4	H	8AC 10E17G
Model Type									
Alarm Package									
Enclosure Rating									
Starting Device									
Pump Full Load Amps									
Pump Disconnects									
Switch Application									
Options: Display, Lockable Latch, SJE MilliAmpMaster™/pipe clamp									

IFS1	See Price List
1	Base
W	Base
9	Base
1	Base
4	$35.00
H	Base
8AC	$0.00
10E	$40.00
17G	$0.00
TOTAL LIST PRICE	$XXX.XX

Cat Page PN 1022328L

SIM/TECH FILTER STF-100 / 100A2
series pressure filters

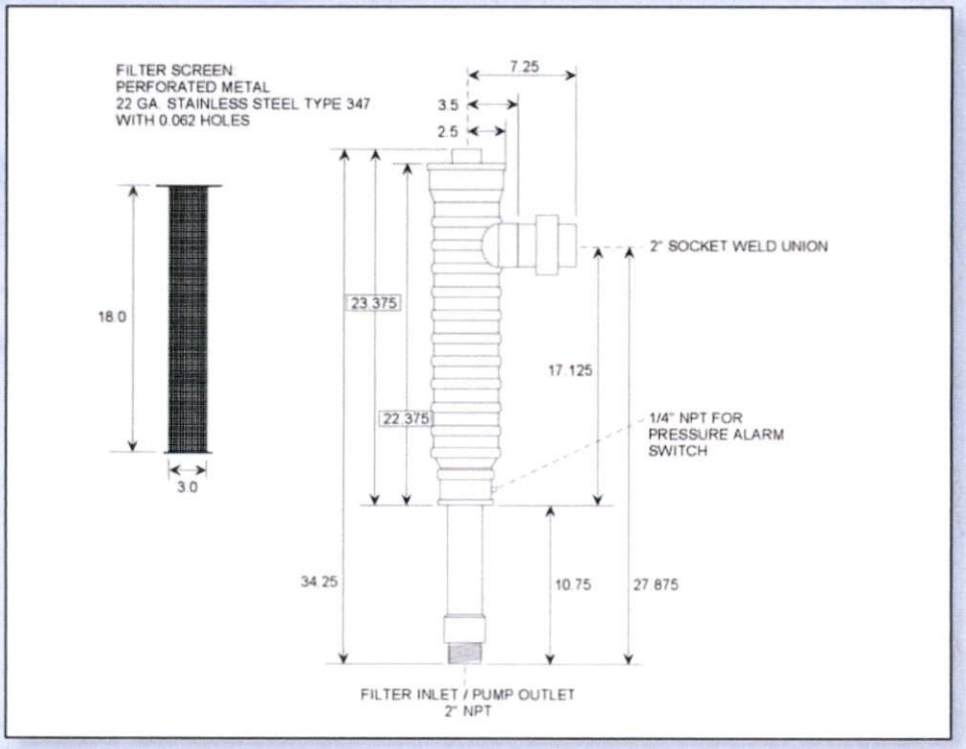
Pressure Filter for Pump Discharge



STF-100A2

FEATURES

- Low maintenance
- Easy to install and service
- Economical
- Extends life of drain field
- Improves effluent quality
- The last line of defense before the laterals
- Vortex scrubbing action helps keep filter clean providing maximum maintenance intervals
- Uses a S.S. filter screen with .062 diameter holes
- Provides a 69.52 sq. in. or 41% open area which allows the filter to pass 83.8 GPM at 1 PSI
- Assures quality effluent with lower TSS levels, keeping pressurized systems functioning at 100% efficiency
- Low head loss .5002 ft. or .21 PSI
- Flow rate with clean screen 120,672 GPD @ 1 PSI
- Flow rate with 95% plugged screen 114,912 GPD @ 1.8 PSI
- Job ready with 2" schedule 80 union and tailpiece attached (STF-100)
- Field assemble does not include union or tailpiece (STF-100A2)
- Use optional filter socks to filter smaller particles



Order part No. STF-100
STF-100A2

CAD detail drawing available in DXF format

Locate on pump discharge.

U.S. Patent # 5, 885, 452
Canada Patent # 2, 237, 751

RELATED PRODUCTS

STF-104-600M page 14
STF-104-150190M page 14
STF-104TN page 14
STF-101 page 14
STF-101A page 14
STF-107page 14
STF-102 page 14
STF-FC page 14
STF-150page 14
STF-103Bpage 14
STF-105 page 14

Design, Installation and Maintenance

of the

T & J Panel Wastewater Treatment System

A Better Quality Effluent

Environmental Health Specialists
Septic Tank Installers

Although this manual is sectioned for specific user groups, we at T & J Panel suggest you familiarize yourself with the complete manual.

11th Edition

System Design

In the early days of the T & J Panel system, when it was still considered an experimental system, the primary reason for permitting the Panel System was because of insufficient space for a conventional system. In the Sewage Regulations [10NCAC 10A.1956 (3) (a) (ii)][15ANCAC 18E .0905], the Panel System should be considered when: a quality effluent may be needed, space is limited, usable soil is limited, or there are indications that at some future time space may be needed for other development. When there is a trend for added development such as additions to homes, pools or other special landscaping development, the T & J Panel System may prevent insufficient space later. As the Environmental Health Specialist who is designing a system, and you can foresee such a trend of continued development, the Panel System may be an option the homeowner would like to utilize.

As noted in the regulations a PPBPS (Prefabricated Permeable Block Panel System) is permitted where soils are suitable, provisionally suitable, or reclassified provisionally suitable; however, only one half of the area needed for a conventional system is required. This is one reason the Panel System can help you use the best soils available on the lot. The minimum soil depth required for **horizontally installed Panel Systems is 26-inches**, whereas the minimum soil depth required for **vertically installed Panel Systems is 34-inches** (minimum depth requires 4"-6" of suitable soil cover). The system can be gravity fed, pumped to a pressure manifold and gravity fed into the lines, or pumped to Low Pressure Panel lines. Most of the concepts for a Panel System layout are the same as for a conventional system; the biggest difference being the aerial area needed and the quality of effluent being introduced into the ground.

The T & J Panel system can be installed as either gravity, pump to gravity, pump to pressure manifold, or low pressure pipe distribution system. When designing a pressure system, the principles of low pressure distribution are as described in the LPP manual. There is further discussion on pressure systems in the installer section of this manual.

Conversion

A three-bedroom house with a 0.4 gpd application rate. (The first three steps are the same as for the conventional system.)

1) 120 gallons per bedroom X 3 bedrooms = 360 gallons per day design flow rate.

2) 360 gallons' flow rate / 0.4 application rate = 900 sq. ft. of conventional trench bottom.

3) 900 sq. ft. / 3 ft. wide trench = 300 linear feet of conventional system.

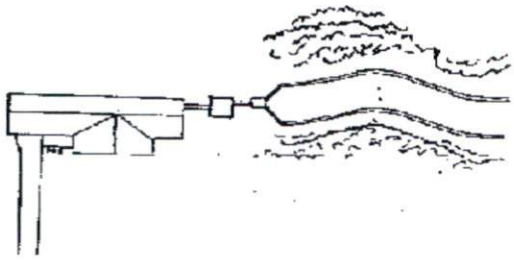
This conventional layout requires 2700 sq. ft. of area on the lot with another equal area of repair space for a total of 5400 sq. ft. of suitable usable area. To calculate the size of the T & J Panel system, the above calculations must be made with an additional fourth step as described in [10NCAC 10A .1956 (3) (a) (ii) (B)] for a PPBPS, (the T & J Panel system).

4) 300 linear feet of conventional system X 0.5 for a horizontally or vertically installed 16-inch Panel System = 150 linear feet of T & J Panel System.

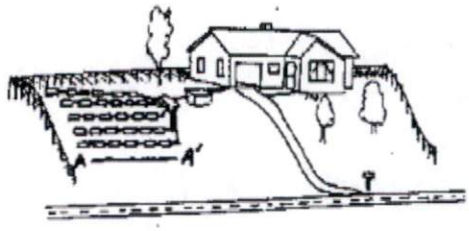
A Panel System requires only a 1200 sq. ft. area on the lot for the system with an equal area for repair, a total of 2400 sq. ft. With the Panel System, the installation and repair can go into the same area as the initial area required for a conventional gravel trench system.

Window Effect

To prevent hydraulic overload in the soil aerial space should always be a consideration for any system. However, it is especially notable with the Panel System as with any system that reduces the size of the aerial area drain field. The following is a simplistic example of this concept.



MOST DESIRABLE

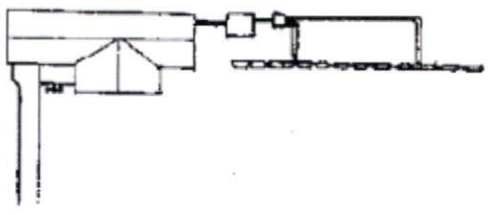


LESS DESIRABLE

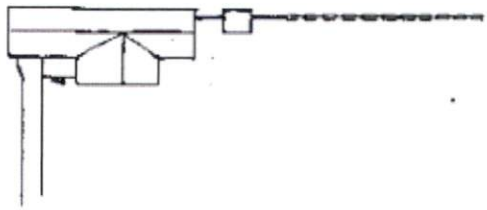
While both systems have the same linear footage of trench, the second diagram is a less desirable design. The effluent must pass through the area A-A' which can cause a strain on that area and even a failure because of hydraulic overloading.

Distribution

Another extreme would be the use of a long single trench fed from only one end. In the incorrect example, the aerial space is good and the chance of hydraulic overloading is greatly reduced. However, down line distribution in the panel line will not give optimum treatment.



CORRECT



INCORRECT

In the correct example we see that the trench has been fed from multiple points. Because the panel lines are put in as level as possible, never exceeding ¼ inch of drain line fall in 10 feet of run, they feed both ways equally. T & J Panel recommends that no gravity line exceed 50 feet unless it is fed from multiple points. In both of these examples we are specifying the Panel System, but the logic applies to the conventional system as well.

Calculating Panels per Trench

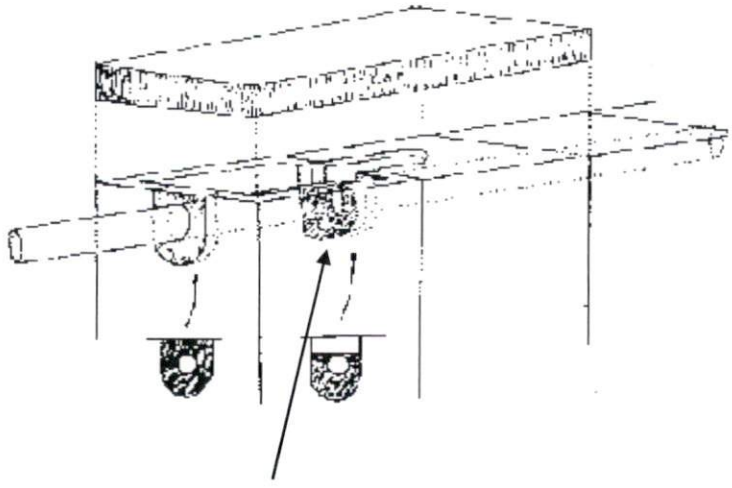
To calculate the number of panels needed for a 150-foot line, multiply 150' X 12" = 1800", then divide by 52" which is 46 inches for the panel and 6 inches for the space between the panels in the trench. 1800" / 52" = 34.6 panels; therefore, you would call for 35 panels. (A material order chart is included in the installer section of this manual.) If there is to be more than one trench, the sizing of the lines should be as equal as possible with as close to the same number of panels in each trench as is practical.

Backfill

Backfill sand shall be a clean washed medium sand that is naturally occurring and falls within the gradation of ASTM C-33 specification. This specification is one that is used in the ready mix industry and is readily available in all areas (also known as 2-S sand) The second type of sand that you will need is a clean particle sand to coat the bottom of each panel's top chamber with a bed of sand one-inch-deep (see pages 13 and 14 for Horizontal Installation). This sand is a medium grade of sand blasting sand. With traditional installation, each fifty-pound bag should cover five panels (See pages 13 and 14 for Horizontal Installation). Backfill sand calculations should be taken from the material sheet.

Foam Sealant / Tar Seals

The drawings below illustrate the outer and inner seal. Note that while the outer seal is a complete seal, the inner seal is only up to the top of the connecting pipe. This is to allow for over flow of the effluent at peak use periods into the lower air chambers. At this point the air chamber becomes an additional storage chamber for the effluent. These seals can be inspected by lifting the caps at the ends of the panels while inspecting the system installation. GE Foam Sealer is an approved alternative to tar for these seals. Care should be used not to glue the caps down with the use of GE Foam Sealer. When using GE Foam Sealer on gravity flow systems, special care should be used on the inner seals of the panel not to over fill or under fill this seal.



OUTER and INNER SEALS (This **inner** seal, if sealed off completely, will void the overflow reservoir)

Trench Preparation

Trench grade should be established so that backfill cover will be four to six inches over the tops of the panels. (Note, on severe slopes, system depth should be adjusted to protect against breakout of effluent.) In soils containing clay, the trench side walls and bottom should be raked to bring slicked over areas back as near to original structure as possible. A light dusting of lime on the sidewalls and bottom will help the system to go back to its original structure.
(At grade installation systems are required to bring in 4-6" of topsoil suited for vegetative growth)

Final Inspection

The following list of key points are things that an inspector should look for when issuing a completion permit:

1) Is the depth of the panels within guidelines?

2) Are drain lines level or less than ¼ inch fall in ten feet?

3) Have seals been properly constructed?

4) Was the proper sand used in the trench backfill?

5) If in soils where clay is present, were the sides, walls and bottom raked and limed?

(For Pumped Systems)

6) Have pump size, head pressure and dose cycle been properly sized and set?

7) Record field data on operations permit.

(Set dose cycle for 3.6 gallons per panel.)

8) Were panels installed horizontally or vertically, according to the permit?

The Panel Block System

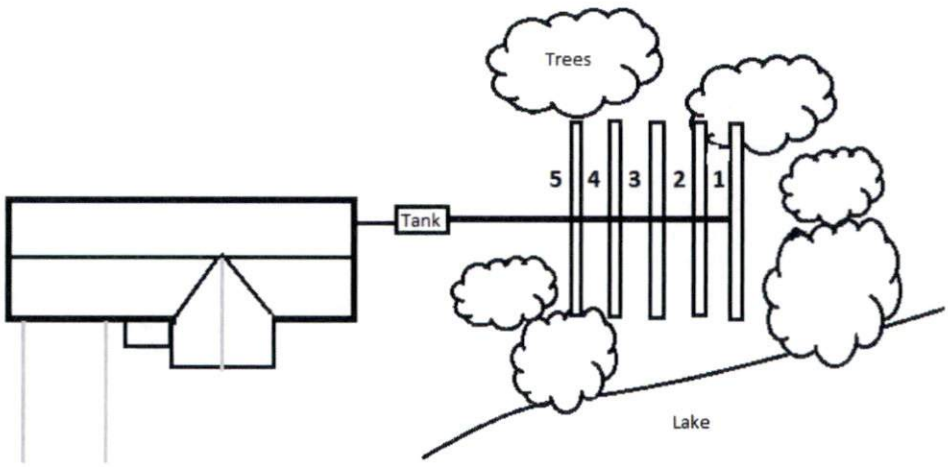
Generally, on level open land, a Panel System can be installed in about the same time as a conventional system; however, traditionally Panel Systems have been installed where space and topography have restricted use of a conventional system. For this reason, Panel System installations have required more time. Many installers enjoy the change of working with panels, not handling gravel, and the satisfaction of knowing a better quality system has been installed.

Ordering Materials

On pages 7 & 8 you will find a materials chart and an order sheet for the T & J Panel System. The distributor in your area will lead you through these sheets when ordering or pricing the system. Please be sure to let your distributor know what installation method you are utilizing, this will affect the amount of materials needed for the system. For information on the distributor located closest to you call **704-924-8600** or fax **704-924-8681**. After ordering, your panels will be shipped to the job site banded together on pallets.

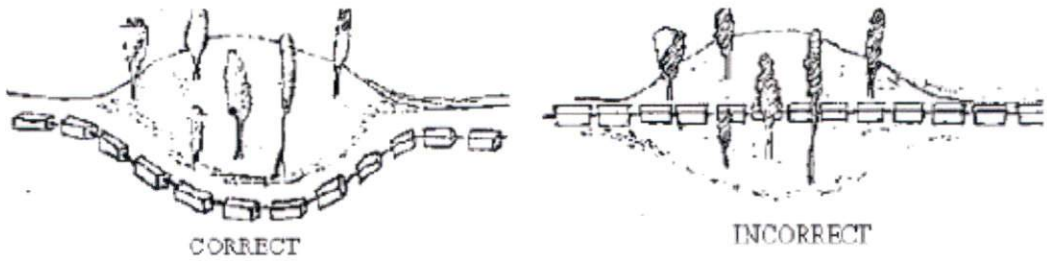
Installation Tips

Installation for multiple line systems should begin in the most confining area and be worked to the more open areas.



Above is an example of a multiple line installation. As you can see, the installation should begin with the line marked 1 and proceed to 2, 3 then 4. This procedure will greatly ease material handling and backfilling. (Note, sections of the drain lines should be left uncovered to allow for inspection of lines when area is confined and return access to lines is limited.)

On the following page are two examples of drain lines on sloping lots. The second drawing shows the drain line going through a slope making the center of the line deeper in the ground. This is not a desirable situation. The first drawing shows the drain line going around the slope keeping the trench depth and cover uniform for the entire length of the line. On slopes, care should be given to avoid cutting away valuable topsoil in an effort to make straight lines. The panel line should be installed on grade with the contour of the natural slope. Panel lines can be curved to almost any degree.



Digging the Trench for Vertical Installation

Start by shooting the grade and marking the contour. For a 16-inch vertically installed panel, add 28 inches to the shallowest or lowest grade that the trench must cross to obtain the trench bottom grade. Dig the trench at the elevation derived, checking the grade frequently. The trench should be a minimum of 2 feet wide. With the trench open, all sidewalls and bottom shall be raked to bring smeared areas back to their original structure before a light dusting of lime is applied. Place a 6-inch layer of backfill sand in the trench and level to grade, placing a 1x4 or 1x6 inch board flat on the top of the 6-inch layer of sand. Once more, check the grade of the trench by shooting the top of the board. Once the grade boards have been set, the panels may be set into the trench by hand or by using the backhoe. Each panel weights about 155 pounds and placement by hand goes quickly. The panels should be placed about 6 inches apart in the trench to obtain equal spacing. Place 10 pounds of clean particle sand (medium sand blasting sand) in the top chamber of each panel to form a bed of sand about one-inch-thick. Place half the sand in one end of the panel and the other half of sand in the other end of the panel. The effluent entering the panel will level the sand for you. GE Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings. Once the GE Foam Sealer or tar seal rope is in place, a 24-inch section of 2 inch PR160 pipe is cut to span from the upper middle top chamber of the first panel to the upper middle chamber of the next panel. The tar seal rope that is used should be of tar or butyl that is soft and pliable to obtain a watertight seal. Now that the connection and sealing is complete, a block cap is placed on each end of the panel covering all openings. (These will be delivered with the panels.) The cap block may well serve as an inspection port at some future date. The trench is ready to be backfilled to the top of the panel with the same backfill sand used in the trench bottom. With the sand to the top of the panel, trenches should be left for the sanitarian to inspect. Soil cover should be added after the final inspection. (At grade installation systems are required to bring in 4-6" of topsoil suited for vegetative growth)

Most Panel Systems are currently used due to space considerations and caution should be taken to preserve suitable soil structure and site conditions.

Materials Chart for Vertical Installation

Materials needed per panel:
- One can of GE Foam Sealer per five panels

or

- Three feet of half inch tar seal rope per panel

- Two feet of 2 inch PR160 pipe per panel, or same linear feet as line layout of pressure system of 1 ¼ inch pipe. Add pipe for tie in of lines to tank and house.

- 50 pounds of particle sand (medium sand blasting sand) per five panels

- Same linear feet of 1x4 or 1x6 as line length

- Bag of powder lime when in clay soil

Vertical Installation

Panel and C-33 Sand fill for a 2-foot-wide trench. Add 50% more for a 3-foot-wide trench.

50 LF – 12 panels
8¼ tons sand

60 LF – 14 panels
10 tons sand

70 LF – 16 panels
11½ tons sand

80 LF – 18 panels
13¼ tons sand

90 LF – 21 panels
15 tons sand

100 LF – 23 panels
16½ tons sand

110 LF – 25 panels
18¼ tons sand

120 LF – 28 panels
20 tons sand

130 LF – 30 panels
21½ tons sand

140 LF – 32 panels
23 tons sand

150 LF – 35 panels
25 tons sand

160 LF – 37 panels
26½ tons sand

170 LF – 39 panels
28 tons sand

180 LF – 42 panels
30 tons sand

190 LF – 44 panels
31½ tons sand

200 LF – 46 panels
33 tons sand

T & J Panel Material Worksheet

Homeowner_____ County_____

Address_____

_____

System Description _____

_____

_____

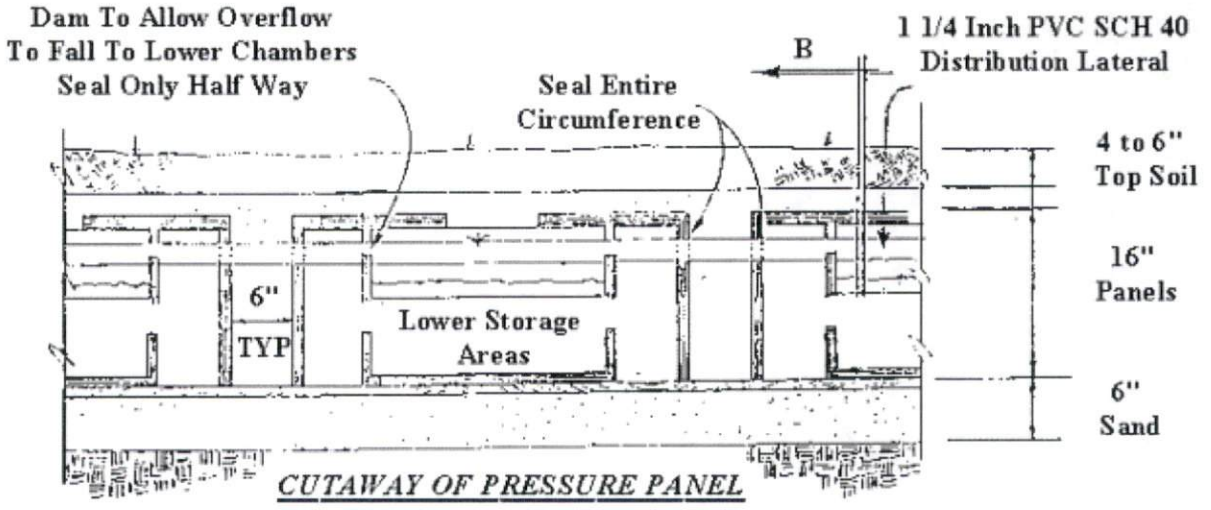
_____	T & J Panels _____Inch (caps N/C)	_____
_____	2" Pipe	_____
_____	1 ¼" Pipe	_____
_____	Fittings for Pipe	_____
_____	Tar Seal Rope (3'/ Panel)	_____
_____	GE Foam Sealer (5 Panels / can)	_____
_____	Medium Sand Blasting Sand (50 lb / 5 panels)	_____
_____	Pallets (Non-returnable)	_____
_____	Screened Creek Sand (C33)	_____
_____	1x4 or 1x6 Boards	_____
_____	Powder Lime	_____
_____	Septic Tank _____ Gallon	_____
_____	Pump Tank _____ Gallon	_____
_____	4" PVC Pipe Schedule 40	_____
_____	Distribution Box	_____
_____	Manifold _____Taps _____Size	_____
_____	Install Training	_____
_____	_____	_____
	Sub-total	_____
	Delivery Charge	_____
	Tax	_____
	Total	_____

Panels with Pressure Distribution under Vertical Installation

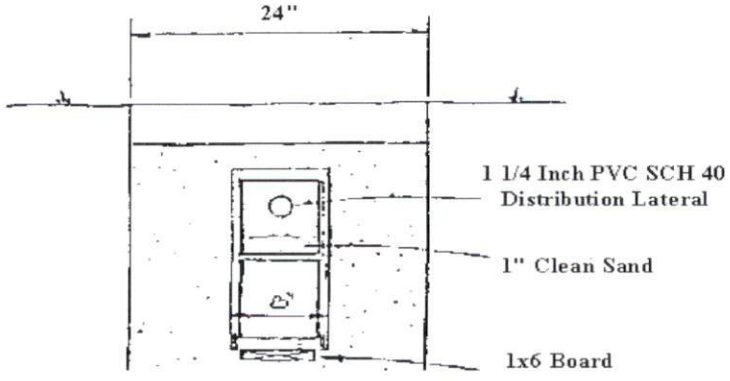
The LP Panel uses technology similar to that of Low Pressure Pipe (LPP) Systems. The tables and distribution design described in the LPP manual is applicable to the pressure Panel System. The system should be used with two to four feet of head. In many respects, a LP Panel is similar to a LPP with the holes discharging into the panels.

The dosing cycle for the Panel System is designed to pump enough effluent to fill the top chambers of all the panels in the system. The top chamber of a 16-inch panel holds 3.6 gallons. When the system has 34 panels and all holes are the same size, you would multiply 34 X 3.6 to get 122 gallons per dose cycle. The holes are drilled in the distribution pipe at the 10 and the 2 o'clock position. These are then placed so that the effluent is pumped into the top chamber of the panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

All valves and turn-ups should be neatly capped, covered and labeled for future service. Pump tanks should be constructed as shown in the drawing on page 12 to allow for service and repairs.



CUTAWAY OF PRESSURE PANEL



Flow Chart of Various Orifices and Pressure Heads

FLOW CHART OF VARIOUS ORIFICES AND HEAD PRESSURES

Head	Orifice Size									
Pressure	3/32"	1/8"	**5/32"**	**3/16"**	7/32"	1/4"	9/32"	5/16"	11/32"	3/8"
ft.	.094"	.125"	**.156"**	**.188"**	.219"	.250"	.281"	.313"	.344"	.375"
2.0	.15	.26	**.41**	**.59**	.80	1.04	1.32	1.63	1.97	2.34
2.1	.15	.27	**.42**	**.60**	.82	1.07	1.35	1.67	2.02	2.40
2.2	.15	.27	**.43**	**.61**	.84	1.09	1.38	1.71	2.07	2.46
2.3	.16	.28	**.44**	**.63**	.86	1.12	1.41	1.75	2.11	2.51
2.4	.16	.29	**.46**	**.64**	.87	1.14	1.44	1.78	2.16	2.57
2.5	.16	.29	**.46**	**.66**	.89	1.17	1.47	1.82	2.20	2.62
2.6	.17	.30	**.46**	**.67**	.91	1.19	1.5	1.86	2.25	2.67
2.7	.17	.30	**.47**	**.68**	.93	1.21	1.53	1.89	2.29	2.72
2.8	.17	.31	**.48**	**.69**	.94	1.23	1.56	1.93	2.33	2.77
2.9	.18	.31	**.49**	**.71**	.96	1.25	1.59	1.96	2.37	2.82
3.0	.18	.32	**.50**	**.72**	.98	1.28	1.62	1.99	2.41	2.87
3.1	.18	.32	**.51**	**.73**	.99	1.3	1.64	2.03	2.45	2.92
3.2	.19	.33	**.51**	**.74**	1.01	1.32	1.67	2.06	2.49	2.97
3.3	.19	.33	**.52**	**.75**	1.02	1.34	1.69	2.09	2.53	3.01
3.4	.19	.34	**.53**	**.76**	1.04	1.36	1.72	2.12	2.57	3.06
3.5	.19	.34	**.54**	**.78**	1.06	1.38	1.74	2.15	2.61	3.10
3.6	.20	.35	**.55**	**.79**	1.07	1.40	1.77	2.18	2.64	3.15
3.7	.20	.35	**.55**	**.80**	1.09	1.42	1.79	2.21	2.68	3.19
3.8	.20	.36	**.56**	**.81**	1.10	1.44	1.82	2.24	2.72	3.23
3.9	.20	.36	**.57**	**.82**	1.11	1.46	1.84	2.27	2.75	3.27
4.0	.21	.37	**.58**	**.83**	1.13	1.47	1.87	2.30	2.79	3.32

GPM

Here you will find a pressure head table to help in flow design of your LP Panel system. These numbers are a guide to help you in selecting the right flow for your system. We have found that in most systems the 5/32" and 3/16" hole at 2 to 4 feet of head pressure works the best in giving a pump cycle of more than 5 minutes and keeps the same maximum top chamber flow load as sited on the previous page.

PRESSURE MANIFOLD TAP FLOW

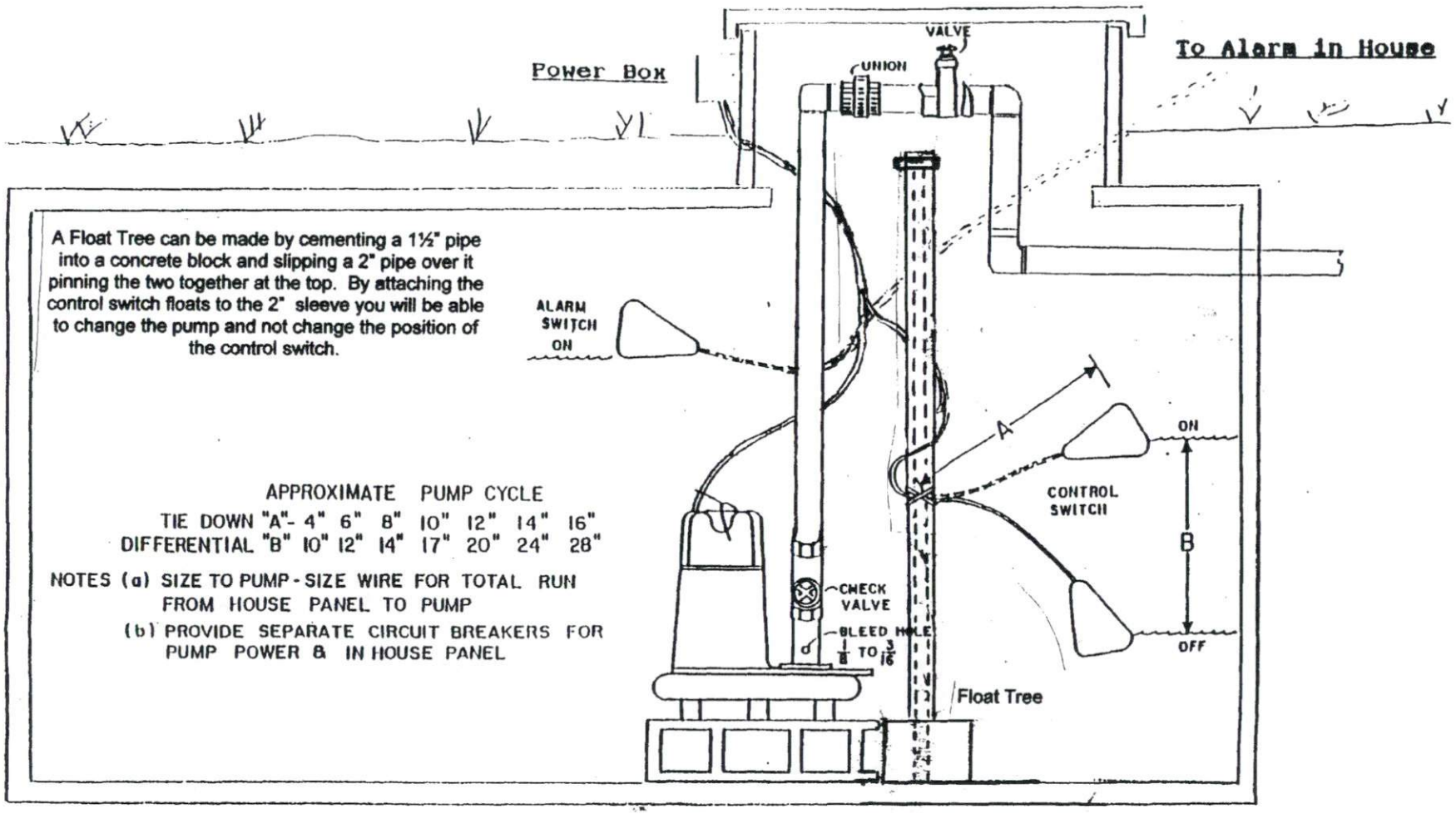
Head	SCH 40		Tap Diameter	SCH 80	
Pressure	1/2"	3/4"		1/2"	3/4"
ft.	0.622	0.824		0.546	0.742
2.0	7.11	12.50		5.48	10.10
2.1	7.29	12.80		5.62	10.40
2.2	7.46	13.10		5.75	10.60
2.3	7.63	13.40		5.88	10.90
2.4	7.79	13.70		6.00	11.10
2.5	7.95	14.00		6.13	11.30
2.6	8.11	14.20		6.25	11.50
2.7	8.26	14.50		6.37	11.80
2.8	8.62	14.80	Gallons	6.48	12.00
2.9	8.36	15.00	per minute	6.60	12.20
3.0	8.71	15.30		6.71	12.40
3.1	8.86	15.50		6.82	12.60
3.2	9.00	15.80		6.93	12.80
3.3	9.14	16.00		7.04	13.00
3.4	9.27	16.30		7.15	13.20
3.5	9.41	16.50		7.25	13.40
3.6	9.54	16.70		7.35	13.60
3.7	9.67	17.00		7.45	13.80
3.8	9.80	17.20		7.55	14.00
3.9	9.93	17.40		7.65	14.10
4.0	10.10	17.70		7.75	14.30

This chart will assist you in determining the proper tap sizes when you have to pump to a pressure manifold in a gravity system.

Pump Sizing

Below is a chart to aid in head selection due to friction loss in PVC pipe. In calculating friction, be sure to add 20% for loss in fittings. In the chart below, friction loss is per 100 feet of pipe. The head created by friction loss is added to the elevation head of lift from the bottom of the pump tank to the top of the highest turn-up.

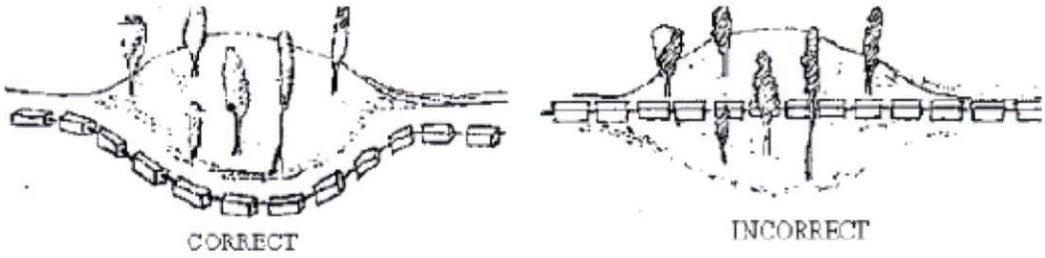
Flow GPM	Pipe Diameter					
	1"	1 1/4"	1 1/2"	2"	3"	4"
	Friction Loss (100ft)					
1	.07					
2	.28	.07				
3	.60	.16	.07			
4	1.01	.25	.12			
5	1.52	.39	.18			
6	2.14	.55	.25	.07		
7	2.89	.76	.36	.10		
8	3.63	.97	.46	.14		
9	4.57	1.21	.58	.17		
10	5.5	1.46	.70	.21		
11		1.77	.84	.25		
12		2.09	1.01	.30	.07	
13		2.42	1.17	.35	.08	
14		2.74	1.33	.39	.09	
15		3.06	1.45	.44	.10	
16		3.49	1.65	.50	.11	
17		3.93	1.86	.56	.12	
18		4.37	2.07	.62	.16	
19		4.81	2.28	.68	.23	
20		5.23	2.46	.74	.30	
25			3.75	1.10	.39	
30			5.22	1.54	.48	
35				2.05	.58	.07
40				2.62	.81	.09
45				3.27	1.08	.12
50				3.98	1.38	.16
60					1.73	.21
70					2.09	.28
80						.37
90						.46
100						.55


Power Box
To Alarm in House
VALVE
UNION
A Float Tree can be made by cementing a 1½" pipe into a concrete block and slipping a 2" pipe over it pinning the two together at the top. By attaching the control switch floats to the 2" sleeve you will be able to change the pump and not change the position of the control switch.
ALARM SWITCH ON
A
ON
CONTROL SWITCH
B
OFF
CHECK VALVE
BLEED HOLE
1/8 TO 3/16
Float Tree
APPROXIMATE PUMP CYCLE
TIE DOWN "A"- 4" 6" 8" 10" 12" 14" 16"
DIFFERENTIAL "B" 10" 12" 14" 17" 20" 24" 28"
NOTES (a) SIZE TO PUMP - SIZE WIRE FOR TOTAL RUN FROM HOUSE PANEL TO PUMP
(b) PROVIDE SEPARATE CIRCUIT BREAKERS FOR PUMP POWER & IN HOUSE PANEL

Shallow Soils Solution

***** Please Let Your Distributor Know If You Plan To Use Horizontal Installation*****

(This can change the amount of materials needed to complete your job)



Digging the Trench for Horizontal Installation

Start by shooting the grade and marking the contour. For a 16-inch panel, shallow application, add **20 inches** to the shallowest or lowest grade that the trench must cross to obtain the trench bottom grade. Dig the trench at the elevation derived, checking the grade frequently. The trench should be a minimum of **3-foot-wide** (9 feet on center). With the trench open, all sidewalls and bottom shall be raked to bring smeared areas back to their original structure before a light dusting of lime is applied. Place a **6-inch** layer of backfill sand in the trench and level to grade, then place a **1x6** inch board flat on the top of the 6-inch layer of sand. Once more check the grade of the trench by shooting the top of the board. Once the grade boards have been set, the panels may be set into the trench by hand or by using the backhoe. Each panel weighs about 155 pounds and placement by hand goes quickly. The panels should be placed about 6 inches apart in the trench to obtain equal spacing. Place 10 pounds of clean particle sand (medium sand blasting sand) in **each chamber** of each panel to form a bed of sand about one-inch thick. Place half the sand in one end of the panel and the other half of sand in the other end of the panel. The effluent entering the panel will level the sand for you. GE Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings. Once the GE Foam Sealer or tar seal rope is in place, a 24-inch section of 2 inch PR160 pipe is cut to span from inside of the two chambers to the next two chambers of the following panel. If tar seal rope is used, it should be of tar or butyl that is soft and pliable to obtain a watertight seal. Once the connection and sealing are complete, a block cap is placed on each end of the panel covering all openings. (These will be delivered with the panels.) The cap block may well serve as an inspection port at some future date. The trench is then ready to be backfilled to the top of the panel with the same backfill sand used in the trench bottom. With the sand to the top of the panel, trenches should be left for the sanitarian to inspect. **Soil cover should be added after the final inspection**. (At grade installation systems are required to bring in 4-6" of topsoil; suited for vegetative growth)

Most Panel Systems are currently used due to space considerations and caution should be taken to preserve suitable soil structure and site conditions.

***** Please Let Your Distributor Know If You Plan To Use Horizontal Installation*****

(This can change the amount of materials needed to complete your job)

Materials Chart for Horizontal Installation

Materials needed per panel:

- **Five feet** of half inch tar seal rope per panel

- **Two cans** of GE Foam Sealer per five panels

- **Two pieces of two feet long 2-inch PR160 pipe** per panel, or two times the linear feet of line layout of pressure system of 1 ¼ inch pipe. Add pipe for tie in of lines to tank and house.

- **100 pounds** of particle sand (medium sand blasting sand) per five panels

- Same linear feet of **1x6** as line length

- Bag of powder lime when in clay soil

Horizontal Installation

Panel and C-33 Sand fill for a **36-inch wide trench**.

50 LF – 12 panels 8¼ tons sand	130 LF – 30 panels 21½ tons sand
60 LF – 14 panels 10 tons sand	140 LF – 32 panels 23 tons sand
70 LF – 16 panels 11½ tons sand	150 LF – 35 panels 25 tons sand
80 LF – 18 panels 13¼ tons sand	160 LF – 37 panels 26½ tons sand
90 LF – 21 panels 15 tons sand	170 LF – 39 panels 28 tons sand
100 LF – 23 panels 16½ tons sand	180 LF – 42 panels 30 tons sand
110 LF – 25 panels 18¼ tons sand	190 LF – 44 panels 31½ tons sand
120 LF – 28 panels 20 tons sand	200 LF – 46 panels 33 tons sand

Panels with Pressure Distribution under Horizontal Installation

The LP Panel uses technology similar to that of Low Pressure Pipe (LPP) Systems. The tables and distribution design described in the LPP manual is applicable to the pressure Panel System. The system should be used with two to four feet of head. In many respects, a LP Panel is similar to a LPP with the holes discharging into the panels.

The dosing cycle for the Panel System is designed to pump enough effluent to fill half of both chambers in all the panels in the system. Each chamber of a 16-inch panel holds 3.6 gallons. When the system has 34 panels and all holes are the same size, you would multiply 34 X 3.6 to get 122 gallons per dose cycle. The holes are drilled in the distribution pipe at the 10 and the 2 o'clock position alternating chambers in each panel. For example, you dose the first panel in the left chamber at 2 o'clock, the second panel will have the hole drilled at 10 o'clock in the right chamber, alternating back and forth going down the line. This prevents one side of the trench from being overloaded by effluent. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

All valves and turn-ups should be neatly capped, covered and labeled for future service. Pump tanks should be constructed as shown in the drawing on page 12 to allow for service and repairs.

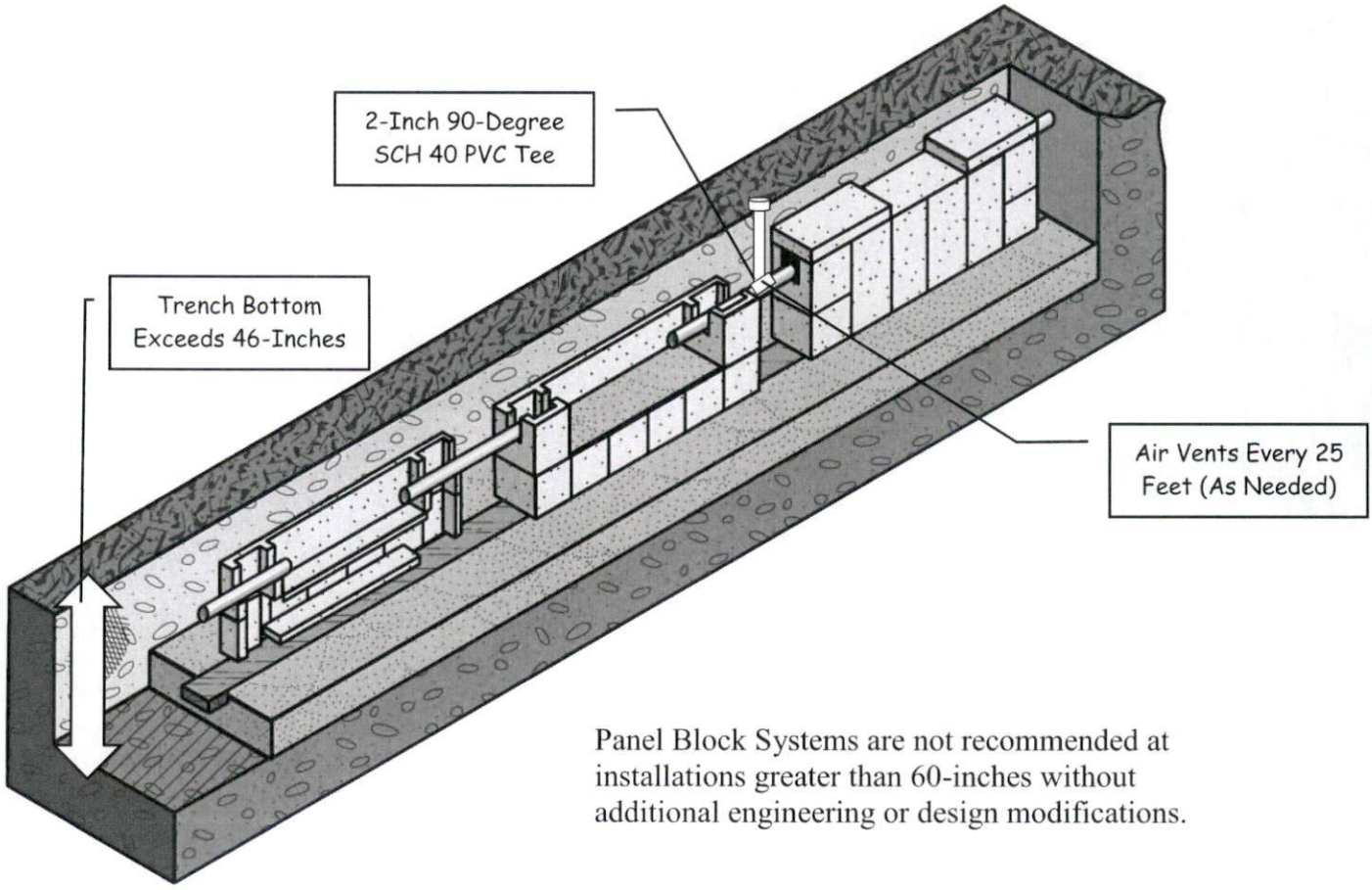
Please feel free to contact a member of T & J Panel with any design, installation or maintenance questions of an LP Panel system.

Flow Chart of Various Orifices and Pressure Heads refer to page 10
Pump Sizing refer to page 11

Deep Installation of Panel Block Systems

Utilize these specifications for ventilation when Trench Bottom *exceeds* 46-inches

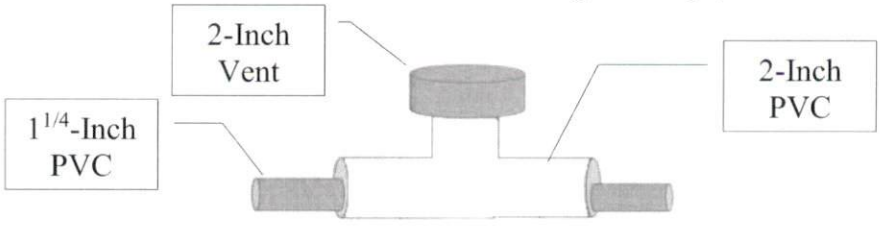
In certain situations, there are more desirable soil conditions deeper in the soil profile. On these sites, Panel Systems can still be utilized, with proper ventilation to the system. Air vents are used with Panel Systems to allow the chambers within the Panel to receive the air needed for treatment.



Panel Block Systems are not recommended at installations greater than 60-inches without additional engineering or design modifications.

Gravity Flow Installation: Cut the 24-inch long, 2-inch PVC pipe in half, then reconnect with a 2-inch 90-Degree SCH 40 Tee. Extend the 2-inch Tee up to ground surface to allow ventilation. Recommend utilizing vent caps, studor vents, or turndowns if needed.

LP Panel Installation (Low Pressure Pipe): Insert your $1^{1/4}$-Inch into a 2-inch PVC "sleeve" that spans from one chamber of a panel to the next. Connect a 2-inch 90-Degree SCH 40 Tee to this "sleeve" halfway between one panel and the next. Extend the 2-inch Tee up to ground surface to allow ventilation. Recommend utilizing vent caps, studor vents, or turndowns if needed.



T & J Panel
Wastewater Treatment System
Patent # 4013559

269 Marble Road
Statesville, NC 28625

Office: **704-924-8600** Fax: **704-924-8681**

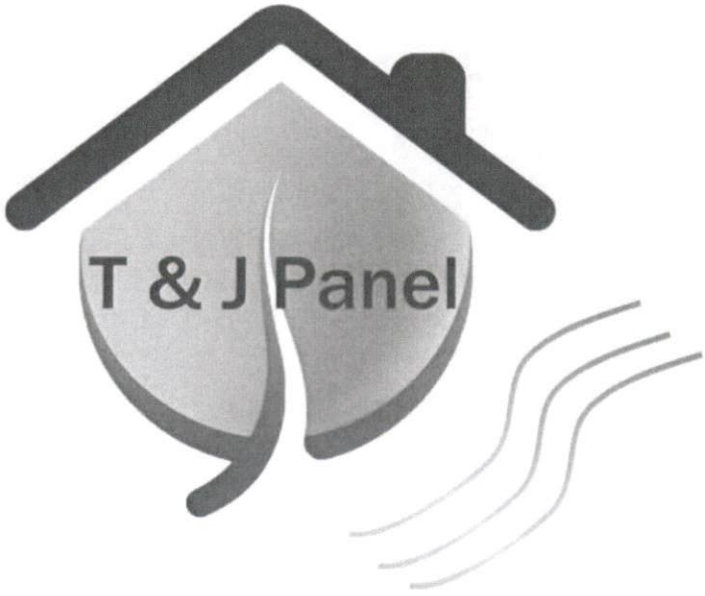
On the web at**: www.tjpanel.com**
Or **www.tjpanelsystem.com**

Office Contacts (Design, Installation, and Maintenance Questions)

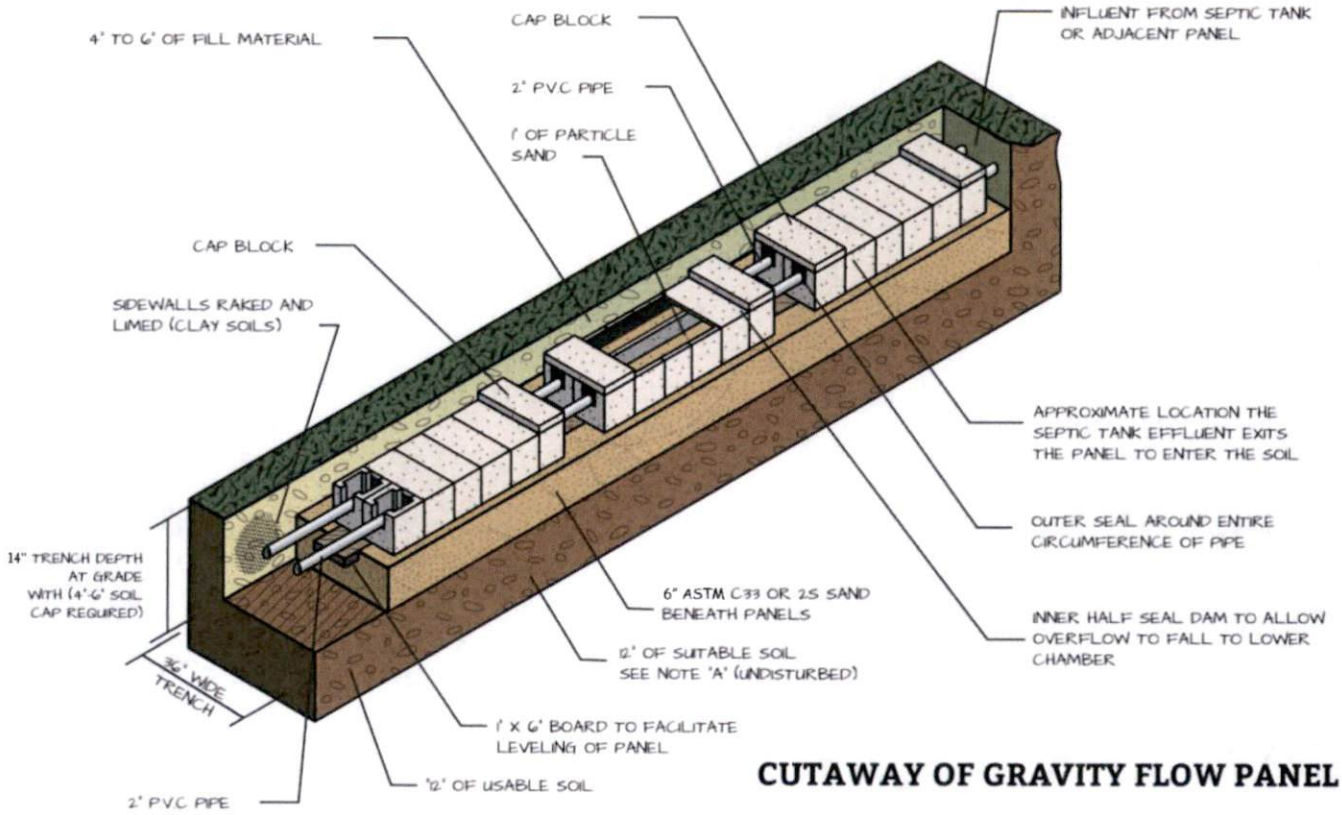
Brad Johnson 704-880-7697
Brad@tjpanel.com

Logan Settle 704-437-6073
Logan@tjpanel.com

Office 704-924-8600
Info@tjpanel.com

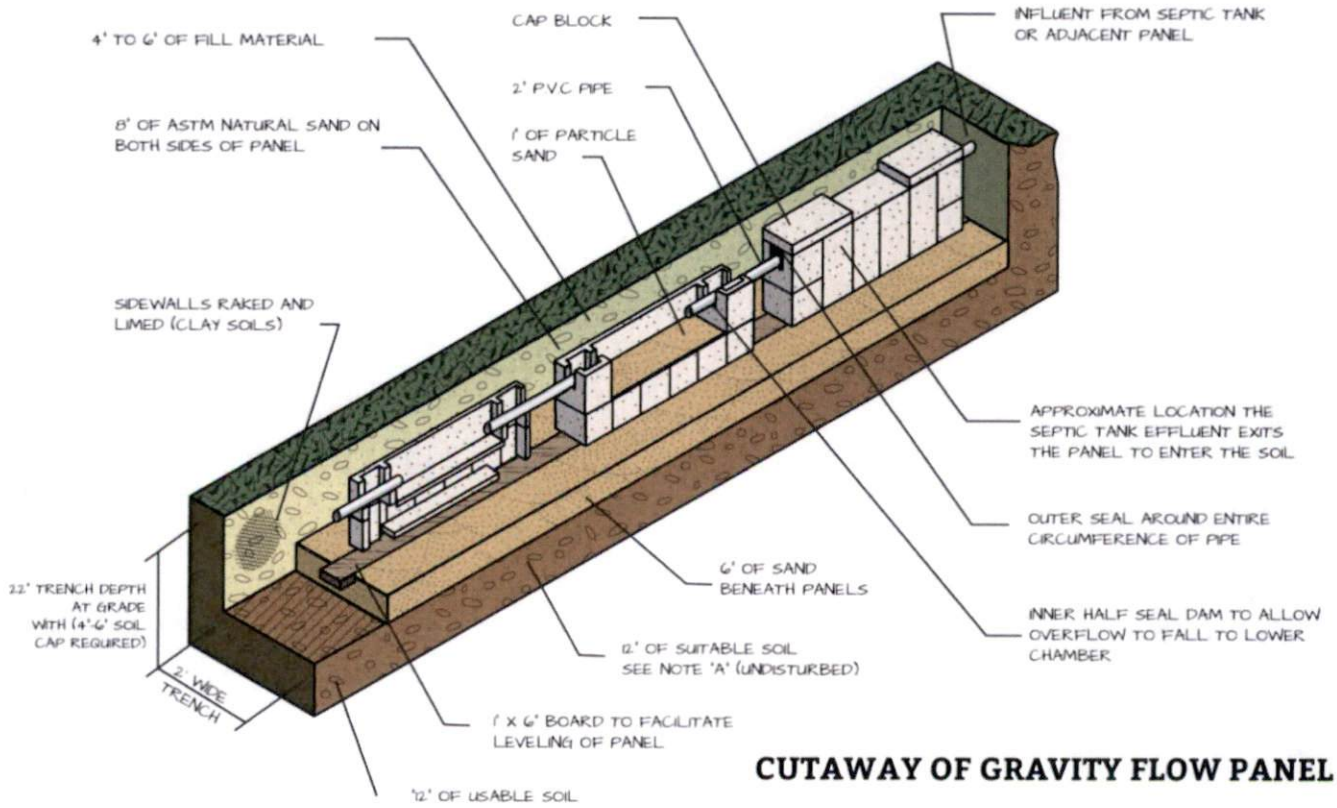


Isometric Drawing of a Segment of T & J Panel Horizontal Installation



CUTAWAY OF GRAVITY FLOW PANEL

Isometric Drawing of a Segment of T & J Panel Vertical Installation



CUTAWAY OF GRAVITY FLOW PANEL