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Arvada, CO 80004
303.908.7823

February 6, 2019

Project No. 527E

John Hotchkiss
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Soils Investigation and Onsite Wastewater Treatment System Design
Hotchkiss Office Building
2290 Old Ranch Road
Colorado Springs, El Paso County, Colorado

Mr. Hotchkiss,

ALL SERVICE septic, LLC performed a soils investigation and completed an onsite wastewater treatment system (OWTS) design for the subject office building. The property is located in Colorado Springs, Colorado in an area where OWTSs are necessary. The Property is served by an onsite water well.

SITE CONDITIONS

An office building with an estimated 25 to 35 full-time employees is proposed for the property. There is a building proposed and a building existing. The existing building will have a bathroom only. The vegetation in the soil treatment area (STA) is native grasses, with no trees. The STA area will not be used as a drive. The slope at the proposed STA is approximately 1% to the southeast. It should be noted that Kettle Creek runs to the east of the property and the STA must be constructed a minimum 50 feet away.

LAND USE – No land use changes will affect the performance of the OWTS. This includes drainages, vegetation, and proximity to any existing water wells. The proposed current land use for the STA will be seeded grasses with no additional landscaping. There is no planned construction on the STA after installation.

SUBSURFACE

The subsurface was investigated on January 16, 2019 by digging two soil profile test pit excavations (Test Pits). A visual and tactile analysis of the soils were performed at approximately 3 -feet below grade.

The materials encountered in the Test Pit #1 consisted of 6 inches of topsoil overlying greenish-brown, blocky, weak, sandy clay loam 4 feet, underlain by brown, medium to coarse- grained, granular sand to 9.0 feet, the maximum depth explored. No groundwater was encountered.

The materials encountered in the Test Pit #2 consisted of 6 inches of topsoil overlying greenish-brown, blocky, weak, sandy clay loam to 8.0 feet, the maximum depth explored. No groundwater was encountered.

A long term acceptance rate (LTAR) of 0.30 gallons per square foot, will be used to design the OWTS, in accordance with Soil Type 3A outlined in the El Paso County On-Site Wastewater Treatment System Regulations.

DESIGN SPECIFICATIONS

While the initial plan for the office building is to house 25 full-time employees, the OWTS design is based on 35 full-time employees and 525 gallons per day (gpd) to allow for future growth.

25 to 35 daily full-time office employees at 15 gpd or 525 GPD will be designed.

525 / LTAR .3 = 1,750 SF (TL1 treatment) Soils Type 3A
Pressurized Trenches with Chambers = 1,750 SF * 0.8 = 1,400 SF * 0.7 = 980 SF

Proposed 85 chambers in 5 trenches = 1,020 SF. Chambers placed on native scarified soils at 2 feet below grade. An automatic distribution valve will serve (6405) the five trenches of gravelless chambers.

A 1,500-gallon (MIN), two-compartment septic tank, with risers and lids to grade, followed by a 500 pump tank, with risers and lids to grade must be installed. An Automatic Distribution Valve (6405) will be used to switch between the five trenches. A high head Orenco pump should be installed to serve the valves and STA. The tanks must be approximately 1 foot below grade with a maximum of 3 feet. Pump must serve 16.4 GPM and 15.4 TDH. The tank and the STA should be not constructed in the driveway.

Float Settings:

On / Off Floats must have 12" separation. The high water level alarm float should be 3" above top 'on' float. This setting will deliver a dose of approximately 90 gallons.

Pump calculations are attached. Effluent will be dosed to the STA through a 2" discharge pipe, to drain after each dose, and serve the distribution valve, and 1.5" diam suspended laterals. The laterals must have 5/32" holes on 3.0 foot centers facing up, with two holes down for drainage. Each lateral must end in a 90 degree elbow facing up with a ball valve for flushing in a valve box, accessible from grade. An observation port is required at each corner of EACH bed.

An S1 Orenco Control Panel with audible and visual alarm, elapsed time meter, and dose counter must accompany the specified P Series Orenco pump. A pump curve is attached.

A sewage ejector pumping system must be installed to direct sewage from the existing building to the septic tank. A 30" diameter pump basin and 2" diam solids handling sewage pumping system is proposed. Pumping curve attached. The pump must be capable of 10.0 GPM and 10.4 feet of total Dynamic Head. The sewage should be directed into the first compartment of the septic tank.

The component manufacturers are typical of applications used by contractors and engineers in this area. Alternatives may be considered or recommended by contacting our office. Construction must be to County Land Use Regulations, and On-Site Wastewater Treatment System Regulations, the OWTS Permit provided by the County, and this design.

REVEGETATION REQUIREMENTS

An adequate layer of good quality topsoil capable of supporting revegetation shall be placed over the entire disturbed area of the OWTS installation. A mixture of native grass seed that has good soil stabilizing characteristics (but without taproots), provides a maximum transpiration rate, and competes well with successional species. No trees or shrubs, or any vegetation requiring regular irrigation shall be placed over the STA. Until vegetation is reestablished, erosion and sediment control measures shall be implemented and maintained on site. The owner of the OWTS shall be responsible for maintaining proper vegetation cover.

OPERATION INFORMATION AND MAINTENANCE

The property owner shall be responsible for the operation and maintenance of each OWTS servicing the property. The property owner is responsible for maintaining service contracts for manufactured units, alternating STAs, and any other components needing maintenance.

Geo-fabrics or plastics should not be used over the absorption area. No heavy equipment, machinery, or materials should be placed on backfilled STAs. Livestock should not graze on the STA. Plumbing fixtures should be checked to ensure that no additional water is being discharged to OWTS. For example, a running toilet or leaky faucet can discharge hundreds of gallons of water a day and harm a STA.

The homeowner should pump the septic tank every two years, or as needed gauged by measurement of solids in the tank. Garbage disposal use should be minimized, and non-biodegradable materials should not be placed into the OWTS. Grease should not be placed in household drains. Loading from a water softener should not be discharged into the OWTS. No hazardous wastes should be directed into the OWTS. Mechanical room drains should not discharge into the OWTS. The OWTS is engineered for domestic waste only.

ADDITIONAL CONSTRUCTION NOTES

If design includes a pump, air release valves and weep holes must be installed to allow pump lines to drain to minimize risk of freezing. The pump shall have an audible and visual alarm notification in the event of excessively high water conditions and shall be connected to a control breaker separate from the high water alarm breaker and from any other control system circuits. The pump system shall have a switch so the pump can be manually operated. If bedrock is encountered our office should be contacted.

Excavation equipment must not drive in excavation of the STA due to the potential to compact soil. Extensions should be placed on all septic tank components to allow access to them from existing grade. Backfill over the STA must be uniform and granular with no material greater than minus 3-inch.

INSTALLATION OBSERVATIONS

ALL SERVICE septic, LLC must view the OWTS during construction. The OWTS observation should be performed before backfill, after placement of OWTS components. Septic tanks, distribution devices, pumps, dosing siphons, and other plumbing, as applicable, must also be observed. ALL SERVICE septic, LLC should be notified 48 hours in advance to observe the installation.

LIMITS:

The design is based on information submitted. If soil conditions encountered are different from conditions described in report, ALL SERVICE septic, LLC should be notified. All OWTS construction must be according to the county regulations. Requirements not specified in this report must follow applicable county regulations. The contractor should have documented and demonstrated knowledge of the requirements and regulations of the county in which they are working. Licensing of Systems Contractors may be required by county regulation.

ALL SERVICE septic, LLC



Timothy R. Petz

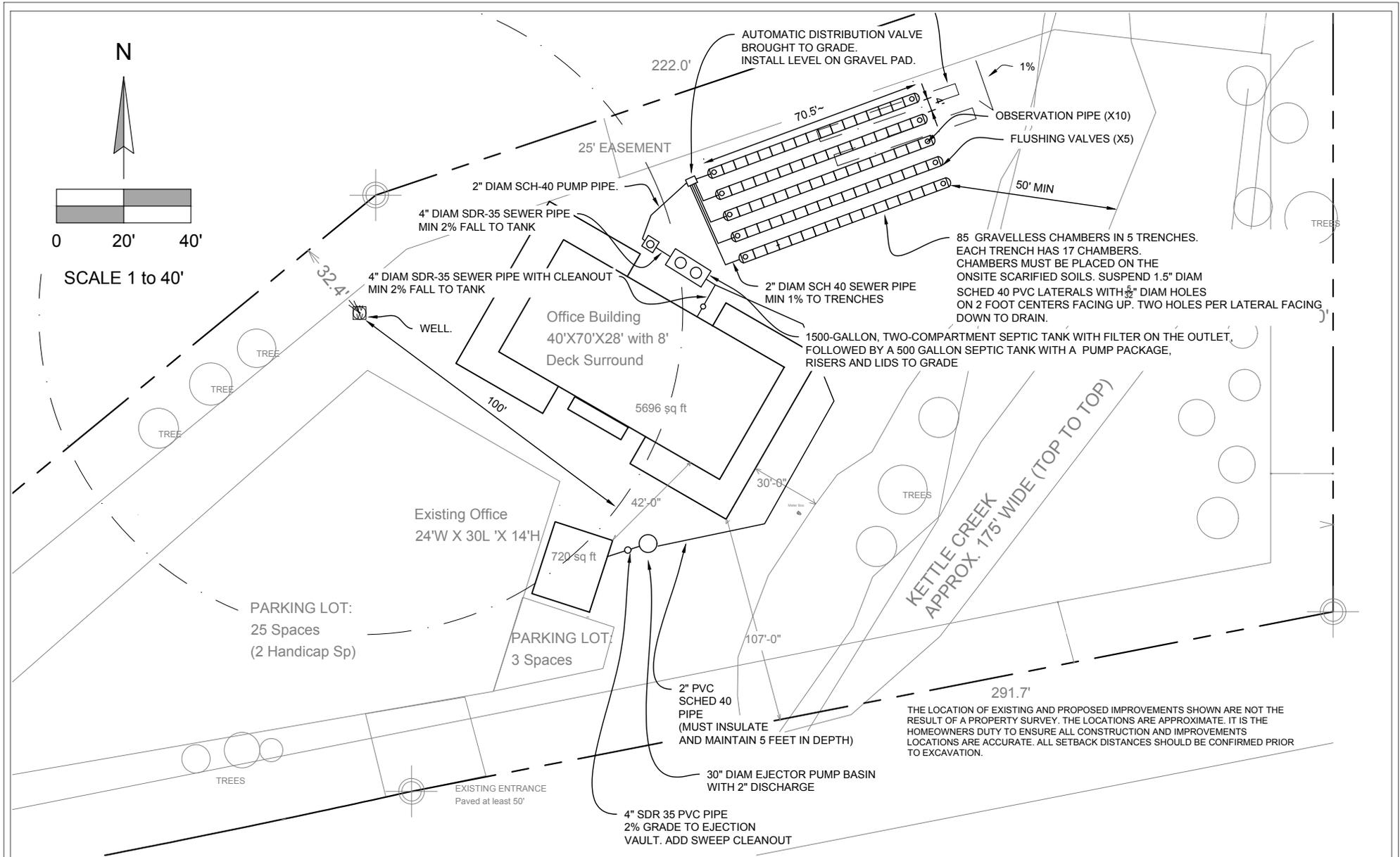
Reviewed By:



Richard H. Petz, PE



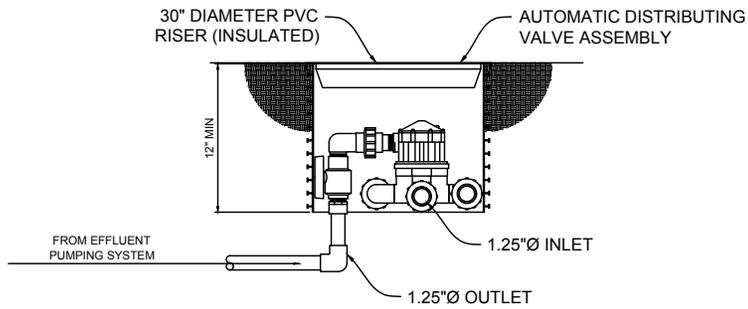
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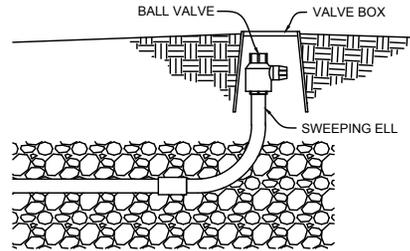
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 Phone: 303.908.7823

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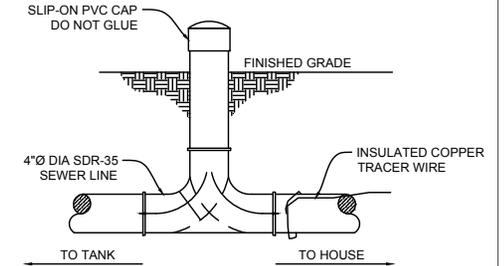
W1
 1 of 5



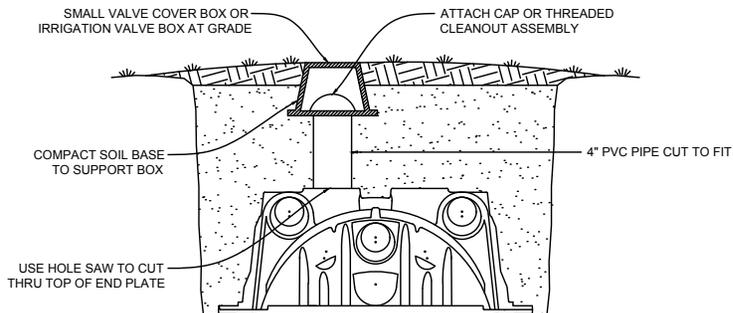
3 AUTOMATIC DISTRIBUTION VALVE
NTS



1 FLUSHING VALVE
NTS

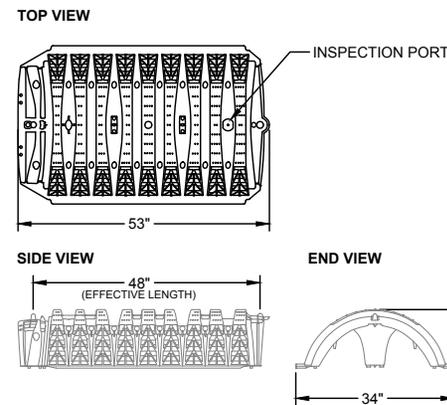


1 CLEANOUT DETAIL
NTS

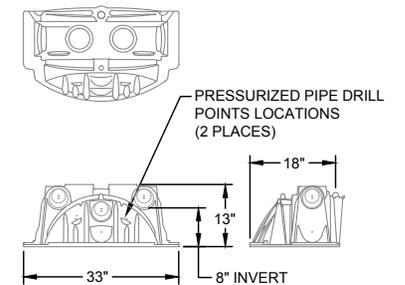


2 CHAMBER DETAILS W/ COVER BOX
NTS

**INFILTRATOR WATER TECHNOLOGIES
QUICK4 PLUS STANDARD CHAMBER
PRODUCT SPECIFICATION
(NOT TO SCALE)**



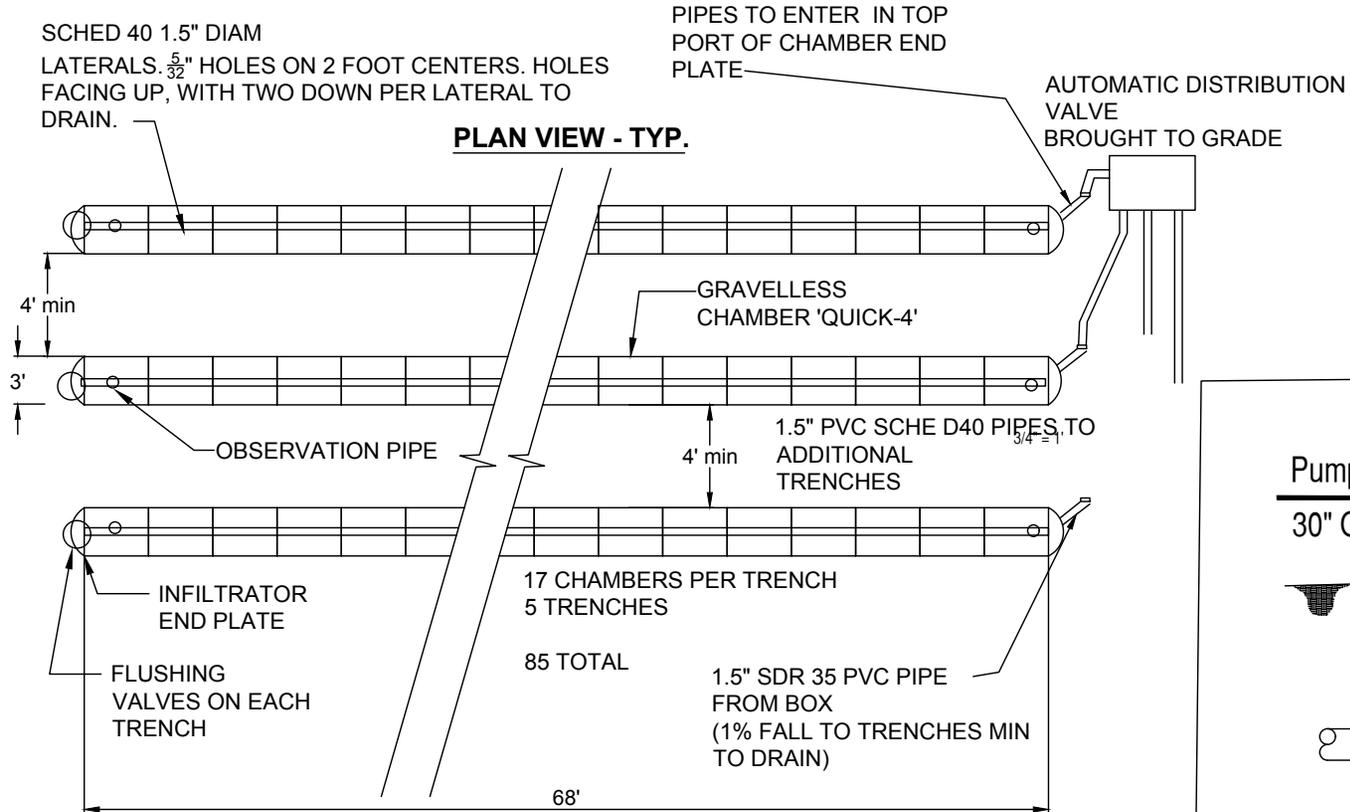
QUICK4 PLUS ALL-IN-ONE 12 END CAP



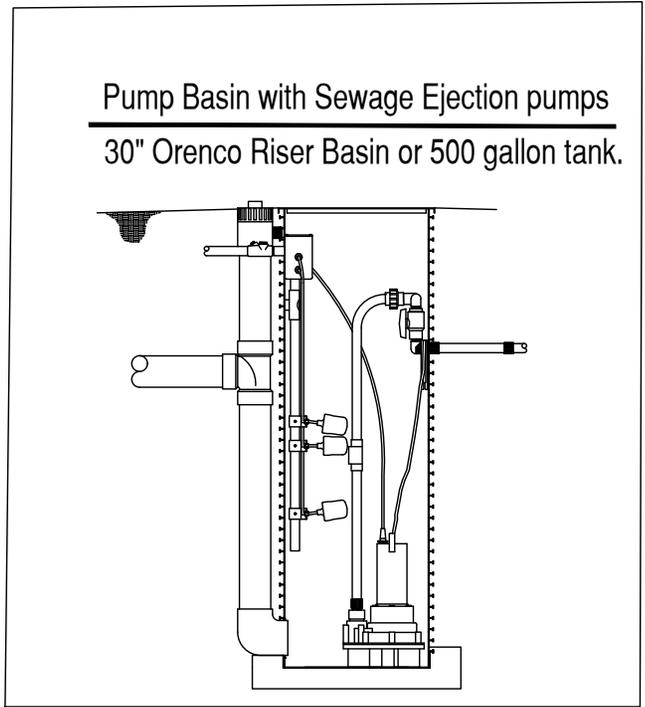
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CHAMBER TRENCHES WITH DISTRIBUTION VALVES
NTS



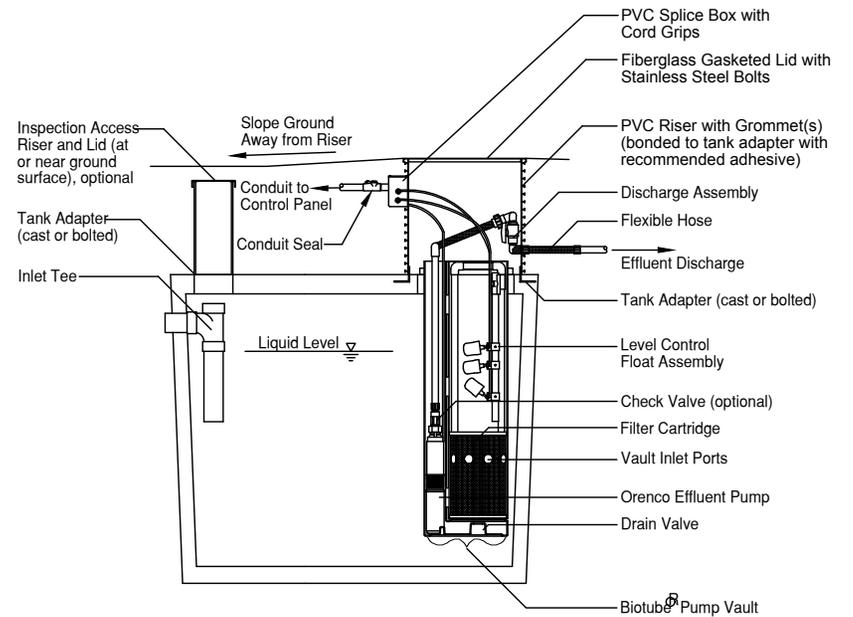
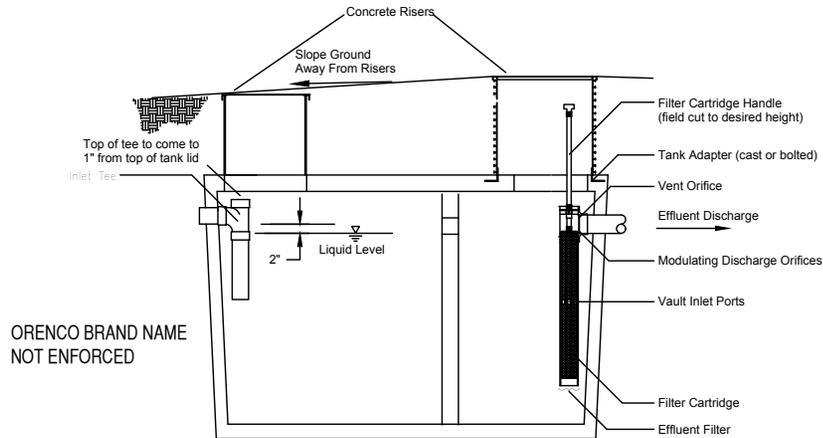
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1500-GAL Septic Tank with the Addition of an Effluent Filter - 2-Comp.

Poly IM Tanks / FLXX / Valley Precast Acceptable



EFFLUENT PUMPING SYSTEM - 500 GALLON PUMP TANK

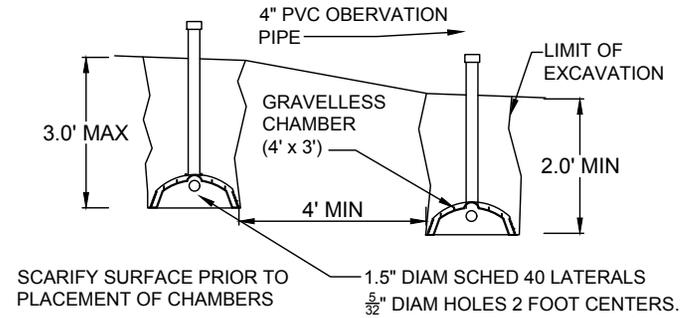


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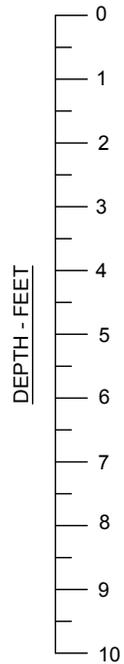
W4
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DRAIN FIELD CROSS SECTION - TYP.



SOIL PROFILE TEST PIT NO. 1

SOIL PROFILE TEST PIT NO. 2

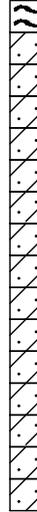


6" TOPSOIL

SANDY CLAY LOAM, BLOCKY,
WEAK, GREEN-BROWN

SAND, MEDIUM TO COURSE
GRAINED, GRANULAR,
BROWN

GROUNDWATER NONE
BEDROCK NONE
ENCOUNTERED DURING EXCAVATION



6" TOPSOIL

SANDY CLAY LOAM, BLOCKY,
WEAK, GREEN-BROWN,
SANDIER WITH DEPTH

CALCULATIONS

35 TOTAL EMPLOYEES @ 15 GPD = 525
GALS/PER/DAY
TREATMENT LEVEL = TL1

APPLICATION RATE = 0.3 GPD/SF
AREA = 525 / 0.3 = 1750 SF

REDUCTION FACTOR
USE OF CHAMBERS = 0.8 X 1750 X 0.7
= 980 SF

CHAMBERS
FIVE ROWS OF 17 CHAMBERS = 85
CHAMBERS

TOTAL AREA PROPOSED = 1020 SF
PROPOSED NUMBER OF CHAMBERS
(12 sqft each) = 85

SOIL TYPE = 3A
SANDY CLAY LOAM.

3 SOIL PROFILE
NTS



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Pump Selection for a Non-Pressurized System - Single Family Residence Project

Sewage Ejection / 527E

Parameters

Discharge Assembly Size	2.00	inches
Transport Length	75	feet
Transport Pipe Class	40	
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max Elevation Lift	10	feet
Design Flow Rate	10	gpm
Flow Meter	None	inches
'Add-on' Friction Losses	0	feet

Calculations

Transport Velocity	0.9	fps
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Frictional Head Losses

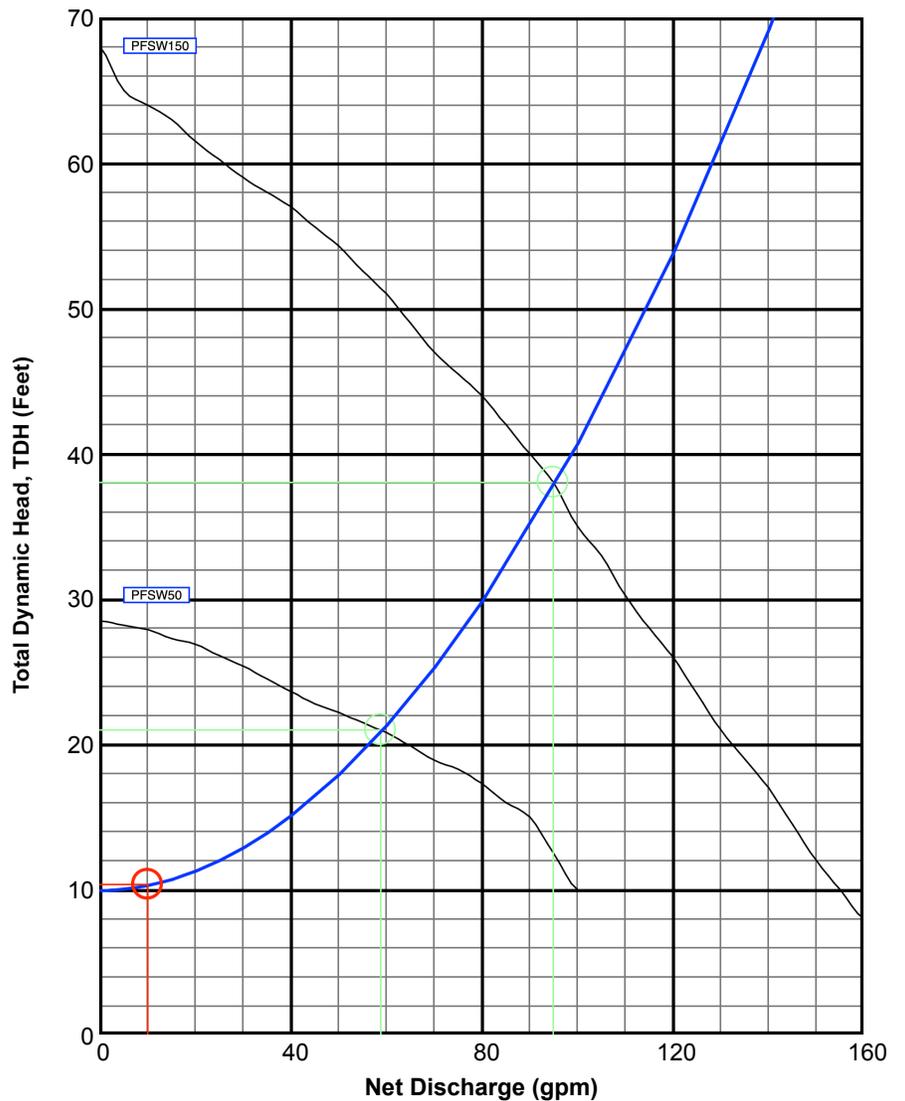
Loss through Discharge	0.2	feet
Loss in Transport	0.2	feet
Loss through Valve	0.0	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	0.0	feet

Pipe Volumes

Vol of Transport Line	13.1	gals
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Minimum Pump Requirements

Design Flow Rate	10.0	gpm
Total Dynamic Head	10.4	feet



PumpData

PFSW50 Sewage Pump
1/2HP, 115/230V 1Ø

PFSW100 Sewage Pump
1HP, 230V 1Ø

Legend

System Curve:	—
Pump Curve:	—
Pump Optimal Range:	—
Operating Point:	○
Design Point:	○



Pump Selection for a Pressurized System - Single Family Residence Project

473E / 10170 E 160th PI, L6B2

Parameters

Discharge Assembly Size	1.25	inches
Transport Length Before Valve	40	feet
Transport Pipe Class	40	
Transport Line Size	2.00	inches
Distributing Valve Model	6605	
Transport Length After Valve	20	feet
Transport Pipe Class	40	
Transport Pipe Size	2.00	inches
Max Elevation Lift	2	feet
Manifold Length	3	feet
Manifold Pipe Class	40	
Manifold Pipe Size	1.50	inches
Number of Laterals per Cell	5	
Lateral Length	71	feet
Lateral Pipe Class	40	
Lateral Pipe Size	1.50	inches
Orifice Size	5/32	inches
Orifice Spacing	3	feet
Residual Head	5	feet
Flow Meter	None	inches
'Add-on' Friction Losses	0	feet

Calculations

Minimum Flow Rate per Orifice	0.68	gpm
Number of Orifices per Zone	24	
Total Flow Rate per Zone	16.4	gpm
Number of Laterals per Zone	1	
% Flow Differential 1st/Last Orifice	3.9	%
Transport Velocity Before Valve	1.6	fps
Transport Velocity After Valve	1.6	fps

Frictional Head Losses

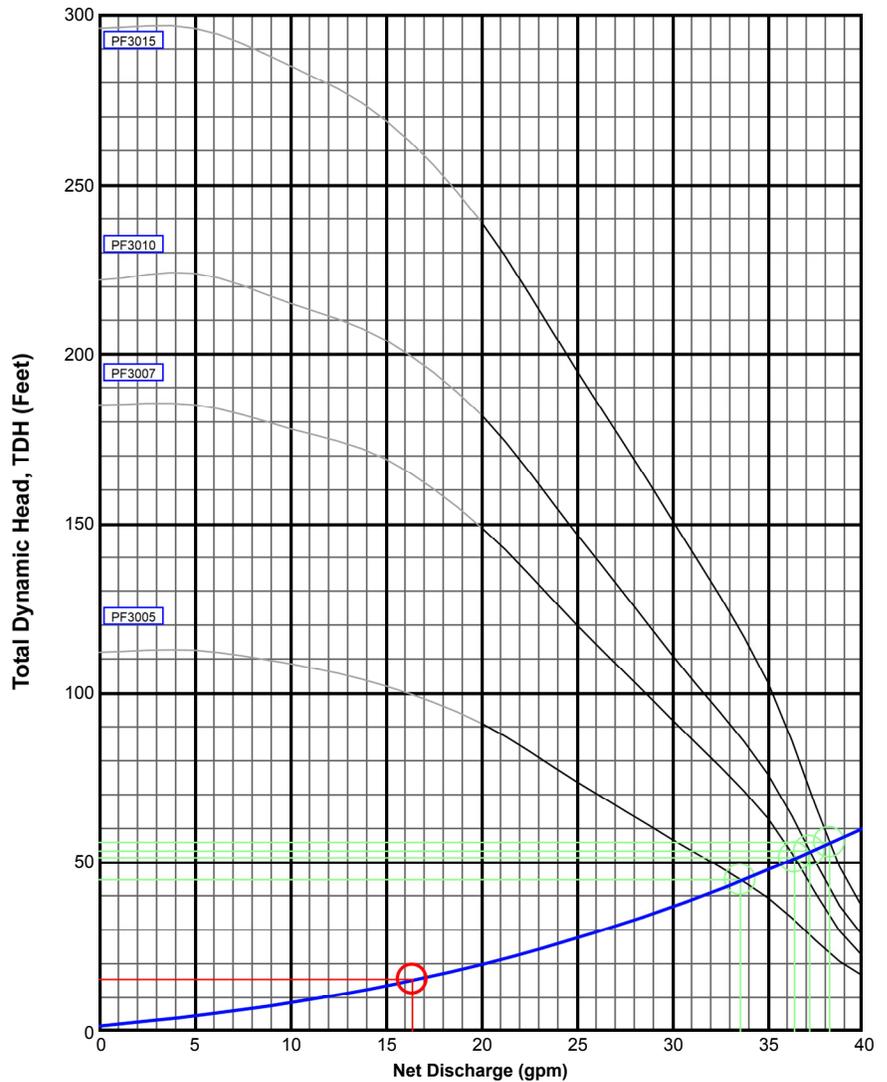
Loss through Discharge	1.9	feet
Loss in Transport Before Valve	0.2	feet
Loss through Valve	5.8	feet
Loss in Transport after Valve	0.1	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.5	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	0.0	feet

Pipe Volumes

Vol of Transport Line Before Valve	6.9	gals
Vol of Transport Line After Valve	3.5	gals
Vol of Manifold	0.3	gals
Vol of Laterals per Zone	7.5	gals
Total Vol Before Valve	6.9	gals
Total Vol After Valve	11.3	gals

Minimum Pump Requirements

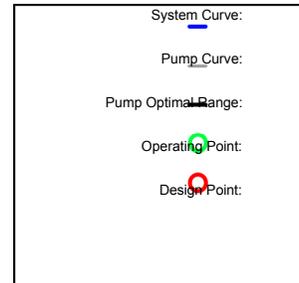
Design Flow Rate	16.4	gpm
Total Dynamic Head	15.4	feet



PumpData

- PF3005 High Head Effluent Pump
30 GPM, 1/2HP
115/230V 1Ø 60Hz, 200V 3Ø 60Hz
- PF3007 High Head Effluent Pump
30 GPM, 3/4HP
230V 1Ø 60Hz, 200/460V 3Ø 60Hz
- PF3010 High Head Effluent Pump
30 GPM, 1HP
230V 1Ø 60Hz, 200/460V 3Ø 60Hz
- PF3015 High Head Effluent Pump
30 GPM, 1-1/2HP
230V 1Ø 60Hz, 200/230/460V 3Ø 60Hz

Legend



PFSW Submersible Sewage Pumps

Applications

PFSW Sewage Pumps are typically used to transport sewage — including solids up to 2 in. (50 mm) in diameter — from pump basins to primary tankage. Their corrosion-resistant construction makes them highly durable in wastewater applications. The PFSW50XX and PFSW15012 are CSA and UL listed, the PFSW10012 is CSA listed only. Manufactured by Franklin Electric.



PFSW5011

PFSW15012



Powered by

Franklin Electric

Features/Specifications

To specify this product, require the following:

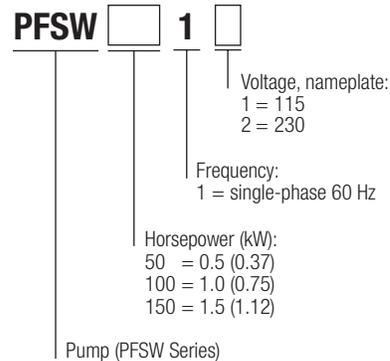
- Ability to handle sewage including solids up to 2 in. (50 mm) in diameter
- Cast iron pump housing and cover with epoxy coating for corrosion resistance
- Oil-filled motor housing for lifetime lubrication and rapid heat dissipation
- Stainless steel screws, bolts, handle, and seal assembly
- Mechanical seals made of corrosion-resistant materials including nitrile and stainless steel with carbon and ceramic faces
- Thermal overload protection for motor
- Rated for continuous duty
- Three-year warranty from date of manufacture

Standard Models

PFSW5011, PFSW5012, PFSW10012, PFSW15012

(Additional configurations available.)

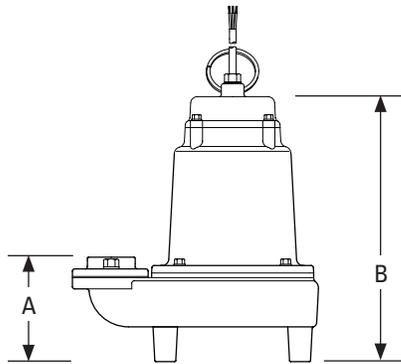
Nomenclature



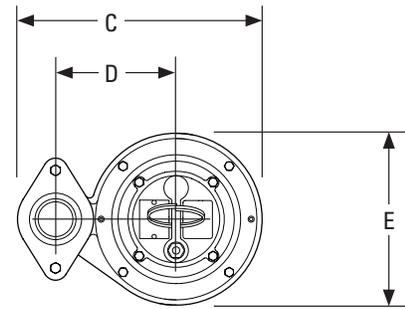
Materials of Construction

	PFSW50XX	PFSW10012	PFSW15012
Motor Housing	Epoxy-coated cast iron	Epoxy-coated cast iron	Epoxy-coated cast iron
Impeller	Cast iron	Cast iron	Brass
Volute	Epoxy-coated cast iron	Epoxy-coated cast iron	Epoxy-coated cast iron
Power cord	16/3, STW	16/3, STW	14/3, SOW
Mechanical shaft seal	Nitrile and stainless steel parts, carbon and ceramic faces	Nitrile and stainless steel parts, carbon and ceramic faces	Nitrile and stainless steel parts, carbon and ceramic faces
Bearings	Ball	Ball	Ball
Shaft	Stainless steel	Stainless steel	Stainless steel
Fasteners	Stainless steel	Stainless steel	Stainless steel

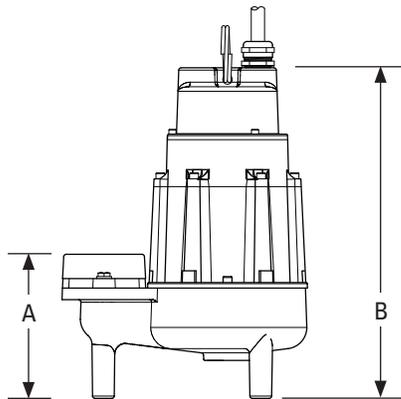
PFSW Series Sewage Pumps (continued)



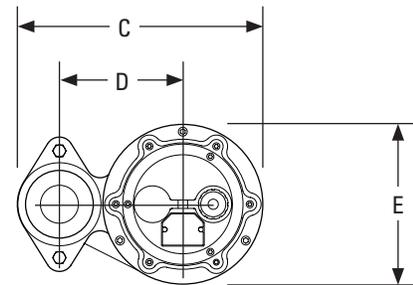
PFSW5011, side view



PFSW5011, top view



PFSW15012, side view



PFSW15012, top view

Specifications

	PFSW5011	PFSW5012	PFSW10012	PFSW15012
Dimensions, in. (mm)				
A	6.8 (173)	6.8 (173)	6.4 (162)	7.6 (193)
B	17.2 (437)	17.2 (437)	15.1 (384)	18.4 (467)
C	14.1 (357)	14.1 (357)	12.3 (311)	12.9 (328)
D	6.9 (176)	6.9 (176)	6.9 (175)	6.5 (165)
E	9.9 (251)	9.9 (251)	9.4 (238)	8.4 (213)
Discharge size ¹	2-in. FNPT	2-in. FNPT	2-in. FNPT	3-in. FNPT
Cord length, ft (m)	20 (6.1)	20 (6.1)	20 (6.1)	20 (6.1)
Weight, lb (kg)	87 (39.5)	88 (39.9)	62 (28.1)	96 (43.5)

Performance

Horsepower (kW)	0.5 (0.37)	0.5 (0.37)	1.0 (0.75)	1.5 (1.12)
Nameplate voltage	115	230	230	230
Full load amps	11.6	4.6	9.8	15.5
Minimum liquid level, in. (mm)	17.5 (450)	17.5 (450)	15.1 (384)	18.4 (470)
Maximum starts per day	100	100	100	100
Minimum off-time, minutes	1	1	1	1
Impeller type	Two vane, non-clog	Two vane, non-clog	Non-clog	Non-clog

¹ Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect discharge assemblies to metric-sized piping.

PFSW Series Sewage Pumps (continued)

Using a Pump Curve

A *pump curve* helps you determine the best pump for your system. Pump curves show the relationship between flow (gpm or L/sec) and pressure (total dynamic head, or TDH), providing a graphical representation of a pump's optimal performance range. At low flow rates, TDH varies from pump to pump, so it is represented as a dashed line in the pump curves. For the most accurate pump specification, use Orenco's PumpSelect™ software.

