SUBSURFACE WASTEWATER DISPOSAL SYSTEM IMPROVEMENTS

AT

BACK CREEK CHRISTIAN ACADEMY
10132 HARRISBURG ROAD
CHARLOTTE, NC 28215

FOR

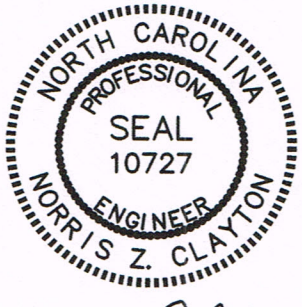
EASTSIDE COMMUNITY CHURCH
10132 HARRISBURG ROAD
CHARLOTTE, NC 28215

PREPARED BY:

HUGH CREED ASSOCIATES, INC., P.A.
CONSULTING ENGINEERS AND LAND SURVEYORS

1306 WEST WENDOVER AVE.
GREENSBORO, N.C. 27408

TELE: (336) 275-9826
FAX: (336) 275-3379
E-MAIL: hca@hughcreedassociates.com



OCTOBER 12, 2018

REV. 10-17-18

WASTEWATER DISPOSAL SYSTEM CALCULATIONS

FOR

BACK CREEK CHRISTIAN ACADEMY

MECKLENBURG COUNTY, NORTH CAROLINA

PROPOSED ENROLLMENT – 280 STUDENTS
DRAINFIELD DESIGN FLOW – 9.0 GPD/STD.
TANKAGE DESIGN FLOW – 10.0 GPD/STD.
LTAR – 0.3 GPD/S.F.

DESIGN NOTE:
THE PROPOSED SYSTEM DESIGN TYPE WILL BE FLOW EQUALIZATION.

DAY	ATTENDANCE	DAILY FLOW (GPD)
MONDAY	280 STUDENTS	2,520
TUESDAY	280 STUDENTS	2,520
WEDNESDAY	280 STUDENTS	2,520
THURSDAY	280 STUDENTS	2,520
FRIDAY	280 STUDENTS	2,520
SATURDAY	0	0
SUNDAY	0	0
TOTAL WEEKLY FLOW		12,600 GAL



10-17-18

EQUALIZATION CYCLE IS ONE (1) WEEK (7-DAYS)

EQUALIZIED DAILY FLOW = 12,600 GPD ÷ 7 DAYS = 1,800 GPD

FLOW BALANCE

DAY	FLOW IN	FLOW OUT	RESIDUAL
MONDAY	2,520	1,800	720
TUESDAY	2,520	1,800	1,440
WEDNESDAY	2,520	1,800	2,160
THURSDAY	2,520	1,800	2,880
FRIDAY	2,520	1,800	3,600
SATURDAY	0	1,800	1,800
SUNDAY	0	1,800	0
	12,600	12,600	0

THE DRAIN FIELD SHALL BE DESIGNED
FOR A DAILY FLOW OF 1,800 GPD

BACK CREEK CHRISTIAN ACADEMY

MECKLENBURG COUNTY, NORTH CAROLINA

REQUIRED SEPTIC TANK

Q= 280 STUDENTS X 10 GPD/STUDENT = 2,800 GPD

SEPTIC TANK SIZE = 0.75(2,800 gpd) + 1,125 = 3,225 GAL.

USE DELLINGER 4,000 GALLON SEPTIC TANK (MODEL: STB-551 (H-20)

REQUIRED GREASE TRAP

THERE WILL NOT BE A KITCHEN IN THE FACILITY PER THE OWNER

* NO GREASE TRAP REQUIRED

DRAINFIELD REQUIREMENTS

REQUIRED LENGTH = 1,800 GPD / 0.30 GPD/SF / 3 FT (TRENCH WIDTH) = 2,000 L.F. OF DRAINFIELD

W/ 25% REDUCTION FOR CHAMBER SYSTEM

REQUIRED LENGTH = 2,000 LT. X .75 = 1,500 FT. OF DRAINFIELD

MANIFOLD LAYOUTS

TAP LAYOUT FOR MANIFOLDS DOSE - 667 GALLONS
DESIGN TYPE - FLOW EQUALIZATION MANIFOLD HEAD-2.0 FT

LINE #	LENGTH (FT)	TAP SIZE/TYPE	TAP FLOW (GAL/MIN.)	FLOW / LINERAR FOOT (GPM/LF.)
L-1	150	1/2" SCH 80	5.48	0.0365
L-2	150	1/2" SCH 80	5.48	0.0365
L-3	150	1/2" SCH 80	5.48	0.0365
L-4	145	1/2" SCH 80	5.48	0.0377
L-5	198	1/2" SCH 40	7.11	0.0359
L-6	198	1/2" SCH 40	7.11	0.0359
L-7	198	1/2" SCH 40	7.11	0.0359
L-8	198	1/2" SCH 40	7.11	0.0359
L-9	198	1/2" SCH 40	7.11	0.0359
TOTALS	1,585		±57.5 GPM	

REQUIRED PUMP DESIGN FLOW = 57.5 GPM

BACK CREEK CHRISTIAN ACADEMY

MECKLENBURG COUNTY, NORTH CAROLINA

PUMP TANK REQUIREMENTS: (RULE .1952 (C) (1) (D)

USE SHOAF PRECAST 10,000 GALLON PUMP TANK (PT-2092)
ASSUME PUMP HEIGTH @ 17" AND TANKAGE VOLUME @ 121.56 GAL/IN.
DOSE = 2,000 GAL / 3 DOSES PER DAY = 667 GALLONS

PUMP SUBMERGENCE VOLUME (17"):	2,067 GALLONS
DOSE VOLUME (5.5"):	667 GALLONS
FLOW EQULATION VOLUME (33"):	4,000 GALLONS
24-HOUR EMERG. STORAGE VOL. (23"):	2,800 GALLONS
PRE-ALARM LEVEL - 4"	486 GALLONS

TOTAL REQUIRED PUMP TANK VOLUME - 10,020 GALLONS
* ACTUAL STORAGE AVAIL. - 10,210 GALLONS (SEE CUT SHEET)

PUMP DESIGN

FORCE MAIN - 3" SCH 40 PVC
LENGTH OF SUPPLY LINE - 275 FT.
PUMP DESIGN FLOW - 57.5 GPM

DOSING PUMP TDH CALCULATIONS

① MANIFOLD HEAD PRESSURE (H_p) = 2.0 FT.

② STATIC HEAD (H_s) = 13 FT.

FRICTION LOSS THROUGH 3" SUPPLY LINE

LENGTH OF SUPPLY MAIN - 275 FT.

FRICTION LOSS/100 FT OF PIPE - ±0.90 FT/100 FT OF PIPE
VELOCITY - ±2.6 FT./SEC. (SCOURING VELOCITY > 2.0 FPS)

FRICTION LOSS W/ PIPE LENGTH = 275 FT X 0.90 FT/100 FT = ±2.5 FT.

FRICTION LOSS W/ FITTINGS = 2.5 FT. X 25% = ±1.0 FT.

③ FRICTION LOSS = ±4 FT.

TOTAL DYNAMIC HEAD (H_f) = 2.0 FT + 13 FT + 4 FT

TOTAL DYNAMIC HEAD (H_f) = ±19 FT.

INSTALL ONE (1) ZOELLOR PUMP CO. MODEL 185 PUMP, SINGLE PHASE, 230 VOLTS, FOR PUMPING ±57.5 GPM @ ±19 FT. TDH. (OR APPROVED EQUAL)

"Quality Pumps Since 1939"

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

ZOELLER® PUMP CO.

MAIL TO: P.O. BOX 16347 • Louisville, KY 40256-0347
SHIP TO: 3649 Cane Run Road • Louisville, KY 40211-1961
(502) 778-2731 • 1 (800) 928-PUMP • FAX (502) 774-3624

SECTION: 2.20.060
FM0659
1110
Supersedes
0108

visit our web site:
www.zoeller.com

COMPARE THESE FEATURES

- Non-clogging vortex impeller design bronze class 88-8-0-4 (180 Series).
- Enclosed impeller design (191 Series).
- Float operated, submersible (NEMA 6) 2-pole mechanical switch.
- Durable cast construction. Cast iron switch case, base, motor and pump housing. No sheet metal parts to rust or corrode.
- Stainless steel screws, bolts, float rod, handle, guard, arm and seal assembly.
- 20 ft. UL Listed 3-wire neoprene cord and plug. Extra cord lengths available in 25-35-50 foot length only.
- Motor - 60 Hz, 3450 RPM, oil-filled, hermetically sealed, automatic reset, thermal overload protected (1 Ph only).
- Maximum temperature for effluent or dewatering 130°F (54°C), WD189 120°F (49°C).
- Variable level control systems available.
- Square Ring & Gasket - Neoprene.
- Shaft Seal - Stainless steel carbon & ceramic rotary.
- Upper sleeve bearing and lower ball bearing running in bath of oil.
- All 180/4180 series pass 3/4 inch spherical solids. Model 191 pump passes 5/8 inch spherical solids.
- On point 14 3/4" • Off point 5" (automatic units).
- Major width 12 3/4" • Height 18 9/16" (single seal pumps).
- 1 1/2" NPT discharge with 2" or 3" flange available (model 191 is not availiable with 3" flange).
- Corrosion resistant powder coated epoxy finish.

MODELS 4185-4186-4188-4189 DOUBLE SEAL PUMPS (Nonauto only)

- Protects motor from seal leaks.
- Improved bearing lubrication.
- Helps eliminate seal and bearing damage from dry runs.
- Major width 12 3/4" • Height 20 7/16".

Note: The sizing of effluent systems normally requires variable level float(s) controls and properly sized basins to achieve required pumping cycles or dosing timers with nonautomatic pumps.

AUTOMATIC UNITS NOT RECOMMENDED FOR USE IN EFFLUENT SYSTEMS

*NOTE: No UL Listing for 200/208 1 Phase Pumps, Model 186 & 191, or Double Seal Series.
See Back Page for UL & CSA Listings

185 - 186 - 188 - 189 Single Seal Series
4185 - 4186 - 4188 - 4189 Double Seal Series
191 Single Seal Drip Pump

(For Pump Prefix Identification see News & Views 0052)

Tested to UL Standard UL778 & Certified to CSA Standard C22.2 No. 108

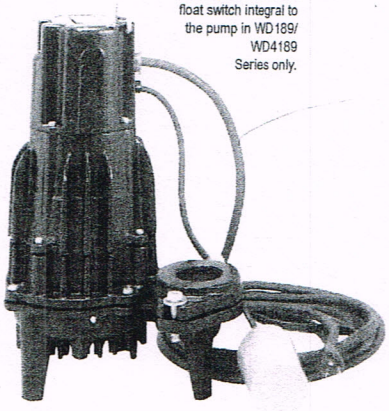
HIGH HEAD "FLOW-MATE"

FOR SEPTIC TANK • LOW PRESSURE PIPE (LPP) AND ENHANCED FLOW STEP SYSTEMS

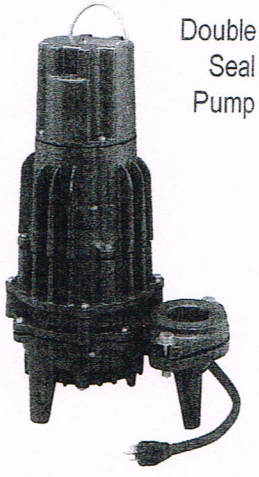
EFFLUENT

OR DEWATERING PUMP • SUBMERSIBLE

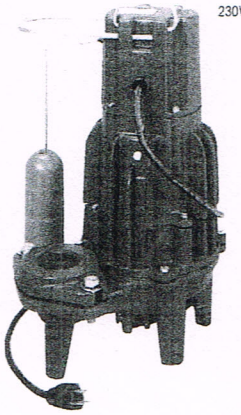
1½" NPT DISCHARGE STANDARD • 2" or 3" FLANGE AVAILABLE



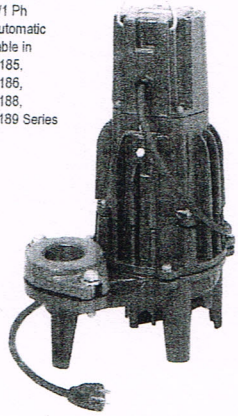
230V Automatic Controlled by variable level float switch integral to the pump in WD189/ WD4189 Series only.



Double Seal Pump



230V/1 Ph Automatic Available in 185, 186, 188, 189 Series

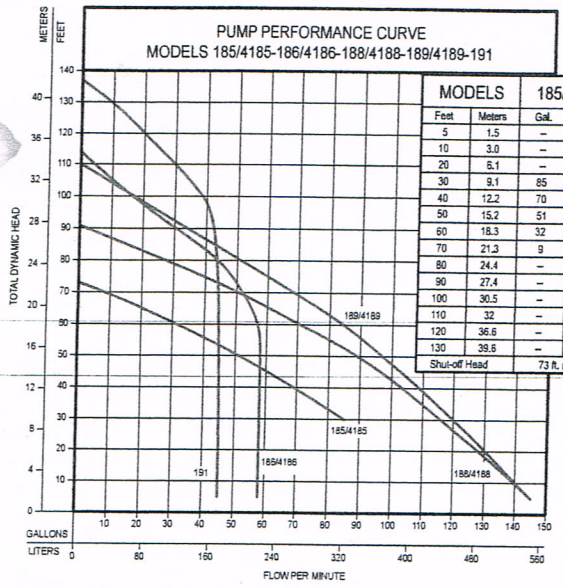


230V/1 Ph Nonautomatic Available in 185/4185, 186/4186, 188/4188, 189/4189 Series

POWDER COATED TOUGH™

Nonautomatic Model for variable level systems

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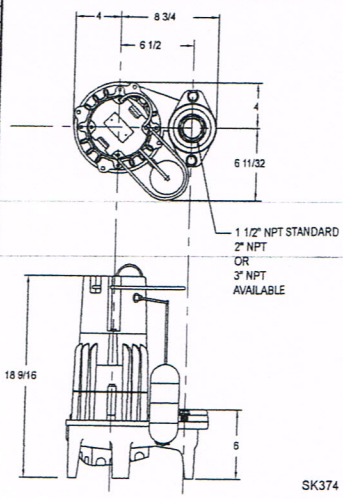


MODELS		185/4185		186/4186		188/4188		189/4189		191	
Feet	Meters	Gal.	Liters	Gal.	Liters	Gal.	Liters	Gal.	Liters	Gal.	Liters
5	1.5	–	–	58	220	145	549	145	549	45	170
10	3.0	–	–	58	220	140	530	140	530	45	170
20	6.1	–	–	58	220	128	484	130.5	494	45	170
30	9.1	85	322	58	220	116	439	120	454	45	170
40	12.2	70	265	58	220	103.5	392	109	413	45	170
50	15.2	51	193	58	220	90	341	97	367	45	170
60	18.3	32	121	58	220	71	269	85	322	45	170
70	21.3	9	34	52	197	51	193	69	261	45	170
80	24.4	–	–	45	170	28	106	51	193	45	170
90	27.4	–	–	30.5	115	2	8	34	129	45	170
100	30.5	–	–	16	60	–	–	17	64	40	151
110	32	–	–	4	15	–	–	–	–	30	114
120	36.6	–	–	–	–	–	–	–	–	20	76
130	39.6	–	–	–	–	–	–	–	–	10	38
Shut-off Head		73 ft. (22m)		114 ft. (35m)		91 ft. (28m)		110 ft. (34m)		137 ft. (42m)	

009903

WARNING: Model 185 should not be subjected to heads less than 30 feet TDH.

Single Seal-180 Series Automatic Design Weight 82-89 lbs.



185 MODELS	4185 MODELS	Standard all models - 20 ft. cord - 1 HP				Control Selection		Listings	
Single Seal	Double Seal	Volts -	Ph	Mode	Amps	Simplex	Duplex	CSA	UL
D185	—	230	1	Auto	9.8	1	—	Y	Y
E185	E4185	230	1	Non	9.8	2 or 3	4	Y	Y
* H185	—	200	1	Auto	11.5	1	—	N	N
* I185	* I4185	200	1	Non	11.5	2 or 3	4	N	N
* F185	* F4185	230	3	Non	7.4	3 & 5	4 & 5	Y	Y
* J185	* J4185	200	3	Non	7.5	3 & 5	4 & 5	Y	Y
* G185	* G4185	460	3	Non	3.7	3 & 5	4 & 5	Y	Y
* BA185	—	575	3	Non	3.3	3 & 5	4 & 5	Y	N

186 MODELS	4186 MODELS	Standard all models - 20 ft. cord - 1½ HP				Control Selection		Listings	
Single Seal	Double Seal	Volts -	Ph	Mode	Amps	Simplex	Duplex	CSA	UL
D186	—	230	1	Auto	13.7	1	—	Y	N
E186	E4186	230	1	Non	13.7	2 or 3	4	Y	N
* H186	—	200	1	Auto	17.2	1	—	Y	N
* I186	* I4186	200	1	Non	17.2	2 or 3	4	Y	N
* F186	* F4186	230	3	Non	9.2	3 & 5	4 & 5	Y	N
* G186	* G4186	460	3	Non	4.6	3 & 5	4 & 5	Y	N

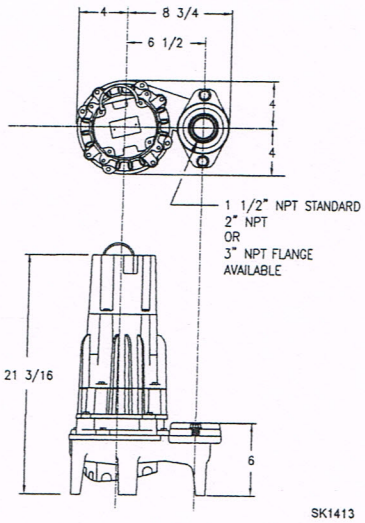
188 MODELS	4188 MODELS	Standard all models - 20 ft. cord - 1½ HP				Control Selection		Listings	
Single Seal	Double Seal	Volts -	Ph	Mode	Amps	Simplex	Duplex	CSA	UL
D188	—	230	1	Auto	14.0	1	—	Y(2)	Y(1)
E188	E4188	230	1	Non	14.0	2 or 3	4	Y	Y(1)
* H188	—	200	1	Auto	16.8	1	—	Y	N
* I188	* I4188	200	1	Non	16.8	2 or 3	4	Y	N
* F188	* F4188	230	3	Non	8.9	3 & 5	4 & 5	Y	Y
* J188	* J4188	200	3	Non	10.3	3 & 5	4 & 5	Y	Y
* G188	* G4188	460	3	Non	4.6	3 & 5	4 & 5	Y	Y
* BA188	—	575	3	Non	3.5	3 & 5	4 & 5	Y	N

189 MODELS	4189 MODELS	Standard all models - 20 ft. cord - 2 HP				Control Selection		Listings	
Single Seal	Double Seal	Volts -	Ph	Mode	Amps	Simplex	Duplex	CSA	UL
(3) D189	—	230	1	Auto	17.1	1	—	Y(2)	Y(1)
(3) E189	(3) E4189	230	1	Non	17.1	2 or 3	4	Y(2)	Y(1)
* H189	—	200	1	Auto	20.5	1	—	Y	N
* I189	* I4189	200	1	Non	20.5	2 or 3	4	Y	N
* F189	* F4189	230	3	Non	11.2	3 & 5	4 & 5	Y	Y
* J189	* J4189	200	3	Non	13.2	3 & 5	4 & 5	Y	Y
* G189	* G4189	460	3	Non	6.0	3 & 5	4 & 5	Y	Y
* BA189	—	575	3	Non	5.8	3 & 5	4 & 5	Y	N
(3) WD189	* WD4189	230	1	Auto	17.1	1	4	N	N

191 MODEL		Standard all models - 20 ft. cord - 2 HP				Control Selection		Listings	
Single Seal	Double Seal	Volts -	Ph	Mode	Amps	Simplex	Duplex	CSA	UL
E191	—	230	1	Non	14.5	2 or 3	4	N	N

* No Molded Plug.
(1) UL Listed unit available with 20 Amp plug.
(2) CSA Approval with 20 Amp plug.
(3) 20 Amp Outlet, P/N 10-0060 must be used.

Double Seal-4180 Series / Weight 89-94 lbs.



SELECTION GUIDE

1. Integral float operated mechanical switch, no external control required.
2. For automatic use single piggyback variable level float switch or double piggyback variable level float switch. Refer to FM0477.
3. See FM1228 for correct model of simplex control panel.
4. See FM0712 for correct model of duplex control panel.
5. Variable level control switch 10-0743 used as a control activator, specify simplex (3) float or duplex (4) float system. Refer to FM0526.

⚠ CAUTION

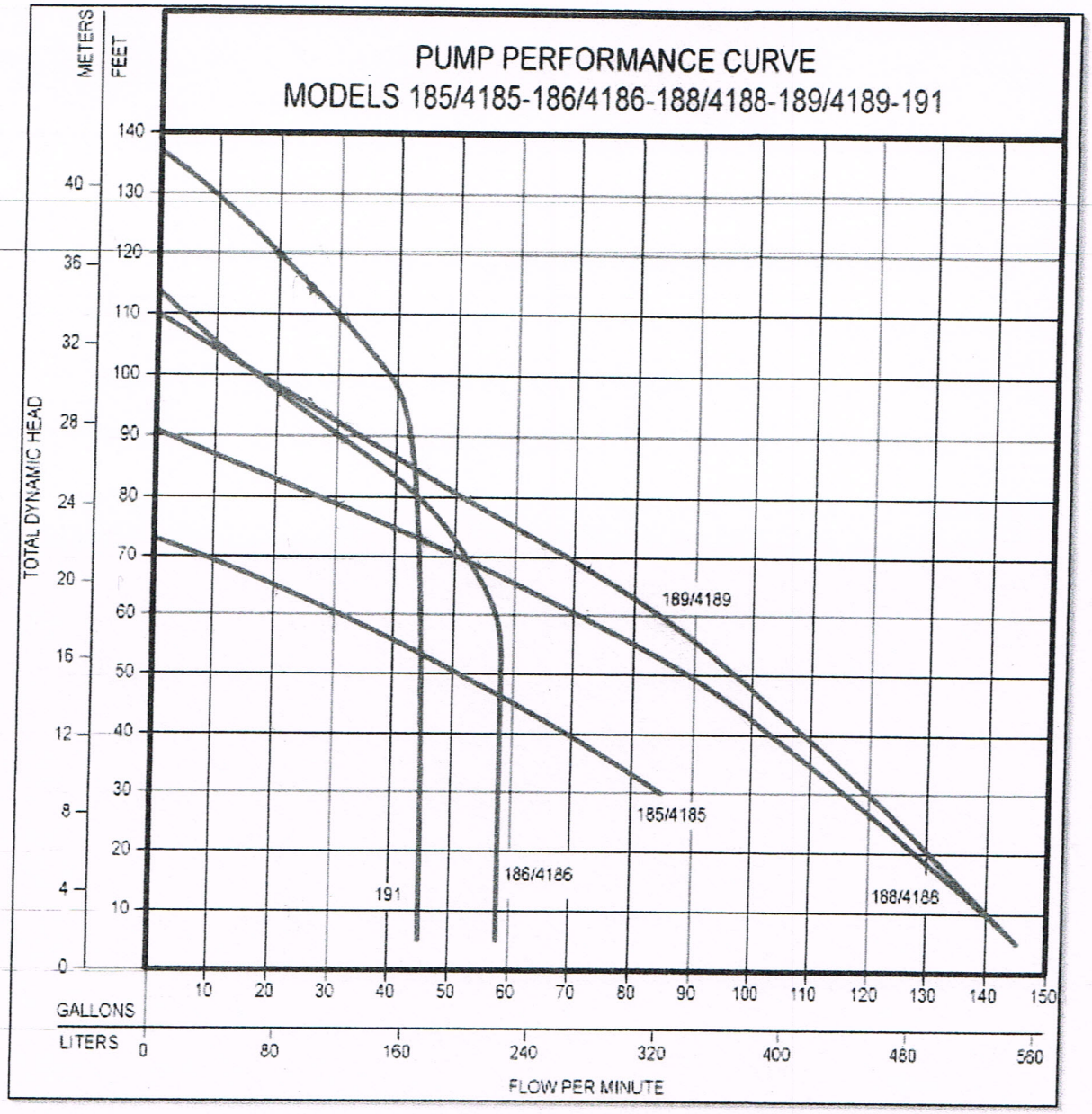
All installation of controls, protection devices and wiring should be done by a qualified licensed electrician. All electrical and safety codes should be followed including the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

For information on additional Zoeller products refer to catalog on Piggyback Variable Level Float Switches, FM0477; Electrical Alternator, FM0486; Mechanical Alternator, FM0495; Sump/Sewage Basins, FM0487; Simplex Pump Control, FM1596; Alarm Systems, FM0732; and Disconnect/Rail Systems, FM0787.

RESERVE POWERED DESIGN

For unusual conditions a reserve safety factor is engineered into the design of every Zoeller pump.

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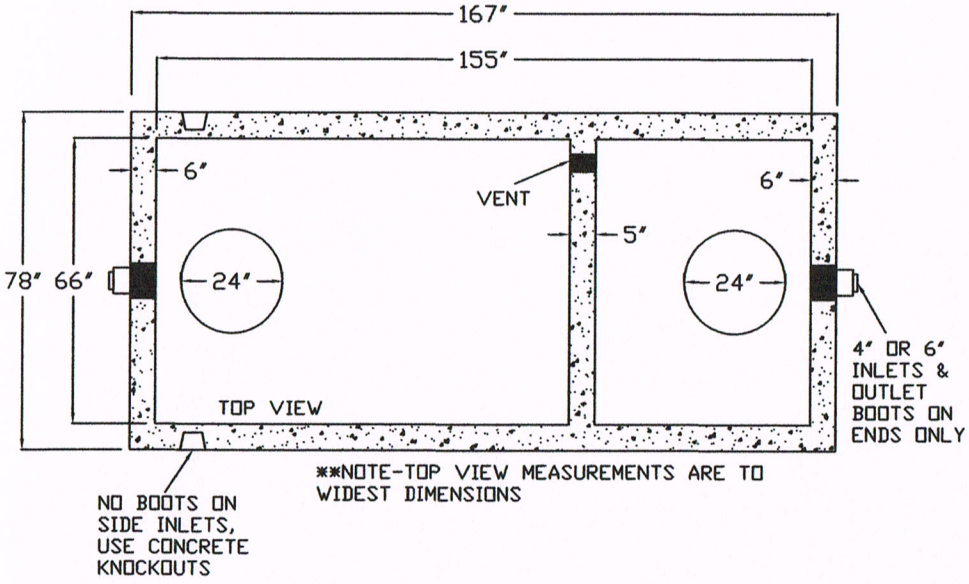
Pump Performance curve Models 185/4185, 186/4186, 188/4188, 189/4189, 191

MODELS		185/4185		186/4186		188/4188		189/4189		191	
Feet	Meters	Gal.	Liters	Gal.	Liters	Gal.	Liters	Gal.	Liters	Gal.	Liters
5	1.5	--	--	58	220	145	549	145	549	45	170
10	3.0	--	--	58	220	140	530	140	530	45	170
20	6.1	--	--	58	220	128	484	130.5	494	45	170
30	9.1	85	322	58	220	116	439	120	454	45	170
40	12.2	70	265	58	220	103.5	392	109	413	45	170
50	15.2	51	193	58	220	90	341	97	367	45	170
60	18.3	32	121	58	220	71	269	85	322	45	170
70	21.3	9	34	52	197	51	193	69	261	45	170
80	24.4	--	--	45	170	28	106	51	193	45	170
90	27.4	--	--	30.5	115	2	8	34	129	45	170
100	30.5	--	--	16	60	--	--	17	64	40	151
110	32	--	--	4	15	--	--	--	--	30	114
120	36.6	--	--	--	--	--	--	--	--	20	76
130	39.6	--	--	--	--	--	--	--	--	10	38
Shut-off Head		73 ft. (22m)		114 ft. (35m)		91 ft. (28m)		110 ft. (34m)		137 ft. (42m)	

Total Dynamic Head/Flow Per Minute (Effluent and Dewatering)

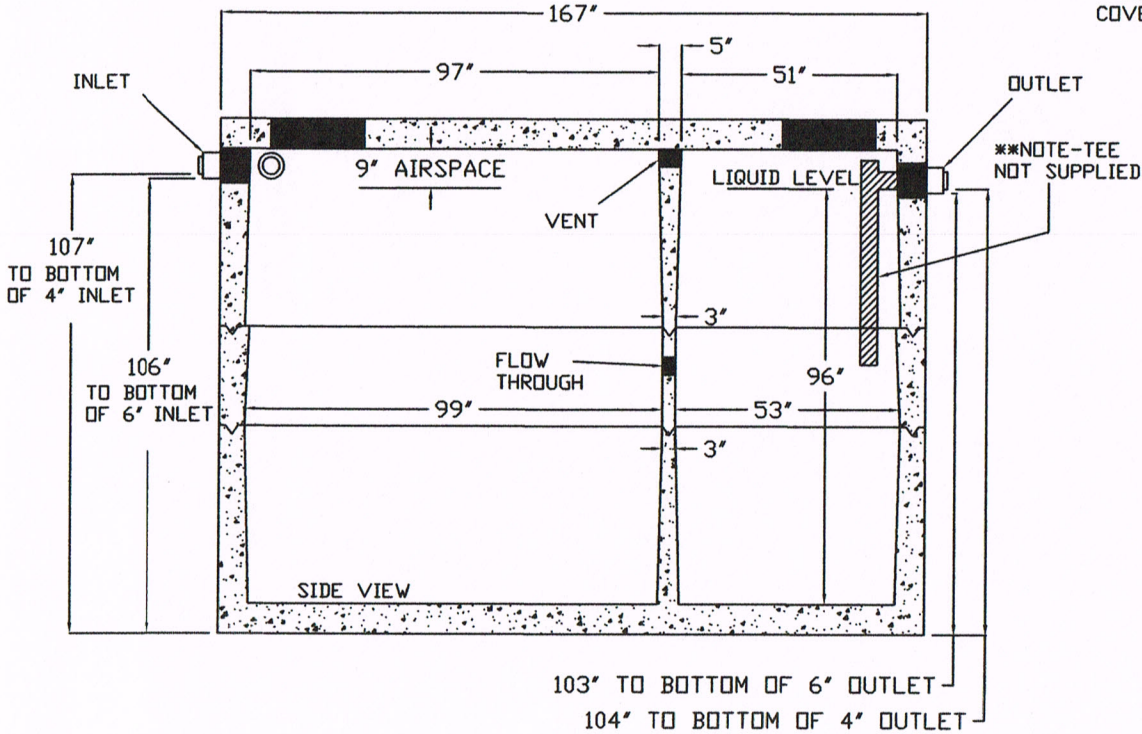
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
WWW.SHOAFPRECAST.COM

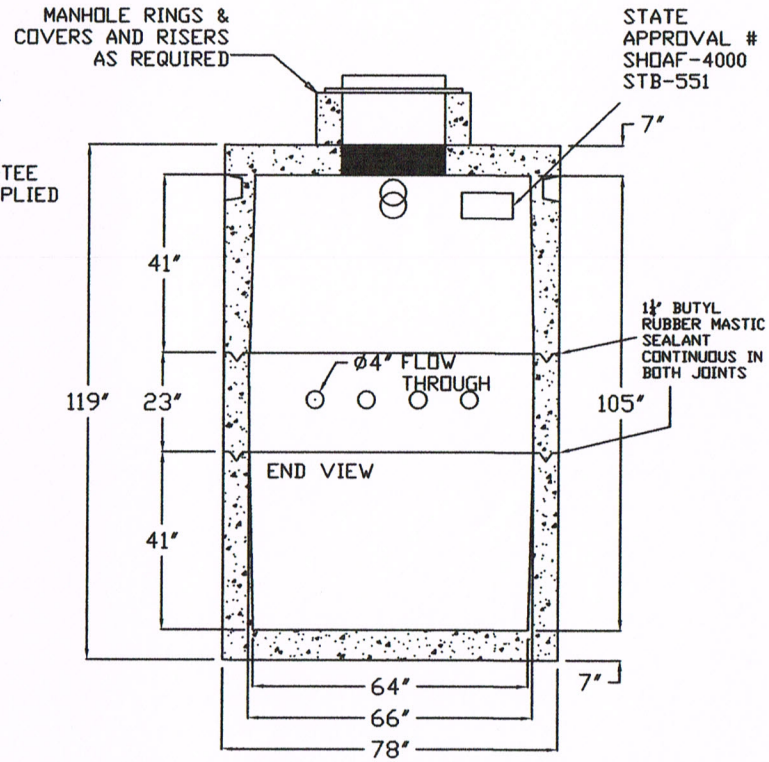
MODEL: MS 4000 H20 STB
H20 TRAFFIC RATED
4000 Gallon Septic Tank

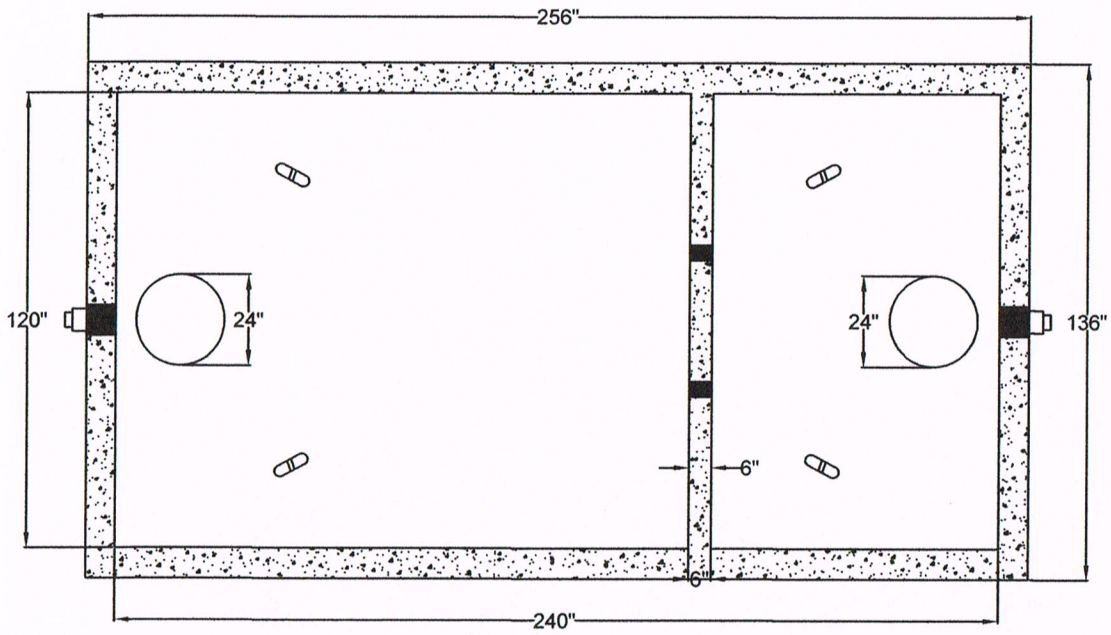


SHOAF-4000 H20 TRAFFIC RATED
STB-551 H20 TRAFFIC RATED
LIQUID CAPACITY-4000 US GALLONS/AIRSPACE-9"
TANK HEIGHT-119"
BOTTOM OF TANK TO CENTER OF INLET-109"
BOTTOM OF TANK TO CENTER OF OUTLET-106"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-4" OR 6" PIPE
TYPE ON INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-5000, TANK WEIGHT-47,000 LBS.
ACCESS TOP WITH RISERS PLUS RINGS AND COVERS (NOT INCLUDED)
REINFORCEMENT PER ENGINEER DRAWING

SCALE-N.T.S.





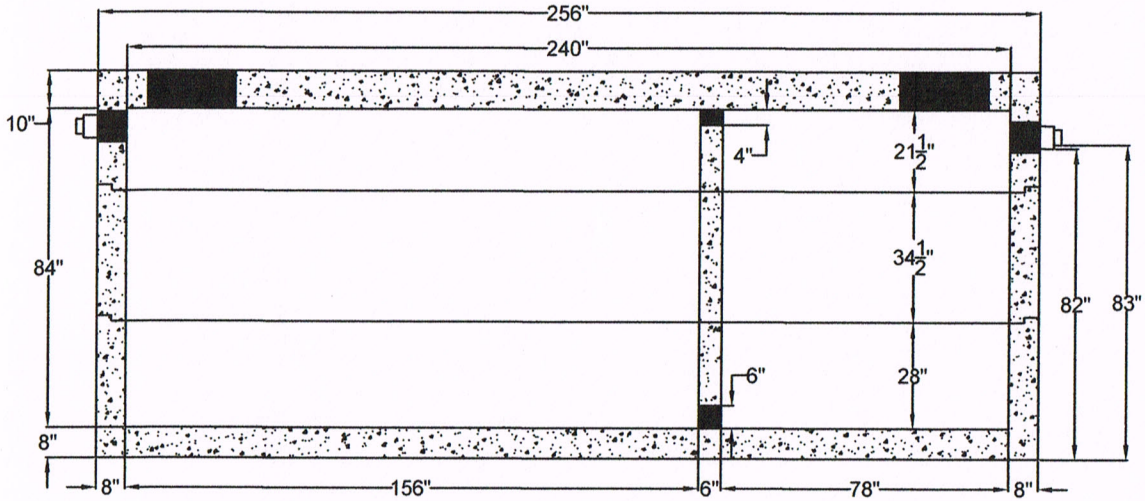


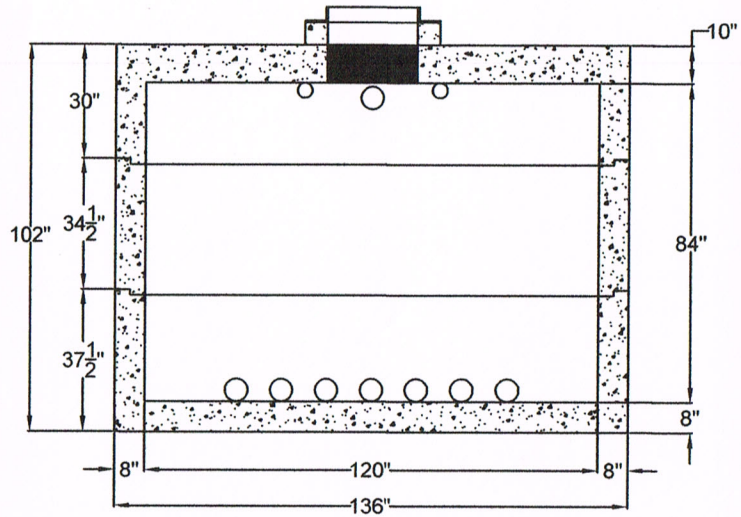
SHOAF - 10,000 GAL. PUMP TANK
HS/20 TRAFFIC RATED
NC APPROVAL # PT-2092

SHOAF PRECAST INC.
4130 W US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
info@shoafprecast.com
www.shoafprecast.com

NOTES:

- FULL CAPACITY - 10,211 GAL.
- GAL. PER INCH - 121.56
- 2:1 LENGTH TO WIDTH RATIO
- PIPE PENETRATION SEALS MEET ASTM C-923
- 1 $\frac{1}{4}$" BUTYL RUBBER SEALANT CONTINUOUS IN JOINTS
- REINFORCED PER ENGINEER SPECS
- CONCRETE - 5,000 PSI MIN.
- TANK WEIGHT - 102,350 #
- -TOP - 42,150 #
- -BOTTOM - 40,100 #
- -RISER SECTION - 20,000 #





POLYLOK™ Inc.
Innovations in Precast, Drainage & Wastewater Products
Zabel® A Division of Polylok Inc.

PL-625 Effluent Filter & Grease Trap

PL-625 Filter

The PL-625 filter is ideal for grease trap applications. The 1/32" filtration has been shown to reduce fats, oils, and grease (FOG) by as much as 60% to 98%! The filter may be used in onsite wastewater systems that require a finer level of TSS removal. Whatever the application, Polylok has the filter for you!

Features:

- Rated for 10,000 GPD (gallons per day).
- 625 linear feet of 1/32" filtration.
- Accepts 4" and 6" SCHD 40 pipe.
- Built in gas deflector.
- Automatic shut-off ball when filter is removed.
- Alarm accessibility.
- Accepts PVC extension handle.

PL-625 Installation:

Ideal for residential and commercial waste flows up to 10,000 gallons per day (GPD).

1. Locate the outlet of the septic tank.
2. Remove the tank cover and pump tank if necessary.
3. Glue the filter housing to the 4" or 6" outlet pipe. If the filter is not centered under the access opening use a Polylok Extend & Lok or piece of pipe to center filter.
4. Insert the PL-625 filter into its housing.
5. Replace and secure the septic tank cover.

PL-625 Maintenance:

The PL-625 Effluent Filters will operate efficiently for several years under normal conditions before requiring cleaning. It is recommended that the filter be cleaned every time the tank is pumped, or at least every three years. If the installed filter contains an optional alarm, the owner will be notified by an alarm when the filter needs servicing. Servicing should be done by a certified septic tank pumper or installer.

1. Locate the outlet of the septic tank.
2. Remove tank cover and pump tank if necessary.
3. Do not use plumbing when filter is removed.
4. Pull PL-625 cartridge out of the housing.
5. Hose off filter over the septic tank. Make sure all solids fall back into septic tank.
6. Insert the filter cartridge back into the housing making sure the filter is properly aligned and completely inserted.
7. Replace and secure septic tank cover.





Outdoor SmartFilter® Alarm
Polylok, Zabel & Best filters accept the SmartFilter® switch and alarm.



Extend & Lok™
Easily installs into existing tanks.