

ENGINEER'S REPORT
YOUNGS ROAD PRIVATE PUMP STATION REDESIGN
DESIGN ANALYSIS AND COMPUTATIONS

Sanitary Sewer System

The proposed sanitary sewer system for the site development at 699 Youngs Road will consist of 6-inch collector sewers flowing to a proposed private pump station. The pump station will be located adjacent to the center of the parcel next to the proposed access driveway. The pump station will discharge into a proposed 2-inch forcemain flowing northerly along the west side of Youngs Road before it will cross to Lawrence Bell Drive and connect into the existing Town of Amherst 8-inch public sanitary sewer.

Wastewater Treatment Plan

Using the Ten States Standards and the typical Health Department Requirements, the following design was developed:

Including potential additional development plus the existing facilities in the service area the tributary flows were calculated as follows:

Daily flows for Distribution Facility No.1	2500 GPD
Daily flows for Distribution Facility No.2	2500 GPD
Total	5000 gpd

In order to estimate the peak flows the daily flow was converted to an equivalent residential population of 200 persons at 25 gal/person/day. The Ten States peaking factor for that population is 4.1480.

The design flows are as follows:

Average Daily Flow: 5000 gpd or 3.47 gpm
Peak Flow 4.1480 (5000): 20740.2 gpd or 14 gpm
Minimum flow at 25% of Avg.: 1250 gpd or 0.87 gpm

The design of the pump station was optimized through a process involving analysis of trial designs and adjusting to account for the results. The pumps, forcemain and wet well were sized for ultimate flow conditions as follows:

1. Forcemain Required Velocity is 2-6 ft/sec
2. Pumps A minimum of twice the peak design flow rate or 28 gpm
3. Wet Well A nominal working volume depth of 1.0 ft, a minimum pump submergence of 3 feet and minimum depth of six (6) feet below the incoming invert.

Wet Well Design

48-inch Diameter Precast Concrete	
Base Elevation	678.24
Pumps Off Elevation	681.24
Lead Pump On	681.70
Lag Pump On	682.20
High Water Alarm	682.70
Incoming Sewer Invert	684.70
Top of Wet Well	696.00

Pump Characteristics

Meyers VS20 2-inch submersible non-clog design sewage pump
5.3-inch Impeller Diameter at 3500 RPM
2.0 BHP Motors
Operating Conditions 25 gpm at 13.5 ft TDH
Maximum cycles = 10 per hour

Force Main Characteristics

Interior Piping to Station Header	4" DIP
Exterior to Valve Pit	4" PVC SDR 18
Max Pressure at Pump	38 ft = 16.5 psi
Static Head	546.2-533.72 = 12.48
Velocity	2.6 ft/sec

Pump Cycles

Minimum Flow:	Fill Time	28.80 min
	Pump Time	1.78 min
	Cycles/hr	1.96 cycles
Average Flow:	Fill Time	12.40 min
	Pump Time	2.0 min
	Cycles/hr	4.17 cycles
Peak Flow:	Fill Time	2.99 min
	Pump Time	4.06 min
	Cycles/hr	8.51 cycles

Copies of the calculations sheets and pump curves are included in the attachments.

KROG YOUNGS ROAD PUMP STATION
SUBMERSIBLE PUMP STATION DESIGN
SUMMARY HYDRAULICS WORKSHEET
WORKUP of DESIGN FLOWS

Facility	Number	Unit Flow (gpd)	Flow (gpd)
1 Distribution Facility1	100 Workers	25	2500
2 Distribution Facility2	100 Workers	25	2500
		Total	<hr/> 5000

KROG YOUNGS ROAD PUMP STATION
 SUBMERSIBLE PUMP STATION DESIGN
 SUMMARY HYDRAULICS WORKSHEET

USING 2" Dia. Force Main Exterior to Station

Rim Elevation	696.00	
Incoming Sewer Invert	684.7	
Design Population	200	persons
Peaking Factor	4.1480	
Avg Daily Flow	5000	gpd
Avg Daily Flow	3.47	gpm
		12 hour shift
Peak Flow	20740.19	gpd
Peak Flow	14	gpm
Nominal Pumping Rate	29	gpm
Nominal Two Minute Pump Vol.	51	gal
Nominal Depth of Working volum	1	ft
Required Area	6.77	ft ²
Maximum Diameter	4	ft
Wetwell Area	12.57	ft ²
Depth Required	0.54	ft
Pump On Elev	681.7	
Initial Pump Off Elev	681.16	
High Point in Force Main	694.5	
Static Head	13.34	ft
Pumping Rate	25	gpm
Revised Pump Vol	43.06	gpm
WetWell Volume	94.01	gal/ft
Pump Dose	0.46	ft
Revised Working Depth	0.46	ft
Pump Off Elev	681.24	
Static Head	13.26	
Base Elevation	679.91	
Pump Outlet Invert	691.33	

Pump Station Design

2- 2 HP Myers V2 Pumps in a 4 Ft Diameter

Precast Concrete Wetwell

HAZEN WILLIAMS FORMULA - PRESSURE FLOW IN PIPES						
ENTER PIPE DIA.(IN.)	2	Rh =	0.041666667	FT	ENTER ELEVATION AT DISCHARGE POINT FROM	694.5
AREA (FT^2)	0.022				VALVE PIT	
ENTER "C"	120	V =	2.553093965	FT/S	ENTER PUMP OFF ELEVATION	681
ENTER DEMAND (GPM)	25	0.06 CFS			ELEVATION DIFFERENCE	13.5
EQUIV. PIPE LENGTH (FT)	2100					
FLOW RATE (gpm)	STATIC HEAD (ft)	FRICTION HEAD (ft)	VELOCITY (ft/sec)	VELOCITY HEAD (ft)	TOTAL DESIGN HEAD (ft)	
0	13.5	0.000	0.000	0.000	13.500	
10	13.5	7.582	1.022	0.016	21.098	
20	13.5	27.332	2.043	0.065	40.897	
25	13.5	41.301	2.554	0.101	54.902	
30	13.5	57.869	3.065	0.146	71.515	
40	13.5	98.534	4.087	0.259	112.293	
50	13.5	148.891	5.108	0.405	162.796	
56.06	13.5	183.985	5.728	0.509	197.994	
60	13.5	208.619	6.130	0.584	222.702	
70	13.5	277.463	7.152	0.794	291.757	
80	13.5	355.214	8.174	1.037	369.751	
90	13.5	441.694	9.195	1.313	456.507	
100	13.5	536.751	10.217	1.621	551.872	
110	13.5	640.250	11.239	1.961	655.711	
120	13.5	752.070	12.260	2.334	767.904	
130	13.5	872.104	13.282	2.739	888.343	
140	13.5	1000.253	14.304	3.177	1016.930	
150	13.5	1136.428	15.325	3.647	1153.575	
160	13.5	1280.545	16.347	4.150	1298.195	
165	13.5	1355.559	16.858	4.413	1373.472	
170	13.5	1432.529	17.369	4.684	1450.714	
180	13.5	1592.308	18.391	5.252	1611.060	
190	13.5	1759.816	19.412	5.851	1779.167	
200	13.5	1934.989	20.434	6.484	1954.973	
205	13.5	2025.432	20.945	6.812	2045.744	
210	13.5	2117.770	21.456	7.148	2138.418	
215	13.5	2211.995	21.966	7.493	2232.988	
220	13.5	2308.102	22.477	7.845	2329.447	
225	13.5	2406.084	22.988	8.206	2427.789	
230	13.5	2505.933	23.499	8.575	2528.008	
235	13.5	2607.646	24.010	8.951	2630.097	
240	13.5	2711.214	24.521	9.336	2734.051	
245	13.5	2816.633	25.032	9.729	2839.863	
250	13.5	2923.897	25.542	10.131	2947.528	
255	13.5	3033.000	26.053	10.540	3057.040	
260	13.5	3143.936	26.564	10.957	3168.394	
265	13.5	3256.701	27.075	11.383	3281.584	
270	13.5	3371.289	27.586	11.816	3396.606	
275	13.5	3487.695	28.097	12.258	3513.453	
280	13.5	3605.914	28.608	12.708	3632.122	
285	13.5	3725.942	29.118	13.166	3752.607	
290	13.5	3847.772	29.629	13.632	3874.904	
295	13.5	3971.401	30.140	14.106	3999.007	
300	13.5	4096.825	30.651	14.588	4124.913	
305	13.5	4224.037	31.162	15.078	4252.616	
310	13.5	4353.035	31.673	15.577	4382.112	
315	13.5	4483.814	32.183	16.083	4513.397	
320	13.5	4616.369	32.694	16.598	4646.467	
325	13.5	4750.696	33.205	17.121	4781.317	
330	13.5	4886.792	33.716	17.652	4917.943	
335	13.5	5024.651	34.227	18.191	5056.342	

Greenman-Pedersen, Inc.
 4950 Genesee Street
 Buffalo, NY 14225

Project: KROG YOUNGS ROAD PUMP STATION
 SUBMERSIBLE PUMP STATION DESIGN
 SUMMARY HYDRAULICS WORKSHEET

DATE: 29-Apr-24
 JOB NO.: 2008034

FORCE MAIN CHARACTERISTICS

USING 2" Dia. Force Main Exterior to Station

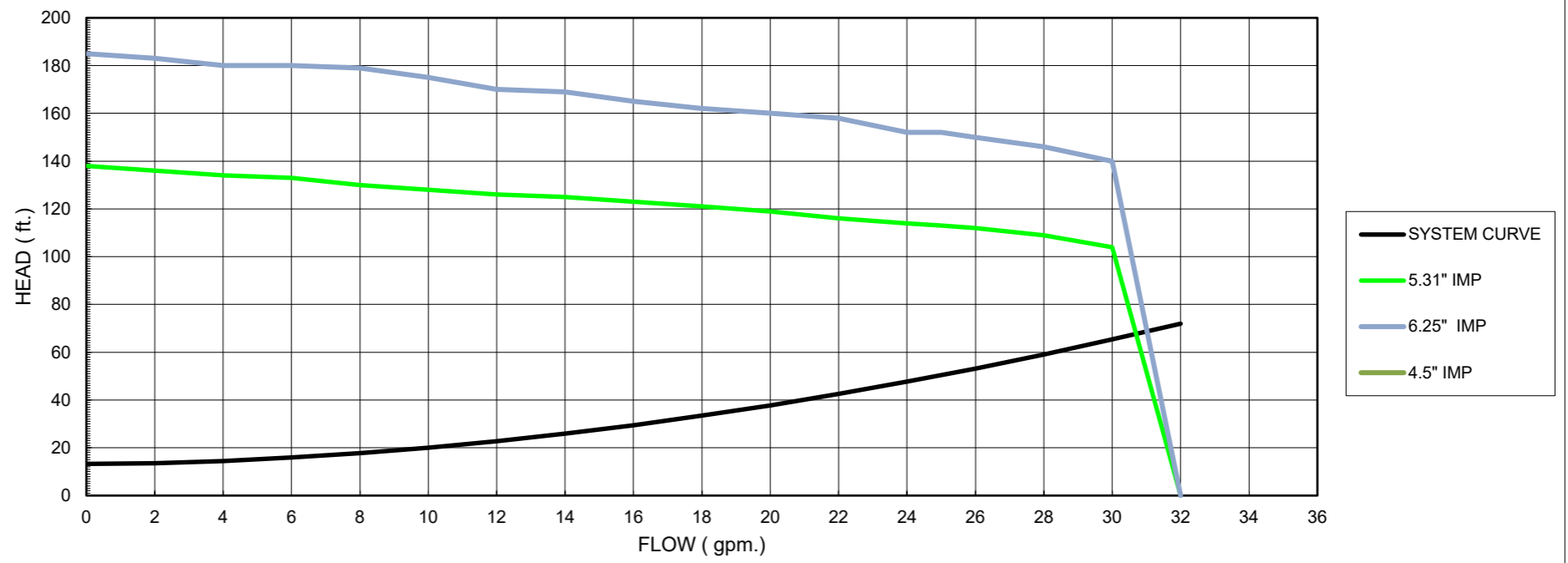
PUMP MODEL: MYERS V2
 PUMP SIZE: 2"
 IMP. SIZE:
 IMP.RPM.: 3500
 HORSEPOWER: 2.0 BHP

	Force Main Exterior		Discharge Interior	
Diameter	DiaM	2	DiaD	2
Length	LenM	1789	LenD	27
Roughness	CoefM	120	CoefD	120
Summation	KminM	7	KminD	6.9
Static	Head	13.26		

Normal Operating Cond. xx gpm at xx ft TDH
 Two pumps operating xx gpm

Q FLOW gpm.	EXTERIOR FRICTION LOSSES ft.	INTERIOR FRICTION LOSSES ft.	EXTERIOR MINOR LOSSES ft.	INTERIOR MINOR LOSSES ft.	SINGLE PUMP TDH ft.	6.25 IMP PUMP CURVE (VH20) ft.	5.31 IMP PUMP CURVE (VH20) ft.	4.5 IMP PUMP CURVE (VH20) ft.	PUMP CURVE ft.	PUMP CURVE ft.	MODIFIED PUMP CURVE ft.	COMBINED PUMP CURVE ft.	EXTERIOR TDH ft.
0.00	0.00	0.00	0.00	0.00	13.26	185.00	138.00				138.00	138.00	13.26
2.00	0.33	0.00	0.00	0.00	13.60	183.00	136.00				135.99	137.00	13.59
4.00	1.19	0.02	0.02	0.02	14.50	180.10	134.00				133.96	135.99	14.46
6.00	2.51	0.04	0.04	0.04	15.89	180.00	133.00				132.92	134.98	15.81
8.00	4.27	0.06	0.07	0.07	17.74	179.00	130.00				129.86	133.96	17.60
10.00	6.46	0.10	0.11	0.11	20.04	175.00	128.00				127.79	133.44	19.83
12.00	9.05	0.14	0.16	0.16	22.77	170.00	126.00				125.70	132.92	22.47
14.00	12.04	0.18	0.22	0.22	25.92	169.00	125.00				124.60	131.39	25.52
16.00	15.41	0.23	0.29	0.29	29.48	165.00	123.00				122.48	129.86	28.96
18.00	19.16	0.29	0.37	0.36	33.44	162.00	121.00				120.35	128.83	32.79
20.00	23.28	0.35	0.45	0.45	37.79	160.00	119.00				118.20	127.79	37.00
22.00	27.77	0.42	0.55	0.54	42.54	158.00	116.00				115.04	126.75	41.58
24.00	32.62	0.49	0.65	0.64	47.67	152.00	114.00				112.86	125.70	46.54
25.00	35.18	0.53	0.71	0.70	50.38	152.00	113.00				111.77	124.60	49.15
26.00	37.83	0.57	0.77	0.76	53.18	150.00	112.00				110.67	125.15	51.86
28.00	43.39	0.65	0.89	0.88	59.07	146.00	109.00				107.47	124.60	57.54
30.00	49.30	0.74	1.02	1.01	65.33	140.00	104.00				102.25	123.54	63.58
32.00	55.55	0.84	1.16	1.14	71.95	0.00	0.00				-1.98	122.48	69.97

KROG YOUNGS ROAD PUMP STATION
SINGLE PUMP OPERATING w/2" FM
MYERS VS20 PUMP



KROG YOUNGS ROAD PUMP STATION
 SUBMERSIBLE PUMP STATION DESIGN
 SUMMARY HYDRAULICS WORKSHEET
 MINOR LOSSES IN FORCE MAIN

Interior to Station	K	No.	Total
90 Deg Bend	0.8	3	2.4
Tee Thru Side Outlet	1.8	1	1.8
Gate Valve Open	0.2	1	0.2
Check Valve	2.5	1	2.5
Total			<u>6.9</u>
Exterior To Station			
45 Deg Bend	0.4	8	3.2
22.5 Deg Bend	0.2	5	1
90 Deg Bend	0.8	0	0
Tee Thru Side Outlet	1.8	1	1.8
Exit	1	1	1
			<u>7</u>
Total Length of Interior FM	27	ft.	
Total Length of Exterior FM	1789	ft	

KROG YOUNGS ROAD PUMP STATION
 SUBMERSIBLE PUMP STATION DESIGN
 SUMMARY HYDRAULICS WORKSHEET

Pump Station Operations Settings

1 Rim Elevation	696.00
2 Incoming Sewer Invert	684.7
3 Maximum Diameter	4 ft
4 Wetwell Area	12.57 ft ²
5 Lead Pump On Elev	681.7
6 All Pumps Off Elev	681.24
7 Working Volume	43.06 gal
8 Pump Rate	25 gpm
9 Average Flow Rate	3 gpm
10 Peak Flow Rate	14 gpm
11 Min Flow Rate	1 gpm
12 Lag Pump on Elev	682.20
13 High Water Alarm Elev	682.70
14 Wetwell Base Elev	678.24

Pump Cycling Times

Average Flow

Pump Time	2.00 min	Fill Time	12.40 min
Cycle Time	14.40 min	Cycles/hr	4.17 cycles

Peak Flow

Pump Time	4.06 min	Fill Time	2.99 min
Cycle Time	7.05 min	Cycles/hr	8.51 cycles

Minimum Flow

Pump Time	1.78 min	Fill Time	28.80 min
Cycle Time	30.58 min	Cycles/hr	1.96 cycles



V2 GRINDER SERIES

SHREDDING WASTEWATER CHALLENGES



PATENTED AXIAL CUTTER TECHNOLOGY



ADVANCED HYDRAULICS



LEGENDARY SEAL LEAK DETECTION

MYERS® V2 SERIES SUBMERSIBLE GRINDER PUMPS

The Myers V2 series grinder is engineered from the ground up, in order to overcome the increased debris and higher pressure required in today's wastewater environment. It features a patented axial cutter design and semi-open impeller to effectively macerate challenging sewage solids into a fine slurry.

Watch the video at www.Femyers.com



POLY ROPE



SHOP RAG



SWIFFERS®



MOP HEAD



PATENTED AXIAL CUTTER TECHNOLOGY

Easily slices through solids and trash found in domestic wastewater without roping or clogging.



ADVANCED HYDRAULICS

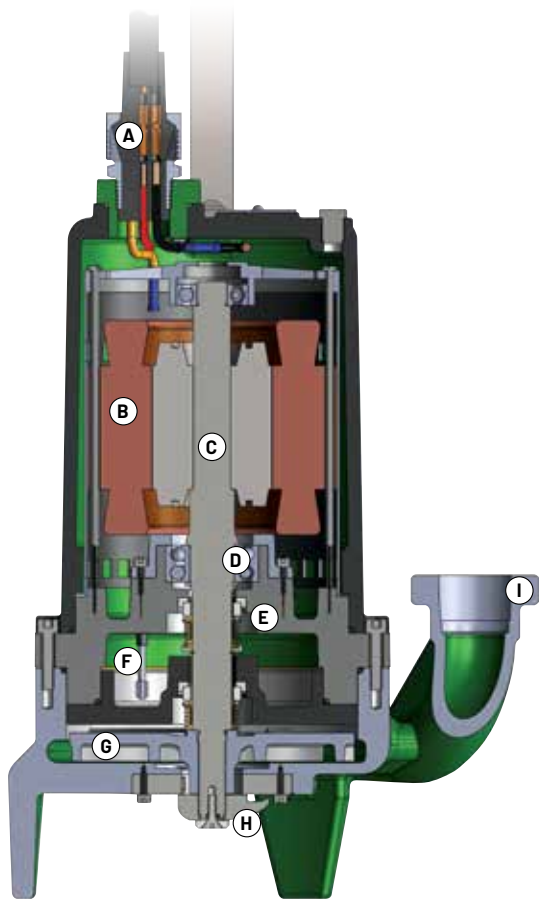
The only single stage 2 HP grinder that can deliver up to 185' of lift for superior performance and reliability.



LEGENDARY SEAL LEAK DETECTION

True early warning system for reduced downtime and maintenance costs.

Features



A. Cable Entry System

- NEW! Optional quick disconnect cord available for ease of maintenance
- Cable jacket sealed by compression fitting; individual wires sealed by compression grommet for double seal protection against water ingress
- Replace power cord without disturbing motor for ease of maintenance

B. Oil-Filled Motor

- Maximizes heat dissipation; provides constant bearing lubrication for long life
- High torque start/run capacitor for single or three-phase motors, assured starting under heavy loads

C. Heavy 416 SST Shaft

- Corrosion resistant, reduces shaft deflection for long life

D. Lower Double Row Ball Bearings

- Absorb both axial and radial loads for increased durability

E. Double Mechanical Shaft Seals

- In oil-filled seal chamber for continuous lubrication, superior motor protection

F. Seal Leak Probe

- Located in seal chamber instead of motor area for true early warning of water leaks. Allows corrective action before costly motor or bearing failure occurs.
- Activates warning light in control panel

G. SST Semi-Open Impeller

- Provides improved performance, resists clogging
- Pump-out vanes help keep trash from seal, reduces pressure at seal face for longer life

H. Axial Cutter System

- Constructed of 440 SST hardened to 57-60Rc for long life
- Easily replaceable without dismantling pump

I. Volute Case

- Cast iron 1-1/4" NPT vertical flanged discharge

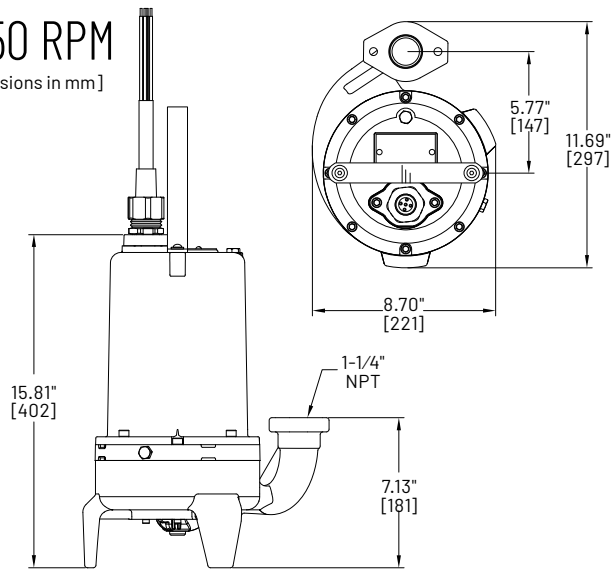
Electrical Data

	V/Ph/Hz	HP	Start Amps	FL Amps	Full Load kW	Start KVA	FL KVA	NEC Code Letter	Service Factor	Model	Standard Cord	
											20'	35'
High Head	230/1/60	2	49	18.5	4.2	11.27	4.26	G	1	Catalog Eng	VH20-21-20 28148D000	VH20-21-35 28148D004
	200/3/60	2	53	12.5	3.9	18.3	4.33	L	1	Catalog Eng	VH20-03-20 28148D001	VH20-03-35 28148D005
	230/3/60	2	46	12	3.9	18.3	4.77	L	1	Catalog Eng	VH20-23-20 28148D002	VH20-23-35 28148D006
	460/3/60	2	23	6	3.9	18.3	4.77	L	1	Catalog Eng	VH20-43-20 28148D003	VH20-43-35 28148D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog Eng	VH20-53-20 28148D020	VH20-53-35 28148D021
Standard Flow	200/1/60	2	66	16	3.2	13.2	3.2	G	1	Catalog Eng	VS20-01-20 28151D020	VS20-01-35 28151D021
	230/1/60	2	49	13.5	3.2	11.27	3.12	G	1	Catalog Eng	VS20-21-20 28151D000	VS20-21-35 28151D004
	200/3/60	2	53	10	3.2	18.3	3.46	L	1	Catalog Eng	VS20-03-20 28151D001	VS20-03-35 28151D005
	230/3/60	2	46	9	3.2	18.3	3.58	L	1	Catalog Eng	VS20-23-20 28151D002	VS20-23-35 28151D006
	460/3/60	2	23	4.2	3.2	18.3	3.35	L	1	Catalog Eng	VS20-43-20 28151D003	VS20-43-35 28151D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog Eng	VS20-53-20 28151D022	VS20-53-35 28151D023
High Flow	200/1/60	2	66	16	3.2	13.2	3.2	G	1	Catalog Eng	VF20-01-20 28247D020	VF20-01-35 28247D021
	230/1/60	2	49	13.5	3.2	11.27	3.12	G	1	Catalog Eng	VF20-21-20 28247D000	VF20-21-35 28247D004
	200/3/60	2	53	10	3.2	18.3	3.46	L	1	Catalog Eng	VF20-03-20 28247D001	VF20-03-35 28247D005
	230/3/60	2	46	9	3.2	18.3	3.58	L	1	Catalog Eng	VF20-23-20 28247D002	VF20-23-35 28247D006
	460/3/60	2	23	4.2	3.2	18.3	3.35	L	1	Catalog Eng	VF20-43-20 28247D003	VF20-43-35 28247D007
	575/3/60	2	25	5	3.9	24.9	4.98	L	1	Catalog Eng	VF20-53-20 28247D022	VF20-53-35 28247D023

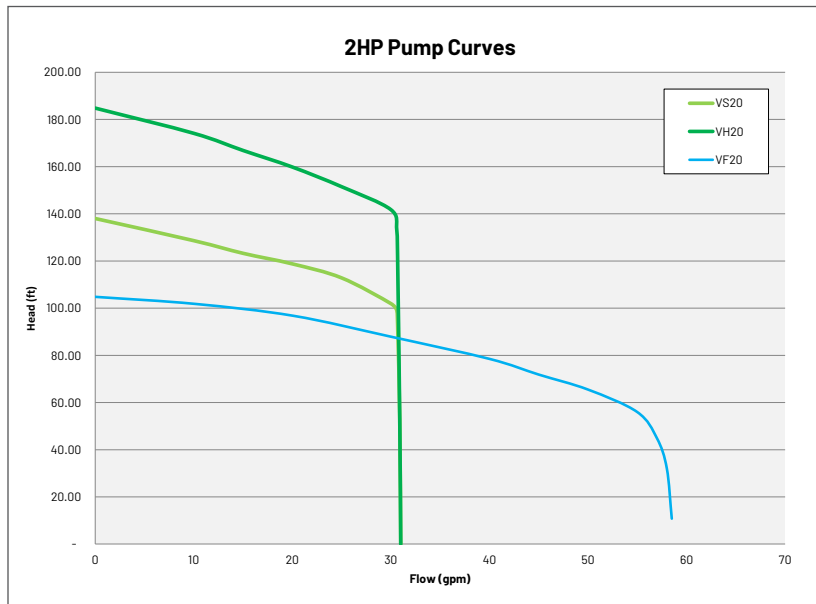
Performance Data and Dimensions

3450 RPM

[Dimensions in mm]



Product Capabilities		
Capacities To	58.5 gpm	221.4 lpm
Heads To	185 ft.	56.34 m
Liquids Handling	domestic raw sewage	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Winding Insulation Temp. (Class F)	311°F	155°C
Motor Electrical Data <small>(Single phase motors are capacitor start type. Myers control panels or capacitor kits are recommended for proper operation and warranty.)</small>	2 hp, 3450 rpm 1 ph - capacitor start/run. 230 volts; 60 Hz 3 ph - induction run 200, 230, 460 volts, 60 Hz	
Std. Third Party Approvals	CSA	
Acceptable pH Range	6 - 9	
Specific Gravity	.9 - 1.1	
Viscosity	28 - 35 SSU	
Discharge (Flange Dia.)	1-1/4 in.	31.75 mm
Min. Sump Diameter		
Simplex	24 in.	61.0 cm
Duplex	36 in.	91.4 cm



Construction Materials	
Motor Housing, Seal Housing, Cord Cap and Volute Case	Cast Iron, Class 30, ASTM A48
Impeller	Semi-Open, Stainless Steel
Mechanical Seals: Standard Optional	Double Tandem Carbon and Ceramic Lower Tungsten Carbide
Pump, Motor Shaft	416 SST
Fasteners	300 Series SST
Rotating Cutter, Stationary Cutter	440 SST 57-60 Rockwell



1101 Myers Parkway | Ashland, OH 44805 | Ph: 855.274.8948 | pentair.com/pentair-myers

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Item Number / Tags	: Default	Size	: Myers - VS20
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: SUB_G_O_AH_00010_A_2 Rev
Quote number	:		2017-05-30
		Date last saved	: 29 Feb 2024 10:37 AM

Operating Conditions

Flow, rated	: 29.69 USgpm
Differential head / pressure, rated (requested)	: 105.3 ft
Differential head / pressure, rated (actual)	: 105.3 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 3500 rpm
Impeller diameter, rated	: 5.31 in
Impeller diameter, maximum	: 5.31 in
Impeller diameter, minimum	: 5.31 in
Efficiency	: -
NPSH required / margin required	: - / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 11 / - Metric units
Minimum Continuous Stable Flow	: -
Head, maximum, rated diameter	: 138.0 ft
Head rise to shutoff	: 31.08 %
Flow, best eff. point	: -
Flow ratio, rated / BEP	: -
Diameter ratio (rated / max)	: 100.00 %
Head ratio (rated dia / max dia)	: 100.00 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

Material selected	: Standard
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Pressure Data

Maximum working pressure	: 59.73 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 0.79 hp
Power, rated	: 1.95 hp
Power, maximum, rated diameter	: 1.95 hp
Motor rating	: 2.00 hp / 1.49 kW (Fixed)

