Pump Specifications—Sta-Rite Berkeley

MANUFACTURE	STA-RITE BERKELEY CENTRIFUGALS								
HORSE POWER	1	1 1/2	1	1 1/2	2	2 1/2	2	3	5
MODEL #	HMSE *	HMSF *	DS2HE	DS2HF	DS2HG	DS2HHG	SSHM2	DHH	DHJ
THERMAL OVERLOAD	YES	YES	YES	YES	YES	YES	YES	YES	YES
SELF PRIMING	YES	YES	YES	YES	YES	YES	YES	YES	YES
STAGES	2	2	1	1	1	1	4	1	1
VOLTAGE	115,230	115,230	115,230	115,230	115, 230	115,230	230	230	230
SUCTION SIZE	1-1/4"	1-1/4"	2"	2"	2"	2"	1-1/2"	2", 3"	2", 3"
DISCHARGE SIZE	1"	1"	1-1/2"	1-1/2"	2"	2"	1-1/4"	2"	2"
PERFORMANCE IN PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
10 GPM	65	70	43	51	56	61	100	61	71
20 GPM	56	65	39	48	54	56	95	60	69
30 GPM	46	58	34	45	49	54	82	59	68
40 GPM		48		39	45	50	64	57	68
50 GPM					39	45	43	54	66
60 GPM						39		52	64
70 GPM								48	64
80 GPM								45	62
90 GPM								41	60
100 GPM									58
PERFORMANCE IN TDH	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD
10 GPM	150	162	99	118	129	141	231	141	164
20 GPM	129	150	90	111	125	129	219	139	159
30 GPM	106	134	79	104	113	125	189	136	157
40 GPM		110		90	104	116	148	132	157
50 GPM					90	104	99	125	152
60 GPM						91		120	148
70 GPM								111	148
80 GPM								104	143
90 GPM								95	139
100 GPM									134

**** HMS SERIES CAN OPERATE AS A DEEP WELL PUMP WITH SUCTION PACKAGE OPTION.***

ALL DATA PROVIDED IS AT THE PUMP DISCHARGE, SYSTEM LOSSES NEED TO BE ACCOUNTED FOR.

PSI= POUNDS PER SQUARE INCH OF PRESSURE

TDH= TOTAL DYNAMIC HEAD

PERFORMANCE BASED ON LESS THAN 2' OF SUCTION LIFT

DO NOT OPERATE PUMP IN THIS AREA!

OPERATE PUMP IN THIS AREA WITH CAUTION!

Note: Prices are subject to change without notice.

Pump Specifications—Flint & Walling

MANUFACTURE	FLINT AND WALLING CENTRIFUGALS						
HORSE POWER	1 1/2	2	2	3	3	5	5
MODEL #	SPJ15-1	CJ101B201	CJ101C201	CJ101C301	C22231	C22251	C22153
THERMAL OVERLOAD	YES	YES	YES	YES	YES	YES	YES
SELF PRIMING	YES	NO	NO	NO	NO	NO	NO
STAGES	1	2	3	3	2	2	1
VOLTAGE	115	115,230	115, 230	230	230	230	230
SUCTION SIZE	2"	2"	2"	2"	2-1/2"	2-1/2"	2-1/2"
DISCHARGE SIZE	1-1/2"	2"	2"	2"	2"	2"	2"
PERFORMANCE IN PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
10 GPM	48	69	89	95	75	73	47
20 GPM	47	66	81	91	73	73	47
30 GPM	45	56	65	81	70	73	47
40 GPM	42	39	32	59	66	73	47
50 GPM	37			21	61	71	47
60 GPM					54	69	47
70 GPM					45	67	46
80 GPM						63	46
90 GPM						60	46
100 GPM						56	45
PERFORMANCE IN TDH	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD	HEAD
10 GPM	111	159	205	219	173	169	108
20 GPM	108	152	187	210	168	169	108
30 GPM	104	129	150	187	162	169	108
40 GPM	97	90	74	136	152	169	108
50 GPM	85			48	141	164	108
60 GPM					125	159	108
70 GPM					104	154	106
80 GPM						145	106
90 GPM						139	106
100 GPM						129	104

ALL DATA PROVIDED IS AT THE PUMP DISCHARGE, SYSTEM LOSSES NEED TO BE ACCOUNTED FOR

PERFORMANCE IS BASED ON LESS THAN 2' OF SUCTION LIFT

PSI= POUNDS PER SQUARE INCH OF PRESSURE

TDH= TOTAL DYNAMIC HEAD

DO NOT OPERATE PUMP IN THIS AREA!

OPERATE PUMP IN THIS AREA WITH CAUTION!

Note: Prices are subject to change without notice.

Pump Specifications—Munro

MANUFACTURE	MUNRO CENTRIFUGALS				
HORSE POWER	3/4	1	1 1/2	2	3
MODEL #	MULP075B	MULP100B	MULP150B	MULP200B	MULP300B
THERMAL OVERLOAD					
SELF PRIMING	YES	YES	YES	YES	YES
STAGES	1	1	1	1	1
VOLTAGE	115, 230	115, 230	115, 230	115, 230	230
SUCTION SIZE	2"	2"	2"	2"	2-1/2"
DISCHARGE SIZE	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"
PERFORMANCE IN PSI	PSI	PSI	PSI	PSI	PSI
10 GPM	39	43	49	59	61
20 GPM	37	40	48	58	61
30 GPM		37	47	56	61
40 GPM			45	54	60
50 GPM			41	51	59
60 GPM				49	56
70 GPM				45	54
80 GPM					49
90 GPM					
100 GPM					
PERFORMANCE IN TDH	HEAD	HEAD	HEAD	HEAD	HEAD
10 GPM	90	99	113	136	141
20 GPM	85	92	111	134	141
30 GPM		85	108	129	141
40 GPM			104	125	139
50 GPM			95	118	136
60 GPM				113	129
70 GPM				104	125
80 GPM					113
90 GPM					
100 GPM					

DATA PROVIDED IS AT PUMP DISCHARGE, SYSTEM LOSSES NEED TO BE ACCOUNTED FOR

PSI= POUNDS PER SQUARE INCH OF PRESSURE

TDH= TOTAL DYNAMIC HEAD

PERFORMANCE IS BASED ON LESS THAN 2' SUCTION LIFT

DO NOT OPERATE PUMP IN THIS AREA!

OPERATE PUMP IN THIS AREA WITH CAUTION!

Note: Prices are subject to change without notice.

Pump Electrical Specifications

HORSE POWER	115V	208V	230V	460V	575V	MIN TRANS Kva	STD Kva
1/6 HP	4.4	2.4	2.2	1.1	0.9	0.53	0.750
1/4 HP	5.8	3.2	2.9	1.4	1.2	0.70	0.750
1/3 HP	7.2	4	3.6	1.8	1.4	0.87	1
1/2 HP	9.8	5.4	4.9	2.5	2	1.2	1.5
3/4 HP	13.8	7.6	6.9	3.5	2.8	1.7	2
1 HP	16	8.8	8	4	3.2	1.9	2
1.5 HP	20	11	10	5	4	2.4	3
2 HP	24	13.2	12	6	4.8	2.9	3
3 HP	34	18.7	17	8.5	6.8	4.1	5
5 HP	56	30.8	28	14	11.2	6.7	7.5
7.5 HP	80	44	40	21	16	9.6	10
10 HP	100	55	50	26	20	12	15

ABOVE FOR TRANSFORMER SIZE RATING PUMP STARTERS

	FUSE SIZE		1 PHASE	3 PHASE
	115V	208V	230V	460V
1 HP	20 AMP		10 AMP	
1.5 HP	25 AMP		15 AMP	
2 HP	40 AMP		20 AMP	
3 HP			25 AMP	
5 HP			30 AMP	
7.5 HP			45 AMP	15 AMP
10 HP			60 AMP	20 AMP
15 HP			100 AMP	25 AMP

115 V 1 PH	COPPER WIRE SIZE/RUN LENGTH			IN FEET		
wire gauge	14	12	10	8	6	4
1HP		54'	90	149	234	342
1.5 HP			68	117	180	261
2 HP			30	77	117	180

220V 1 PH						
1HP	223	253	555	871	1356	2070
1.5 HP	185	293	459	721	1123	1728
2 HP	142	237	370	586	920	1407
3 HP		180	285	446	712	1130
5 HP			140	266	400	675
7.5 HP				120	295	465

USE THIS AS A GUIDE ONLY, USE QUALIFIED ELECTRICIAN TO DETERMINE YOUR SPECIFIC SITUATION

Note: Prices are subject to change without notice.

Water Feature Pump Data Worksheet

GPH	**Pumping Requirements:** To size a pump, first figure how big the water feature will be. Use table attached, then divide the figure by 60 to get GPM	_____GPM
Total Dynamic Head (TDH)	**Elevation:** a. Suction Lift When using a submersible pump suction lift should be "0". When using a non-submersible pump, measure vertical distance from water level to pump inlet. (Total measurement in feet) b. Elevation Change To figure elevation, measure the vertical distance from the surface of water to the highest point of discharge. (Total measurement in feet)	(a) _____FEET (b) _____FEET +
	Friction Loss: To estimate friction loss, keep velocity feet per second at 5' +/- 1' to first determine ideal pipe size. Then using friction loss chart, calculate loss per 100' of pipe based on flow + pipe size determined above. Multiply loss per 100' by number of 100' sections of pipe. (Total measurement in feet)	_____FEET +
	PSI - Pounds Per Square Inch Determine the pressure required to run both the fountain head and/or pressure filters (refer to the manufacturer's specifications). PSI x 2.31 = HEAD IN FEET	_____FEET =
	Total Dynamic Head (TDH): Total the sum of elevation, friction loss and PSI. This total equals TDH in feet.	_____TDH

Misc.

Electrical:			**Filtration:**			Check manufacturer's specifications to determine PSI for these filters.
Voltage:	☐ 110 Volt	☐ 220 Volt ☐ 440 Volt	Gravity:	☐ Waterfall	☐ Skimmer	
Phase:	☐ Single Phase	☐ Three Phase	Pressure:	☐ Pressure	☐ Sand	

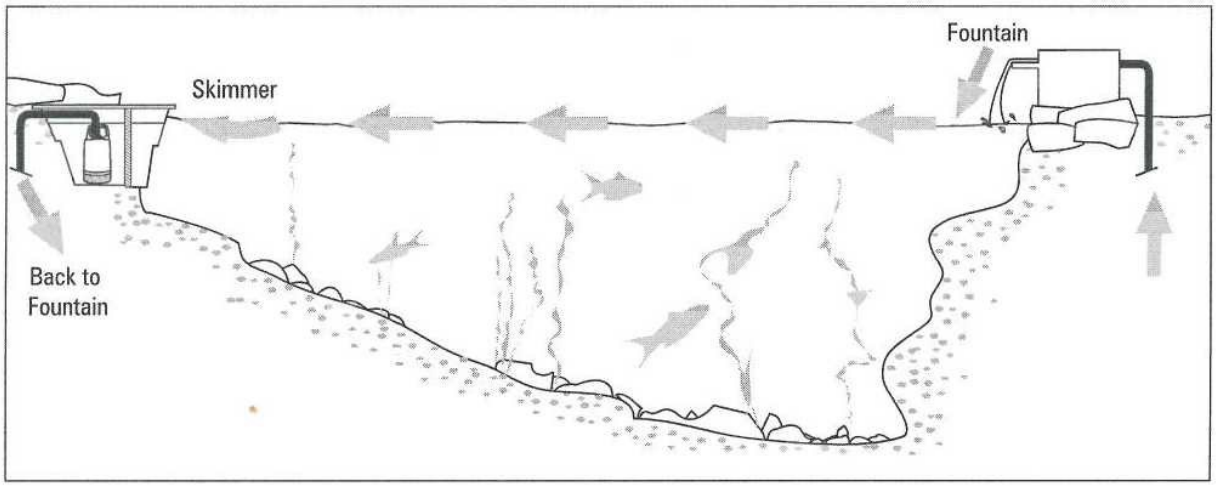
Feature

☐ Pond ☐ Fountain ☐ Pondless

Weir Chart

Length (L) of weir in feet

Head in Inches	1	3	5	Additional gpm for each ft over 5 ft
1	2420	6420	10790	2615
1 1/4	2970	9025	15025	3025
1 1/2	3895	11820	19770	3970
1 3/4	4860	14400	24900	5015
2	5910	18120	30360	6120
2 1/4	7020	21660	36300	7320
2 1/2	8170	25320	42360	8580
2 3/4	9420	29100	48900	9900
3	10670	33120	55560	10020



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Note: Prices are subject to change without notice.

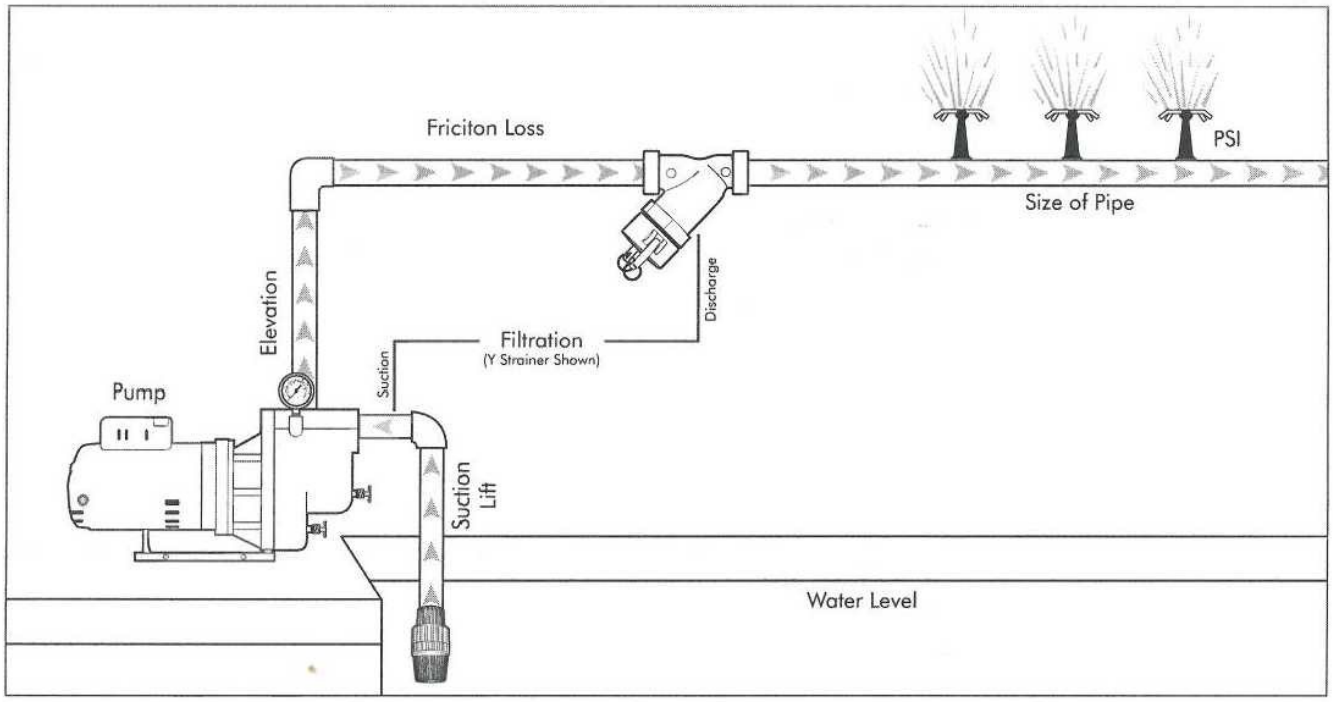
Centrifugal Pump Data Worksheet

GPM	**Pumping Requirements:** To size a pump, first figure total gallonage needed. (For example: Irrigation system, household usage, etc.)	_____GPM
Total Dynamic Head (TDH)	**Elevation:** a. Suction Lift To determine suction lift, measure the vertical distance between the water level and the pump inlet. (Total measurement in feet) b. Elevation Change To figure elevation, measure the vertical distance from the pump inlet to the highest point in the system. (Total measurement in feet)	(a) _____FEET (b) _____FEET +
	Friction Loss: To estimate friction loss, keep velocity feet per second at 5' +/- 1' to determine ideal pipe size. Refer to friction loss chart. (Total measurement in feet) *Refer to manufactuer's friction loss info and add.	_____FEET +
	PSI - Pounds Per Square Inch Determine the pressure required at the end of the line of the largest zone. Convert to head in feet using the following equation. PSI x 2.31 = HEAD IN FEET	_____FEET =
	Total Dynamic Head (TDH): Total the sum of elevation, friction loss and PSI. This total equals TDH in feet.	_____TDH

Misc.	Electrical:			Filtration:	Power Supply:
	Voltage:	☐ 110 Volt	☐ 220 Volt ☐ 440 Volt	☐ Suction	☐ Engine Driven
	Phase:	☐ Single Phase	☐ Three Phase	☐ Discharge	☐ Gas

H20 Water Supply:

☐ Suction from Pond ☐ Pump in Well ☐ Flooded Suction ☐ Irrigation Ditch



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Note: Prices are subject to change without notice.

Pipe Formulas & Conversion Factors

Precipitation Rates

U.S.

Equilateral Triangular Spacing

P.R.= (in/hr) $\frac{(\text{GPM of 360}) \times 96.25}{(\text{Head Spacing})^2 \times .866}$

Square/Rectangular Spacing

P.R.= (in/hr) $\frac{(\text{GPM of 360}) \times 96.25}{\text{Head Spacing} \times \text{Row Spacing}}$

Square/Rectangular Spacing for Specific Arc

P.R.= (in/hr) $\frac{34650 \times \text{GPM (for any arc)}}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$

Metric

P.R.= (mm/hr) $\frac{m^3/\text{hr of 360} \times 1000}{m^2 \times .866}$

P.R.= (mm/hr) $\frac{m^3/\text{hr of 360} \times 1000}{\text{Head Spacing} \times \text{Row Spacing}}$

P.R.= (mm/hr) $\frac{m^3/\text{hr (for any arc)} \times 1000}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$

Horsepower

H.P. = $\frac{\text{GPM} \times \text{Ft of Head}}{3{,}960 \times \text{Pump Efficiency (expressed as a decimal)}}$

Station Run Time

S.R.T. = (min/wk) $\frac{\text{Total Weekly Req'd (inch/wk)} \times 60 \text{ (min/hr)}}{\text{Precipitation Rate (in/hr)}}$

S.R.T. = (min/wk) $\frac{\text{Total Weekly Req'd (mm/wk)} \times 60 \text{ (min/hr)}}{\text{Precipitation Rate (mm/hr)}}$

Pipe Velocity

V= (ft/sec) $\frac{0.4085 \times \text{Flow (GPM)}}{(\text{Inside Pipe Diameter in Inches})^2}$

V= (m/sec) $\frac{1273.24 \times \text{Flow (l/sec)}}{(\text{Inside Pipe Diameter in Millimeters})^2}$

Slope

S = $\frac{\text{Rise (Measure of Length)}}{\text{Run (Measure of Length)}}$

To Convert	From	To	Multiply By
Area	acres	feet²	43560
	acres	meters²	4046.8
	meters²	feet²	10.764
	feet²	inches²	144
	inches²	centimeters²	6.452
	hectares	meters²	10,000
	hectares	acres	2.471
Power	kilowatts	horsepower	1.3410
Flow	feet³/minutes	meters³/second	0.0004719
	feet³/second	meters³/second	.02832
	yards³/minute	meters³/second	.01274
	gallons/minute	meters³/hour	.22716
	gallons/minute	liters/minute	3.7854
	gallons/minutes	liters/second	.06309
	meters³/hour	liters/minute	16.645
	meters³/hour	liters/second	.2774
	liters/minute	liters/second	60
Length	feet	inches	12
	inches	centimeters	2.540
	feet	meters	.30481
	kilometers	miles	.6214
	miles	feet	5280
	miles	meters	1609.34
	millimeters	inch	.03937

To Convert	From	To	Multiply By
Pressure	psi	kilopascals	6.89476
	psi	bars	.068948
	bars	kilopascals	100
	psi	feet of head	2.31
Velocity	feet/second	meters/second	.3048
Volume	feet³	gallons	7.481
	feet³	liters	28.32
	meters³	feet³	35.31
	meters³	yard³	1.3087
	yards³	feet³	27
	yards³	gallons	202
	acres/feet	feet³	43,560
	gallons	meters³	.003785
	gallons	liters	3.785
	imperial gallons	gallons	1.833

Note: Prices are subject to change without notice.

Friction Loss Characteristics

POLYETHYLENE (PE) PLASTIC PIPE ID CONTROLLED

Size: ½" thru 4" Flow: 1 thru 500GPM

PE 3408 ASTM D-2239 C=140 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

Size	½"		¾"		1"		1¼"		1½"		2"		2½"		3"		4"	
Avg ID	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026	
Flow GPM	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss
1	1.05	0.49	0.60	0.12	0.37	0.04	0.21	0.01	0.16	0.00								
2	2.11	1.76	1.20	0.45	0.74	0.14	0.43	0.04	0.31	0.02	0.19	0.01						
3	3.16	3.73	1.80	0.95	1.11	0.29	0.64	0.08	0.47	0.04	0.29	0.01						
4	4.22	6.35	2.40	1.62	1.48	0.50	0.86	0.13	0.63	0.06	0.38	0.02	0.27	0.01				
5	5.27	9.60	3.00	2.44	1.85	0.76	1.07	0.20	0.79	0.09	0.48	0.03	0.33	0.01				
6	6.33	13.46	3.61	3.43	2.22	1.06	1.29	0.28	0.94	0.13	0.57	0.04	0.40	0.02	0.26	0.01		
7	7.38	17.91	4.21	4.56	2.60	1.41	1.50	0.37	1.10	0.18	0.67	0.05	0.47	0.02	0.30	0.01		
8	8.44	22.93	4.81	5.84	2.97	1.80	1.71	0.47	1.26	0.22	0.76	0.07	0.54	0.03	0.35	0.01		
9	9.49	28.52	5.41	7.26	3.34	2.24	1.93	0.59	1.42	0.28	0.86	0.08	0.60	0.03	0.39	0.01		
10	10.55	34.67	6.01	8.82	3.71	2.73	2.14	0.72	1.57	0.34	0.95	0.10	0.67	0.04	0.43	0.01		
12			7.21	12.37	4.45	3.82	2.57	1.01	1.89	0.48	1.15	0.14	0.80	0.06	0.52	0.02		
14			8.41	16.45	5.19	5.08	3.00	1.34	2.20	0.63	1.34	0.19	0.94	0.08	0.61	0.03		
16			9.61	21.07	5.93	6.51	3.43	1.71	2.52	0.81	1.53	0.24	1.07	0.10	0.69	0.04	0.40	0.01
18			10.82	26.21	6.67	8.10	3.86	2.13	2.83	1.01	1.72	0.30	1.20	0.13	0.78	0.04	0.45	0.01
20			12.02	31.85	7.42	9.84	4.28	2.59	3.15	1.22	1.91	0.36	1.34	0.15	0.87	0.05	0.50	0.01
22					8.16	11.74	4.71	3.09	3.46	1.46	2.10	0.43	1.47	0.18	0.95	0.06	0.55	0.02
24					8.90	13.79	5.14	3.63	3.78	1.72	2.29	0.51	1.61	0.21	1.04	0.07	0.60	0.02
26					9.64	16.00	5.57	4.21	4.09	1.99	2.48	0.59	1.74	0.25	1.13	0.09	0.65	0.02
28					10.38	18.35	6.00	4.83	4.41	2.28	2.67	0.68	1.87	0.28	1.21	0.10	0.70	0.03
30					11.12	20.85	6.43	5.49	4.72	2.59	2.86	0.77	2.01	0.32	1.30	0.11	0.76	0.03
32					11.86	23.50	6.86	6.19	5.04	2.92	3.06	0.87	2.14	0.36	1.39	0.13	0.81	0.03
34					12.61	26.29	7.28	6.92	5.35	3.27	3.25	0.97	2.28	0.41	1.47	0.14	0.86	0.04
36							7.71	7.69	5.67	3.63	3.44	1.08	2.41	0.45	1.56	0.16	0.91	0.04
38							8.14	8.50	5.98	4.02	3.63	1.19	2.54	0.50	1.65	0.17	0.96	0.05
40							8.57	9.35	6.30	4.42	3.82	1.31	2.68	0.55	1.73	0.19	1.01	0.05
42							9.00	10.24	6.61	4.83	4.01	1.43	2.81	0.60	1.82	0.21	1.06	0.06
44							9.43	11.16	6.93	5.27	4.20	1.56	2.94	0.66	1.91	0.23	1.11	0.06
46							9.86	12.12	7.24	5.72	4.39	1.70	3.08	0.71	1.99	0.25	1.16	0.07
48							10.28	13.11	7.56	6.19	4.58	1.84	3.21	0.77	2.08	0.27	1.21	0.07
50							10.71	14.14	7.87	6.68	4.77	1.98	3.35	0.83	2.17	0.29	1.26	0.08
55							11.78	16.87	8.66	7.97	5.25	2.36	3.68	0.99	2.38	0.35	1.38	0.09
60							12.85	19.82	9.44	9.36	5.73	2.77	4.02	1.17	2.60	0.41	1.51	0.11
65									10.23	10.86	6.21	3.22	4.35	1.36	2.82	0.47	1.64	0.13
70									11.02	12.45	6.68	3.69	4.69	1.55	3.03	0.54	1.76	0.14
75									11.81	14.15	7.16	4.19	5.02	1.77	3.25	0.61	1.89	0.16
80									12.59	15.95	7.64	4.73	5.35	1.99	3.47	0.69	2.01	0.18
85									13.38	17.84	8.12	5.29	5.69	2.23	3.68	0.77	2.14	0.21
90											8.59	5.88	6.02	2.48	3.90	0.86	2.27	0.23
95											9.07	6.50	6.36	2.74	4.12	0.95	2.39	0.25
100											9.55	7.15	6.69	3.01	4.33	1.05	2.52	0.28
110											10.50	8.53	7.36	3.59	4.77	1.25	2.77	0.33
120											11.46	10.02	8.03	4.22	5.20	1.47	3.02	0.39
130											12.41	11.62	8.70	4.89	5.63	1.70	3.27	0.45
140											13.37	13.33	9.37	5.61	6.07	1.95	3.52	0.52
150													10.04	6.38	6.50	2.22	3.78	0.59
160													10.71	7.19	6.94	2.50	4.03	0.67
170													11.38	8.04	7.37	2.79	4.28	0.74
180													12.05	8.94	7.80	3.11	4.53	0.83
190													12.72	9.88	8.24	3.43	4.78	0.92
200													13.39	10.87	8.67	3.78	5.03	1.01
220															9.54	4.50	5.54	1.20
240															10.40	5.29	6.04	1.41
260															11.27	6.14	6.54	1.64
280															12.14	7.04	7.05	1.88
300															13.00	8.00	7.55	2.13
320															13.87	9.02	8.05	2.40
340																	8.56	2.69
360																	9.06	2.99
380																	9.57	3.30
400																	10.07	3.63
420																	10.57	3.98
440																	11.08	4.33
460																	11.58	4.71
480																	12.08	5.09
500																	12.59	5.49

Shaded area represents velocities over 5 fps. Use with caution.

See pg 148 for friction loss formulas

Note: Prices are subject to change without notice.

Friction Loss Characteristics

PVC CLASS 200 IPS PLASTIC PIPE

Size: ½" thru 6" Flow: 1 thru 500GPM

ASTM D-2241 (1120, 1220) SDR 21 C=150 PSI LOSS PER 100 FEET OF PIPE (PSI/100 FT)

size	½"		¾"		1"		1¼"		1½"		2"		2½"		3"		4"		6"	
Avg.ID	0.696		0.910		1.169		1.482		1.700		2.129		2.581		3.146		4.046		5.955	
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
Avg Wall	0.072		0.070		0.073		0.089		0.100		0.123		0.147		0.177		0.227		0.335	
MinWall	0.062		0.060		0.063		0.079		0.090		0.113		0.137		0.167		0.214		0.316	
Flow GPM	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss
1	0.84	0.25	0.49	0.07	0.30	0.02	0.19	0.01	0.14	0.00										
2	1.68	0.90	0.99	0.24	0.60	0.07	0.37	0.02	0.28	0.01	0.18	0.00								
3	2.53	1.90	1.48	0.52	0.90	0.15	0.56	0.05	0.42	0.02	0.27	0.01								
4	3.37	3.24	1.97	0.88	1.19	0.26	0.74	0.08	0.56	0.04	0.36	0.01	0.24	0.01						
5	4.21	4.89	2.46	1.33	1.49	0.39	0.93	0.12	0.71	0.06	0.45	0.02	0.31	0.01						
6	5.05	6.86	2.96	1.86	1.79	0.55	1.11	0.17	0.85	0.09	0.54	0.03	0.37	0.01	0.25	0.00				
7	5.90	9.12	3.45	2.47	2.09	0.73	1.30	0.23	0.99	0.12	0.63	0.04	0.43	0.02	0.29	0.01				
8	6.74	11.68	3.94	3.17	2.39	0.94	1.49	0.30	1.13	0.15	0.72	0.05	0.49	0.02	0.33	0.01				
9	7.58	14.53	4.43	3.94	2.69	1.17	1.67	0.37	1.27	0.19	0.81	0.06	0.55	0.02	0.37	0.01				
10	8.42	17.66	4.93	4.79	2.99	1.42	1.86	0.45	1.41	0.23	0.90	0.08	0.61	0.03	0.41	0.01				
12	10.11	24.75	5.91	6.71	3.58	1.98	2.23	0.63	1.69	0.32	1.08	0.11	0.73	0.04	0.49	0.02				
14	11.79	32.93	6.90	8.93	4.18	2.64	2.60	0.83	1.98	0.43	1.26	0.14	0.86	0.06	0.58	0.02				
16	13.48	42.16	7.88	11.44	4.78	3.38	2.97	1.07	2.26	0.55	1.44	0.18	0.98	0.07	0.66	0.03	0.40	0.01		
18	15.16	52.44	8.87	14.23	5.37	4.21	3.34	1.33	2.54	0.68	1.62	0.23	1.10	0.09	0.74	0.03	0.45	0.01		
20			9.85	17.29	5.97	5.11	3.72	1.61	2.82	0.83	1.80	0.28	1.22	0.11	0.82	0.04	0.50	0.01		
22			10.84	20.63	6.57	6.10	4.09	1.92	3.11	0.99	1.98	0.33	1.35	0.13	0.91	0.05	0.55	0.01		
24			11.82	24.24	7.17	7.17	4.46	2.26	3.39	1.16	2.16	0.39	1.47	0.15	0.99	0.06	0.60	0.02		
26			12.81	28.11	7.76	8.31	4.83	2.62	3.67	1.34	2.34	0.45	1.59	0.18	1.07	0.07	0.65	0.02		
28			13.80	32.25	8.36	9.53	5.20	3.01	3.95	1.54	2.52	0.52	1.71	0.20	1.15	0.08	0.70	0.02		
30			14.78	36.64	8.96	10.83	5.57	3.41	4.24	1.75	2.70	0.59	1.84	0.23	1.24	0.09	0.75	0.03		
32					9.55	12.21	5.94	3.85	4.52	1.97	2.88	0.66	1.96	0.26	1.32	0.10	0.80	0.03	0.37	0.00
34					10.15	13.66	6.32	4.31	4.80	2.21	3.06	0.74	2.08	0.29	1.40	0.11	0.85	0.03	0.39	0.00
36					10.75	15.18	6.69	4.79	5.08	2.45	3.24	0.82	2.20	0.32	1.48	0.12	0.90	0.04	0.41	0.01
38					11.35	16.78	7.06	5.29	5.36	2.71	3.42	0.91	2.33	0.36	1.57	0.14	0.95	0.04	0.44	0.01
40					11.94	18.45	7.43	5.82	5.65	2.98	3.60	1.00	2.45	0.39	1.65	0.15	1.00	0.04	0.46	0.01
42					12.54	20.20	7.80	6.37	5.93	3.27	3.78	1.09	2.57	0.43	1.73	0.16	1.05	0.05	0.48	0.01
44					13.14	22.02	8.17	6.94	6.21	3.56	3.96	1.19	2.69	0.47	1.81	0.18	1.10	0.05	0.51	0.01
46					13.73	23.91	8.55	7.54	6.49	3.86	4.14	1.29	2.82	0.51	1.90	0.19	1.15	0.06	0.53	0.01
48					14.33	25.87	8.92	8.15	6.78	4.18	4.32	1.40	2.94	0.55	1.98	0.21	1.20	0.06	0.55	0.01
50					14.93	27.90	9.29	8.79	7.06	4.51	4.50	1.51	3.06	0.59	2.06	0.23	1.25	0.07	0.58	0.01
55							10.22	10.49	7.76	5.38	4.95	1.80	3.37	0.71	2.27	0.27	1.37	0.08	0.63	0.01
60							11.15	12.33	8.47	6.32	5.40	2.11	3.67	0.83	2.47	0.32	1.50	0.09	0.69	0.01
65							12.07	14.30	9.18	7.33	5.85	2.45	3.98	0.96	2.68	0.37	1.62	0.11	0.75	0.02
70							13.00	16.40	9.88	8.41	6.30	2.81	4.29	1.10	2.89	0.42	1.74	0.12	0.81	0.02
75							13.93	18.63	10.59	9.56	6.75	3.20	4.59	1.25	3.09	0.48	1.87	0.14	0.86	0.02
80							14.86	21.00	11.29	10.77	7.20	3.60	4.90	1.41	3.30	0.54	1.99	0.16	0.92	0.02
85									12.00	12.05	7.65	4.03	5.21	1.58	3.50	0.60	2.12	0.18	0.98	0.03
90									12.71	13.40	8.10	4.48	5.51	1.76	3.71	0.67	2.24	0.20	1.04	0.03
95									13.41	14.81	8.55	4.95	5.82	1.94	3.92	0.74	2.37	0.22	1.09	0.03
100									14.12	16.28	9.00	5.45	6.12	2.13	4.12	0.81	2.49	0.24	1.15	0.04
110											9.90	6.50	6.74	2.55	4.53	0.97	2.74	0.29	1.27	0.04
120											10.80	7.63	7.35	2.99	4.95	1.14	2.99	0.34	1.38	0.05
130											11.70	8.85	7.96	3.47	5.36	1.32	3.24	0.39	1.50	0.06
140											12.60	10.16	8.57	3.98	5.77	1.52	3.49	0.45	1.61	0.07
150											13.50	11.54	9.19	4.52	6.18	1.73	3.74	0.51	1.73	0.08
160											14.40	13.01	9.80	5.10	6.60	1.95	3.99	0.57	1.84	0.09
170													10.41	5.70	7.01	2.18	4.24	0.64	1.96	0.10
180													11.02	6.34	7.42	2.42	4.49	0.71	2.07	0.11
190													11.64	7.01	7.83	2.67	4.74	0.79	2.19	0.12
200													12.25	7.71	8.24	2.94	4.98	0.86	2.30	0.13
220													13.47	9.19	9.07	3.51	5.48	1.03	2.53	0.16
240													14.70	10.80	9.89	4.12	5.98	1.21	2.76	0.18
260															10.72	4.78	6.48	1.41	2.99	0.21
280															11.54	5.48	6.98	1.61	3.22	0.25
300															12.37	6.23	7.48	1.83	3.45	0.28
320															13.19	7.02	7.98	2.06	3.68	0.31
340															14.02	7.86	8.47	2.31	3.91	0.35
360															14.84	8.73	8.97	2.57	4.14	0.39
380																	9.47	2.84	4.37	0.43
400																	9.97	3.12	4.60	0.48
420																	10.47	3.42	4.83	0.52
440																	10.97	3.72	5.06	0.57
460																	11.46	4.04	5.29	0.62
480																	11.96	4.37	5.52	0.67
500																	12.46	4.72	5.75	0.72

Shaded area represents velocities over 5 fps. Use with caution.

See pg 148 for friction loss formulas

Note: Prices are subject to change without notice.