



Naples Botanical Garden (Naples, FL)

## **The Intelligent Use of Water**

The Naples Botanical Garden was selected as the 2009 Rain Bird Intelligent Use of Water Leadership Award winner. Having adopted the water use goals for LEED Gold Certification, the garden is a leader in freshwater conservation and management and incorporates numerous water conserving features into its design. Parking lot bio-swales capture rainwater that filters through the ground, carrying water to the giant entry feature bio-swale, the Rain Garden. A "River of Grass" garden feature serves as a natural filtration system before the water is slowly released to the preserve area. The primary irrigation system for the garden implements soil moisture detectors that direct water as needed through drip emitters. The system has allowed the garden to reduce water use by 50 percent.



## **Water Conservation Initiatives**

- Since 1933 Rain Bird has focused on developing products and technologies that use water in the most efficient manner possible. This commitment to The Intelligent Use of Water® extends to education, training, services for the industry and the community. For information visit [www.rainbird.com/iuow](http://www.rainbird.com/iuow)
- The Intelligent Use of Water Award recognizes individuals' and organizations' contributions to reducing outdoor water waste. The Intelligent Use of Water Film Competition ([www.iuowfilm.com](http://www.iuowfilm.com)), is an opportunity for both amateur and professional filmmakers to draw attention to the need to use water wisely
- The Intelligent Use of Water Summit Series convenes water experts from around the world – many of them from the green industry – to discuss conservation strategies and initiatives

## How to Use This Catalog

### Precipitation Rates

Rain Bird has calculated for you the precipitation rates for our comprehensive lines of impacts, sprays, and rotors. These rates are an indication of the approximate rate at which water is being applied. The equations used to calculate the precipitation rates are as follows:

<p style="text-align: center;"><b>■</b></p> <p style="text-align: center;"><b>Square Spacing</b></p> <p><b>U.S.:</b> <math>PR = \frac{96.3 \times \text{gpm}}{S \times S}</math></p> <p><b>Metric:</b> <math>PR = \frac{1000 \times \text{m}^3/\text{h}}{S \times S}</math></p>	<p style="text-align: center;"><b>▲</b></p> <p style="text-align: center;"><b>Triangular Spacing</b></p> <p><b>U.S.:</b> <math>PR = \frac{96.3 \times \text{gpm}}{S \times L}</math></p> <p><b>Metric:</b> <math>PR = \frac{1000 \times \text{m}^3/\text{h}}{S \times L}</math></p>
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- 96.3 = Constant (inches/square foot/hour)
- 1000 = Constant (millimeter/square meter/hour)
- gpm = Gallons per minute (applied to area by sprinklers)
- m<sup>3</sup>/h = Cubic meters per hour (applied to area by sprinklers)
- S = Spacing between sprinklers
- L = Spacing between rows (S x 0.866)

### Specification Information

The information in this catalog was accurate at the time of printing and may be used for proper specification of each product. For the most up-to-date information, go to the Rain Bird web site at [www.rainbird.com](http://www.rainbird.com).

### ASAE Test Certification Statement

Rain Bird Corporation certifies that pressure, flow rate, and radius data for its products were determined and listed in accordance with ASAE Standard S398.1, Procedure for Sprinkler Testing and Performance Reporting, and are representative of performance of production sprinklers at the time of publication. Actual product performance may differ from the published specifications due to normal manufacturing variations and sample selection. All other specifications are solely the recommendations of Rain Bird Corporation.

### Reference Charts

Information contained in this catalog is based upon generally accepted formulas, computations, and trade practices. Rain Bird Corporation, and its subsidiaries and affiliates, shall not be responsible or liable therefore if any problems, difficulties, or injuries should arise from or in connection with the use or application of this information, or if there is any error herein, typographical or otherwise.

### Technical Support

Rain Bird Technical Support has the answers to your specific product and water-management questions. Call our toll-free Technical Service or Spec Hotline numbers, or for maximum convenience, access the Rain Bird web site. You'll get expert advice and the right solutions.

<b>Technical Service</b>	<b>Spec Hotline</b>	<b>Internet Address</b>
1-800-RAINBIRD (1-800-724-6247)	1-800-458-3005	<a href="http://www.rainbird.com">www.rainbird.com</a>

### Pressure Loss Through Water Meters

Pressure Loss: psi  
Nominal Size

Flow gpm	5/8"	3/4"	1"	1 1/2"	2"	3"	4"
1	0.2	0.1					
2	0.3	0.2					
3	0.4	0.3					
4	0.6	0.5	0.1				
5	0.9	0.6	0.2				
6	1.3	0.7	0.3				
7	1.8	0.8	0.4				
8	2.3	1.0	0.5				
9	3.0	1.3	0.6				
10	3.7	1.6	0.7				
11	4.4	1.9	0.8				
12	5.1	2.2	0.9				
13	6.1	2.6	1.0				
14	7.2	3.1	1.1				
15	8.3	3.6	1.2				
16	9.4	4.1	1.4	0.4			
17	10.7	4.6	1.6	0.5			
18	12.0	5.2	1.8	0.6			
19	13.4	5.8	2.0	0.7			
20	15.0	6.5	2.2	0.8			
22		7.9	2.8	1.0			
24		9.5	3.4	1.2			
26		11.2	4.0	1.4			
28		13.0	4.6	1.6			
30		15.0	5.3	1.8			
32			6.0	2.1	0.8		
34			6.9	2.4	0.9		
36			7.8	2.7	1.0		
38			8.7	3.0	1.2		
40			9.6	3.3	1.3		
42			10.6	3.6	1.4		
44			11.7	3.9	1.5		
46			12.8	4.2	1.6		
48			13.9	4.5	1.7		
50			15.0	4.9	1.9	0.7	
52				5.3	2.1		
54				5.7	2.2		
56				6.2	2.3		
58				6.7	2.5		
60				7.2	2.7		
65				8.3	3.2	1.1	
70				9.8	3.7	1.3	
75				11.2	4.3	1.5	
80				12.8	4.9	1.6	0.7
90				16.1	6.2	2.0	0.8
100				20.0	7.8	2.5	0.9
110					9.5	2.9	1.0
120					11.3	3.4	1.2
130					13.0	3.9	1.4
140					15.1	4.5	1.6
150					17.3	5.1	1.8
160					20.0	5.8	2.1
170						6.5	2.4
180						7.2	2.7
190						8.0	3.0
200						9.0	3.2
220						11.0	3.9
240						13.0	4.7
260						15.0	5.5
280						17.3	6.3
300						20.0	7.2
350							10.0
400							13.0
450							16.2
500							20.0

PVC Class 160 IPS Plastic Pipe

(1120, 1220) SDR 26 C=150

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1" through 6" Flow 1 through 600 gpm

Size	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
O.D.	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625
I.D.	1.195	1.532	1.754	2.193	2.655	3.230	4.154	6.115
Wall Thk	0.06	0.064	0.073	0.091	0.110	0.135	0.173	0.225
Flow gpm	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss
1	0.29	0.02	0.17	0.01	0.13	0.00	0.08	0.00
2	0.57	0.06	0.35	0.02	0.27	0.01	0.17	0.00
3	0.86	0.14	0.52	0.04	0.40	0.02	0.25	0.01
4	1.14	0.23	0.70	0.07	0.53	0.04	0.34	0.01
5	1.43	0.35	0.87	0.11	0.66	0.05	0.42	0.02
6	1.72	0.49	1.04	0.15	0.80	0.08	0.51	0.03
7	2.00	0.66	1.22	0.20	0.93	0.10	0.59	0.03
8	2.29	0.84	1.39	0.25	1.06	0.13	0.68	0.04
9	2.57	1.04	1.57	0.31	1.20	0.16	0.76	0.05
10	2.86	1.27	1.74	0.38	1.33	0.20	0.85	0.07
11	3.15	1.51	1.91	0.45	1.46	0.23	0.93	0.08
12	3.43	1.78	2.09	0.53	1.59	0.27	1.02	0.09
14	4.00	2.36	2.44	0.71	1.86	0.37	1.19	0.12
16	4.58	3.02	2.78	0.90	2.12	0.47	1.36	0.16
18	5.15	3.76	3.13	1.12	2.39	0.58	1.53	0.20
20	5.72	4.57	3.48	1.36	2.66	0.71	1.70	0.24
22	6.29	5.45	3.83	1.63	2.92	0.84	1.87	0.28
24	6.87	6.40	4.18	1.91	3.19	0.99	2.04	0.33
26	7.44	7.43	4.53	2.22	3.45	1.15	2.21	0.39
28	8.01	8.52	4.87	2.54	3.72	1.32	2.38	0.44
30	8.58	9.68	5.22	2.89	3.98	1.50	2.55	0.50
35	10.01	12.87	6.09	3.84	4.65	1.99	2.97	0.67
40	11.44	16.48	6.96	4.92	5.31	2.55	3.40	0.86
45	12.87	20.49	7.83	6.12	5.98	3.17	3.82	1.07
50	14.30	24.90	8.70	7.43	6.64	3.85	4.25	1.30
55	15.73	29.70	9.57	8.87	7.30	4.59	4.67	1.55
60	17.16	34.89	10.44	10.42	7.97	5.39	5.10	1.82
65	18.59	40.45	11.31	12.08	8.63	6.25	5.52	2.11
70	20.02	46.40	12.18	13.85	9.29	7.17	5.95	2.42
75			13.05	15.74	9.96	8.15	6.37	2.75
80			13.92	17.74	10.62	9.18	6.80	3.10
85			14.79	19.84	11.29	10.27	7.22	3.46
90			15.66	22.05	11.95	11.42	7.64	3.85
95			16.53	24.37	12.61	12.62	8.07	4.26
100			17.41	26.80	13.28	13.87	8.49	4.68
110			19.15	31.97	14.61	16.55	9.34	5.58
120					15.93	19.44	10.19	6.56
130					17.26	22.54	11.04	7.60
140					18.59	25.85	11.89	8.72
150					19.92	29.37	12.74	9.91
160					13.59	11.16	9.27	4.40
170					14.44	12.49	9.85	4.93
180					15.29	13.88	10.43	5.48
190					16.14	15.34	11.01	6.05
200					16.99	16.87	11.59	6.65
225					19.11	20.98	13.04	8.27
250					14.49	10.06	9.79	3.87
275					15.94	11.99	10.77	4.62
300					17.39	14.09	11.75	5.43
325					18.83	16.34	12.73	6.29
350							13.70	7.22
375							14.68	8.20
400							15.66	9.24
425							16.64	10.34
450							17.62	11.49
475							18.60	12.70
500							19.58	13.97
550								13.02
600								5.75

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = .408 \frac{Q}{d} - 2$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{C}\right) 1.852 \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

PVC Class 200 IPS Plastic Pipe

(1120, 1220) SDR 21 C=150

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 3/4" through 6" Flow 1 through 600 gpm

Size	3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"			
O.D.	1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625			
I.D.	0.930		1.189		1.502		1.720		2.149		2.601		3.166		4.072		5.993			
Wall Thk	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	
1	0.47	0.06	0.29	0.02	0.18	0.01	0.14	0.00	0.09	0.00	0.06	0.00	0.04	0.00	0.02	0.00	0.01	0.00	0.01	0.00
2	0.94	0.22	0.58	0.07	0.36	0.02	0.28	0.01	0.18	0.00	0.12	0.00	0.08	0.00	0.05	0.00	0.02	0.00	0.02	0.00
3	1.42	0.46	0.87	0.14	0.54	0.04	0.41	0.02	0.27	0.01	0.18	0.00	0.12	0.00	0.07	0.00	0.03	0.00	0.03	0.00
4	1.89	0.79	1.16	0.24	0.72	0.08	0.55	0.04	0.35	0.01	0.24	0.01	0.16	0.00	0.10	0.00	0.05	0.00	0.05	0.00
5	2.36	1.19	1.44	0.36	0.91	0.12	0.69	0.06	0.44	0.02	0.30	0.01	0.20	0.00	0.12	0.00	0.06	0.00	0.06	0.00
6	2.83	1.67	1.73	0.50	1.09	0.16	0.83	0.08	0.53	0.03	0.36	0.01	0.24	0.00	0.15	0.00	0.07	0.00	0.07	0.00
7	3.31	2.22	2.02	0.67	1.27	0.22	0.97	0.11	0.62	0.04	0.42	0.01	0.29	0.01	0.17	0.00	0.08	0.00	0.08	0.00
8	3.78	2.84	2.31	0.86	1.45	0.28	1.10	0.14	0.71	0.05	0.48	0.02	0.33	0.01	0.20	0.00	0.09	0.00	0.09	0.00
9	4.25	3.53	2.60	1.07	1.63	0.34	1.24	0.18	0.80	0.06	0.54	0.02	0.37	0.01	0.22	0.00	0.10	0.00	0.10	0.00
10	4.72	4.29	2.89	1.30	1.81	0.42	1.38	0.22	0.88	0.07	0.60	0.03	0.41	0.01	0.25	0.00	0.11	0.00	0.11	0.00
11	5.20	5.12	3.18	1.55	1.99	0.50	1.52	0.26	0.97	0.09	0.66	0.03	0.45	0.01	0.27	0.00	0.13	0.00	0.13	0.00
12	5.67	6.02	3.47	1.82	2.17	0.58	1.66	0.30	1.06	0.10	0.72	0.04	0.49	0.02	0.30	0.00	0.14	0.00	0.14	0.00
14	6.61	8.00	4.05	2.42	2.54	0.78	1.93	0.40	1.24	0.14	0.85	0.05	0.57	0.02	0.34	0.01	0.16	0.00	0.16	0.00
16	7.56	10.24	4.62	3.10	2.90	0.99	2.21	0.51	1.42	0.17	0.97	0.07	0.65	0.03	0.39	0.01	0.18	0.00	0.18	0.00
18	8.50	12.74	5.20	3.85	3.26	1.24	2.49	0.64	1.59	0.22	1.09	0.09	0.73	0.03	0.44	0.01	0.20	0.00	0.20	0.00
20	9.45	15.48	5.78	4.68	3.62	1.50	2.76	0.78	1.77	0.26	1.21	0.10	0.82	0.04	0.49	0.01	0.23	0.00	0.23	0.00
22	10.39	18.46	6.36	5.59	3.98	1.79	3.04	0.93	1.95	0.31	1.33	0.12	0.90	0.05	0.54	0.01	0.25	0.00	0.25	0.00
24	11.34	21.69	6.93	6.56	4.35	2.11	3.31	1.09	2.12	0.37	1.45	0.15	0.98	0.06	0.59	0.02	0.27	0.00	0.27	0.00
26	12.28	25.15	7.51	7.61	4.71	2.44	3.59	1.26	2.30	0.43	1.57	0.17	1.06	0.06	0.64	0.02	0.30	0.00	0.30	0.00
28	13.22	28.85	8.09	8.73	5.07	2.80	3.87	1.45	2.48	0.49	1.69	0.19	1.14	0.07	0.69	0.02	0.32	0.00	0.32	0.00
30	14.17	32.77	8.67	9.92	5.43	3.18	4.14	1.65	2.65	0.56	1.81	0.22	1.22	0.08	0.74	0.02	0.34	0.00	0.34	0.00
35	16.53	43.59	10.11	13.19	6.34	4.23	4.83	2.19	3.10	0.74	2.11	0.29	1.43	0.11	0.86	0.03	0.40	0.01	0.40	0.01
40	18.89	55.80	11.56	16.89	7.24	5.42	5.52	2.80	3.54	0.95	2.42	0.37	1.63	0.14	0.99	0.04	0.45	0.01	0.45	0.01
45			13.00	21.00	8.15	6.74	6.21	3.48	3.98	1.18	2.72	0.47	1.83	0.18	1.11	0.05	0.51	0.01	0.51	0.01
50			14.45	25.51	9.05	8.18	6.90	4.23	4.42	1.43	3.02	0.57	2.04	0.22	1.23	0.06	0.57	0.01	0.57	0.01
55			15.89	30.43	9.96	9.76	7.59	5.05	4.86	1.71	3.32	0.67	2.24	0.26	1.35	0.08	0.63	0.01	0.63	0.01
60			17.34	35.75	10.86	11.47	8.28	5.93	5.31	2.01	3.62	0.79	2.45	0.30	1.48	0.09	0.68	0.01	0.68	0.01
65			18.78	41.46	11.77	13.30	8.98	6.88	5.75	2.33	3.92	0.92	2.65	0.35	1.60	0.10	0.74	0.02	0.74	0.02
70					12.68	15.25	9.67	7.89	6.19	2.67	4.23	1.05	2.85	0.41	1.72	0.12	0.80	0.02	0.80	0.02
75					13.58	17.33	10.36	8.96	6.63	3.03	4.53	1.20	3.06	0.46	1.85	0.14	0.85	0.02	0.85	0.02
80					14.49	19.53	11.05	10.10	7.08	3.42	4.83	1.35	3.26	0.52	1.97	0.15	0.91	0.02	0.91	0.02
85					15.39	21.84	11.74	11.30	7.52	3.82	5.13	1.51	3.46	0.58	2.09	0.17	0.97	0.03	0.97	0.03
90					16.30	24.28	12.43	12.56	7.96	4.25	5.43	1.68	3.67	0.65	2.22	0.19	1.02	0.03	1.02	0.03
95					17.20	26.83	13.12	13.88	8.40	4.70	5.74	1.86	3.87	0.71	2.34	0.21	1.08	0.03	1.08	0.03
100					18.11	29.51	13.81	15.26	8.85	5.16	6.04	2.04	4.08	0.78	2.46	0.23	1.14	0.04	1.14	0.04
110					19.92	35.20	15.19	18.20	9.73	6.16	6.64	2.43	4.48	0.94	2.71	0.27	1.25	0.04	1.25	0.04
120							16.57	21.38	10.61	7.24	7.25	2.86	4.89	1.10	2.96	0.32	1.36	0.05	1.36	0.05
130							17.95	24.79	11.50	8.39	7.85	3.31	5.30	1.27	3.20	0.37	1.48	0.06	1.48	0.06
140							19.33	28.44	12.38	9.62	8.45	3.80	5.71	1.46	3.45	0.43	1.59	0.07	1.59	0.07
150									13.27	10.93	9.06	4.32	6.11	1.66	3.70	0.49	1.71	0.07	1.71	0.07
160									14.15	12.32	9.66	4.87	6.52	1.87	3.94	0.55	1.82	0.08	1.82	0.08
170									15.04	13.78	10.27	5.44	6.93	2.09	4.19	0.61	1.93	0.09	1.93	0.09
180									15.92	15.32	10.87	6.05	7.34	2.33	4.43	0.68	2.05	0.10	2.05	0.10
190									16.81	16.93	11.47	6.69	7.74	2.57	4.68	0.76	2.16	0.12	2.16	0.12
200									17.69	18.62	12.08	7.35	8.15	2.83	4.93	0.83	2.27	0.13	2.27	0.13
225									19.90	23.15	13.59	9.14	9.17	3.51	5.54	1.03	2.56	0.16	2.56	0.16
250											15.10	11.11	10.19	4.27	6.16	1.26	2.84	0.19	2.84	0.19
275											16.61	13.26	11.21	5.09	6.77	1.50	3.13	0.23	3.13	0.23
300											18.11	15.57	12.23	5.98	7.39	1.76	3.41	0.27	3.41	0.27
325											19.62	18.06	13.25	6.94	8.01	2.04	3.70	0.31	3.70	0.31
350													14.26	7.96	8.62	2.34	3.98	0.36	3.98	0.36
375													15.28	9.04	9.24	2.66	4.27	0.41	4.27	0.41
400													16.30	10.19	9.85	2.99	4.55	0.46	4.55	0.46
425													17.32	11.40	10.47	3.35	4.83	0.51	4.83	0.51
450													18.34	12.67	11.09	3.72	5.12	0.57	5.12	0.57
475													19.36	14.00	11.70	4.11	5.40	0.63	5.40	0.63
500															12.32	4.52	5.69	0.69	5.69	0.69
550															13.55	5.40	6.26	0.82	6.26	0.82
600															14.78	6.34	6.82	0.97	6.82	0.97

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \sqrt{\frac{Q}{d^5}}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{C}\right) 1.852 \left(\frac{Q^{1.852}}{d^{4.866}}\right)] \times 4.33$  for psi loss per 100' of pipe

**PVC Class 315 IPS Plastic Pipe**

(1120, 1220) SDR 13.5 C=150

**PVC Class 315 IPS Plastic Pipe**

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
O.D.	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
I.D.	0.716		0.894		1.121		1.414		1.618		2.023		2.449		2.982		3.834		5.643	
Wall Thk	0.062		0.078		0.097		0.123		0.141		0.176		0.213		0.259		0.333		0.491	
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	0.80	0.22	0.51	0.07	0.33	0.02	0.20	0.01	0.16	0.00	0.10	0.00	0.07	0.00	0.05	0.00	0.03	0.00	0.01	0.00
2	1.59	0.78	1.02	0.26	0.65	0.09	0.41	0.03	0.31	0.01	0.20	0.00	0.14	0.00	0.09	0.00	0.06	0.00	0.03	0.00
3	2.39	1.65	1.53	0.56	0.98	0.19	0.61	0.06	0.47	0.03	0.30	0.01	0.20	0.00	0.14	0.00	0.08	0.00	0.04	0.00
4	3.19	2.81	2.04	0.96	1.30	0.32	0.82	0.10	0.62	0.05	0.40	0.02	0.27	0.01	0.18	0.00	0.11	0.00	0.05	0.00
5	3.98	4.25	2.56	1.44	1.63	0.48	1.02	0.16	0.78	0.08	0.50	0.03	0.34	0.01	0.23	0.00	0.14	0.00	0.06	0.00
6	4.78	5.96	3.07	2.02	1.95	0.67	1.23	0.22	0.94	0.11	0.60	0.04	0.41	0.02	0.28	0.01	0.17	0.00	0.08	0.00
7	5.58	7.92	3.58	2.69	2.28	0.89	1.43	0.29	1.09	0.15	0.70	0.05	0.48	0.02	0.32	0.01	0.19	0.00	0.09	0.00
8	6.37	10.14	4.09	3.44	2.60	1.15	1.63	0.37	1.25	0.19	0.80	0.06	0.54	0.03	0.37	0.01	0.22	0.00	0.10	0.00
9	7.17	12.61	4.60	4.28	2.93	1.42	1.84	0.46	1.40	0.24	0.90	0.08	0.61	0.03	0.41	0.01	0.25	0.00	0.12	0.00
10	7.97	15.33	5.11	5.20	3.25	1.73	2.04	0.56	1.56	0.29	1.00	0.10	0.68	0.04	0.46	0.01	0.28	0.00	0.13	0.00
11	8.77	18.28	5.62	6.21	3.58	2.06	2.25	0.67	1.72	0.35	1.10	0.12	0.75	0.05	0.51	0.02	0.31	0.01	0.14	0.00
12	9.56	21.47	6.13	7.29	3.90	2.42	2.45	0.78	1.87	0.41	1.20	0.14	0.82	0.05	0.55	0.02	0.33	0.01	0.15	0.00
14	11.16	28.56	7.16	9.70	4.55	3.22	2.86	1.04	2.18	0.54	1.40	0.18	0.95	0.07	0.64	0.03	0.39	0.01	0.18	0.00
16	12.75	36.56	8.18	12.41	5.20	4.13	3.27	1.33	2.50	0.69	1.60	0.23	1.09	0.09	0.74	0.04	0.44	0.01	0.21	0.00
18	14.34	45.46	9.20	15.44	5.85	5.13	3.68	1.66	2.81	0.86	1.80	0.29	1.23	0.11	0.83	0.04	0.50	0.01	0.23	0.00
20	15.94	55.25	10.22	18.76	6.50	6.24	4.09	2.02	3.12	1.05	2.00	0.35	1.36	0.14	0.92	0.05	0.56	0.02	0.26	0.00
22	17.53	65.90	11.24	22.37	7.15	7.44	4.49	2.40	3.43	1.25	2.20	0.42	1.50	0.17	1.01	0.06	0.61	0.02	0.28	0.00
24	19.12	77.41	12.27	26.28	7.80	8.74	4.90	2.82	3.74	1.47	2.40	0.49	1.63	0.20	1.10	0.07	0.67	0.02	0.31	0.00
26			13.29	30.48	8.45	10.14	5.31	3.27	4.06	1.70	2.60	0.57	1.77	0.23	1.19	0.09	0.72	0.03	0.33	0.00
28			14.31	34.95	9.10	11.62	5.72	3.76	4.37	1.95	2.79	0.66	1.91	0.26	1.29	0.10	0.78	0.03	0.36	0.00
30			15.33	39.71	9.75	13.21	6.13	4.27	4.68	2.22	2.99	0.75	2.04	0.29	1.38	0.11	0.83	0.03	0.38	0.01
35			17.89	52.82	11.38	17.57	7.15	5.68	5.46	2.95	3.49	0.99	2.38	0.39	1.61	0.15	0.97	0.04	0.45	0.01
40					13.00	22.49	8.17	7.27	6.24	3.77	3.99	1.27	2.72	0.50	1.84	0.19	1.11	0.06	0.51	0.01
45					14.63	27.96	9.19	9.03	7.02	4.69	4.49	1.58	3.06	0.62	2.07	0.24	1.25	0.07	0.58	0.01
50					16.25	33.98	10.22	10.98	7.80	5.70	4.99	1.92	3.41	0.76	2.30	0.29	1.39	0.09	0.64	0.01
55					17.88	40.53	11.24	13.10	8.58	6.80	5.49	2.29	3.75	0.90	2.53	0.35	1.53	0.10	0.71	0.02
60					19.50	47.61	12.26	15.38	9.36	7.99	5.99	2.69	4.09	1.06	2.76	0.41	1.67	0.12	0.77	0.02
65							13.28	17.84	10.14	9.26	6.49	3.12	4.43	1.23	2.99	0.47	1.81	0.14	0.83	0.02
70							14.30	20.46	10.92	10.62	6.99	3.58	4.77	1.41	3.22	0.54	1.95	0.16	0.90	0.02
75							15.32	23.25	11.70	12.07	7.49	4.07	5.11	1.61	3.45	0.62	2.08	0.18	0.96	0.03
80							16.34	26.19	12.48	13.60	7.99	4.59	5.45	1.81	3.68	0.69	2.22	0.20	1.03	0.03
85							17.37	29.30	13.26	15.21	8.48	5.13	5.79	2.02	3.90	0.78	2.36	0.23	1.09	0.03
90							18.39	32.57	14.04	16.91	8.98	5.70	6.13	2.25	4.13	0.86	2.50	0.25	1.15	0.04
95							19.41	36.00	14.82	18.69	9.48	6.30	6.47	2.49	4.36	0.95	2.64	0.28	1.22	0.04
100									15.60	20.55	9.98	6.93	6.81	2.73	4.59	1.05	2.78	0.31	1.28	0.05
110									17.16	24.51	10.98	8.27	7.49	3.26	5.05	1.25	3.06	0.37	1.41	0.06
120									18.72	28.79	11.98	9.71	8.17	3.83	5.51	1.47	3.33	0.43	1.54	0.07
130											12.98	11.26	8.85	4.44	5.97	1.70	3.61	0.50	1.67	0.08
140											13.97	12.91	9.54	5.10	6.43	1.95	3.89	0.58	1.80	0.09
150											14.97	14.67	10.22	5.79	6.89	2.22	4.17	0.65	1.92	0.10
160											15.97	16.53	10.90	6.52	7.35	2.50	4.45	0.74	2.05	0.11
170											16.97	18.49	11.58	7.30	7.81	2.80	4.72	0.82	2.18	0.13
180											17.97	20.56	12.26	8.11	8.27	3.11	5.00	0.92	2.31	0.14
190											18.97	22.72	12.94	8.97	8.73	3.44	5.28	1.01	2.44	0.15
200											19.96	24.98	13.62	9.86	9.19	3.78	5.56	1.11	2.57	0.17
225													15.32	12.26	10.34	4.70	6.25	1.38	2.89	0.21
250													17.03	14.90	11.48	5.71	6.95	1.68	3.21	0.26
275													18.73	17.77	12.63	6.82	7.64	2.01	3.53	0.31
300															13.78	8.01	8.34	2.36	3.85	0.36
325															14.93	9.28	9.03	2.73	4.17	0.42
350															16.08	10.65	9.73	3.14	4.49	0.48
375															17.23	12.10	10.42	3.56	4.81	0.54
400															18.38	13.63	11.12	4.01	5.13	0.61
425															19.52	15.25	11.81	4.49	5.45	0.68
450																	12.51	4.99	5.77	0.76
475																	13.20	5.52	6.09	0.84
500																	13.89	6.07	6.41	0.92
550																	15.28	7.23	7.06	1.10
600																	16.67	8.50	7.70	1.30

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{Q}{d^{0.5}}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{C}\right)^{1.852} \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

PVC Schedule 40 IPS Plastic Pipe

(1120, 1220) C=150

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
O.D.	0.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	6.065
Wall Thk	0.109	0.113	0.133	0.140	0.145	0.154	0.203	0.216	0.237	0.280	0.109	0.113	0.133	0.140	0.145	0.154	0.203	0.216	0.237	0.280
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	1.06	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.16	0.00	0.10	0.00	0.07	0.00	0.04	0.00	0.03	0.00	0.01	0.00
2	2.11	1.55	1.20	0.39	0.74	0.12	0.43	0.03	0.32	0.02	0.19	0.00	0.13	0.00	0.09	0.00	0.05	0.00	0.02	0.00
3	3.17	3.28	1.80	0.83	1.11	0.26	0.64	0.07	0.48	0.03	0.29	0.01	0.20	0.00	0.13	0.00	0.08	0.00	0.03	0.00
4	4.22	5.58	2.41	1.42	1.48	0.44	0.86	0.12	0.64	0.06	0.38	0.02	0.26	0.01	0.17	0.00	0.10	0.00	0.04	0.00
5	5.28	8.43	3.01	2.15	1.86	0.66	1.07	0.17	0.80	0.09	0.48	0.02	0.33	0.01	0.22	0.00	0.13	0.00	0.06	0.00
6	6.34	11.81	3.61	3.01	2.23	0.93	1.29	0.24	0.96	0.12	0.57	0.03	0.40	0.01	0.26	0.01	0.15	0.00	0.07	0.00
7	7.39	15.71	4.21	4.00	2.60	1.24	1.50	0.33	1.12	0.16	0.67	0.05	0.46	0.02	0.30	0.01	0.18	0.00	0.08	0.00
8	8.45	20.12	4.81	5.12	2.97	1.58	1.72	0.42	1.28	0.20	0.76	0.06	0.53	0.02	0.35	0.01	0.20	0.00	0.09	0.00
9	9.50	25.01	5.41	6.37	3.34	1.97	1.93	0.52	1.44	0.25	0.86	0.07	0.59	0.03	0.39	0.01	0.23	0.00	0.10	0.00
10	10.56	30.40	6.02	7.74	3.71	2.39	2.15	0.63	1.60	0.31	0.96	0.09	0.66	0.04	0.43	0.01	0.25	0.00	0.11	0.00
11	11.61	36.26	6.62	9.23	4.08	2.85	2.36	0.75	1.76	0.37	1.05	0.11	0.73	0.04	0.48	0.02	0.28	0.00	0.12	0.00
12	12.67	42.59	7.22	10.84	4.45	3.35	2.57	0.88	1.91	0.43	1.15	0.12	0.79	0.05	0.52	0.02	0.30	0.00	0.13	0.00
14	14.78	56.64	8.42	14.42	5.20	4.45	3.00	1.17	2.23	0.57	1.34	0.16	0.92	0.07	0.61	0.02	0.35	0.01	0.16	0.00
16	16.89	72.52	9.63	18.46	5.94	5.70	3.43	1.50	2.55	0.73	1.53	0.21	1.06	0.09	0.69	0.03	0.40	0.01	0.18	0.00
18	19.01	90.17	10.83	22.95	6.68	7.09	3.86	1.87	2.87	0.91	1.72	0.26	1.19	0.11	0.78	0.04	0.45	0.01	0.20	0.00
20	21.12	109.58	12.03	27.89	7.42	8.62	4.29	2.27	3.19	1.10	1.91	0.32	1.32	0.13	0.87	0.05	0.50	0.01	0.22	0.00
22			13.24	33.27	8.17	10.28	4.72	2.71	3.51	1.32	2.10	0.38	1.45	0.15	0.95	0.06	0.55	0.01	0.24	0.00
24			14.44	39.08	8.91	12.07	5.15	3.18	3.83	1.55	2.29	0.45	1.58	0.18	1.04	0.07	0.60	0.02	0.27	0.00
26			15.64	45.32	9.65	14.00	5.58	3.69	4.15	1.79	2.49	0.52	1.71	0.21	1.13	0.08	0.66	0.02	0.29	0.00
28			16.85	51.98	10.39	16.06	6.01	4.23	4.47	2.06	2.68	0.59	1.85	0.24	1.22	0.09	0.71	0.02	0.31	0.00
30			18.05	59.05	11.14	18.24	6.44	4.80	4.79	2.34	2.87	0.67	1.98	0.27	1.30	0.10	0.76	0.03	0.33	0.00
35					12.99	24.26	7.51	6.39	5.58	3.11	3.35	0.89	2.31	0.36	1.52	0.13	0.88	0.03	0.39	0.00
40					14.85	31.06	8.58	8.18	6.38	3.98	3.82	1.15	2.64	0.46	1.74	0.17	1.01	0.04	0.44	0.01
45					16.71	38.62	9.65	10.17	7.18	4.95	4.30	1.42	2.97	0.58	1.95	0.21	1.13	0.06	0.50	0.01
50					18.56	46.94	10.73	12.36	7.98	6.02	4.78	1.73	3.30	0.70	2.17	0.25	1.26	0.07	0.56	0.01
55					11.80	14.74	8.78	7.18	5.26	2.06	3.63	0.84	2.39	0.30	1.39	0.08	0.61	0.01		
60					12.87	17.32	9.57	8.43	5.74	2.43	3.96	0.98	2.60	0.36	1.51	0.09	0.67	0.01		
65					13.94	20.08	10.37	9.78	6.21	2.81	4.29	1.14	2.82	0.41	1.64	0.11	0.72	0.01		
70					15.02	23.03	11.17	11.21	6.69	3.23	4.62	1.31	3.04	0.47	1.76	0.13	0.78	0.02		
75					16.09	26.17	11.97	12.74	7.17	3.66	4.95	1.48	3.25	0.54	1.89	0.14	0.83	0.02		
80					17.16	29.49	12.77	14.36	7.65	4.13	5.28	1.67	3.47	0.60	2.02	0.16	0.89	0.02		
85					18.23	32.99	13.56	16.06	8.13	4.62	5.60	1.87	3.69	0.68	2.14	0.18	0.94	0.02		
90					19.31	36.67	14.36	17.85	8.61	5.14	5.93	2.08	3.91	0.75	2.27	0.20	1.00	0.03		
95					15.16	19.73	9.08	5.68	6.26	2.30	4.12	0.83	2.39	0.22	1.26	0.03				
100					15.96	21.69	9.56	6.24	6.59	2.53	4.34	0.91	2.52	0.24	1.11	0.03				
110					17.55	25.88	10.52	7.44	7.25	3.01	4.77	1.09	2.77	0.29	1.22	0.04				
120					19.15	30.40	11.47	8.74	7.91	3.54	5.21	1.28	3.02	0.34	1.33	0.05				
130					12.43	10.14	8.57	4.11	5.64	1.48	3.28	0.40	1.44	0.05						
140					13.39	11.63	9.23	4.71	6.08	1.70	3.53	0.45	1.55	0.06						
150					14.34	13.21	9.89	5.35	6.51	1.93	3.78	0.52	1.67	0.07						
160					15.30	14.89	10.55	6.03	6.94	2.18	4.03	0.58	1.78	0.08						
170					16.25	16.65	11.21	6.74	7.38	2.44	4.28	0.65	1.89	0.09						
180					17.21	18.51	11.87	7.50	7.81	2.71	4.54	0.72	2.00	0.10						
190					18.17	20.46	12.53	8.29	8.25	2.99	4.79	0.80	2.11	0.11						
200					19.12	22.50	13.19	9.11	8.68	3.29	5.04	0.88	2.22	0.12						
225					14.84	11.33	9.76	4.09	5.67	1.09	2.50	0.15								
250					16.48	13.77	10.85	4.98	6.30	1.33	2.78	0.18								
275					18.13	16.42	11.93	5.94	6.93	1.58	3.05	0.22								
300					13.02	6.97	7.56	1.86	3.33	0.25										
325					14.10	8.09	8.19	2.16	3.61	0.29										
350					15.19	9.27	8.82	2.47	3.89	0.34										
375					16.27	10.54	9.45	2.81	4.16	0.38										
400					17.36	11.87	10.08	3.16	4.44	0.43										
425					18.44	13.28	10.71	3.54	4.72	0.48										
450					19.53	14.76	11.34	3.93	5.00	0.54										
475							11.97	4.35	5.28	0.59										
500							12.60	4.78	5.55	0.65										
550							13.86	5.70	6.11	0.78										
600							15.12	6.70	6.66	0.91										

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{Q}{D^2}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{L}\right) 1.852 \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

**PVC Schedule 80 IPS Plastic Pipe**

(1120, 1220) C=150

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"										
O.D.	0.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625										
I.D.	0.546	0.742	0.957	1.278	1.500	1.939	2.323	2.900	3.826	5.761										
Wall Thk	0.147	0.154	0.179	0.191	0.200	0.218	0.276	0.300	0.337	0.432										
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									
1	1.37	0.81	0.74	0.18	0.45	0.05	0.25	0.01	0.18	0.01	0.11	0.00	0.08	0.00	0.05	0.00	0.03	0.00	0.01	0.00
2	2.74	2.92	1.48	0.66	0.89	0.19	0.50	0.05	0.36	0.02	0.22	0.01	0.15	0.00	0.10	0.00	0.06	0.00	0.02	0.00
3	4.11	6.18	2.23	1.39	1.34	0.40	0.75	0.10	0.54	0.05	0.33	0.01	0.23	0.01	0.15	0.00	0.08	0.00	0.04	0.00
4	5.48	10.52	2.97	2.37	1.78	0.69	1.00	0.17	0.73	0.08	0.43	0.02	0.30	0.01	0.19	0.00	0.11	0.00	0.05	0.00
5	6.85	15.90	3.71	3.57	2.23	1.04	1.25	0.25	0.91	0.12	0.54	0.03	0.38	0.01	0.24	0.00	0.14	0.00	0.06	0.00
6	8.22	22.27	4.45	5.01	2.68	1.45	1.50	0.36	1.09	0.16	0.65	0.05	0.45	0.02	0.29	0.01	0.17	0.00	0.07	0.00
7	9.59	29.62	5.19	6.66	3.12	1.93	1.75	0.47	1.27	0.22	0.76	0.06	0.53	0.03	0.34	0.01	0.20	0.00	0.09	0.00
8	10.96	37.92	5.94	8.53	3.57	2.47	2.00	0.61	1.45	0.28	0.87	0.08	0.61	0.03	0.39	0.01	0.22	0.00	0.10	0.00
9	12.33	47.16	6.68	10.60	4.01	3.07	2.25	0.75	1.63	0.35	0.98	0.10	0.68	0.04	0.44	0.01	0.25	0.00	0.11	0.00
10	13.70	57.30	7.42	12.88	4.46	3.74	2.50	0.91	1.82	0.42	1.09	0.12	0.76	0.05	0.49	0.02	0.28	0.00	0.12	0.00
11	15.07	68.35	8.16	15.37	4.91	4.46	2.75	1.09	2.00	0.50	1.20	0.14	0.83	0.06	0.53	0.02	0.31	0.01	0.14	0.00
12	16.44	80.29	8.90	18.05	5.35	5.23	3.00	1.28	2.18	0.59	1.30	0.17	0.91	0.07	0.58	0.02	0.33	0.01	0.15	0.00
14			10.39	24.01	6.24	6.96	3.50	1.70	2.54	0.78	1.52	0.22	1.06	0.09	0.68	0.03	0.39	0.01	0.17	0.00
16			11.87	30.74	7.14	8.91	4.00	2.18	2.90	1.00	1.74	0.29	1.21	0.12	0.78	0.04	0.45	0.01	0.20	0.00
18			13.36	38.22	8.03	11.08	4.50	2.71	3.27	1.24	1.96	0.36	1.36	0.15	0.87	0.05	0.50	0.01	0.22	0.00
20			14.84	46.45	8.92	13.47	5.00	3.30	3.63	1.51	2.17	0.43	1.51	0.18	0.97	0.06	0.56	0.02	0.25	0.00
22			16.32	55.40	9.81	16.06	5.50	3.93	3.99	1.80	2.39	0.52	1.67	0.21	1.07	0.07	0.61	0.02	0.27	0.00
24			17.81	65.08	10.70	18.87	6.00	4.62	4.36	2.12	2.61	0.61	1.82	0.25	1.17	0.09	0.67	0.02	0.30	0.00
26			19.29	75.47	11.60	21.88	6.50	5.36	4.72	2.46	2.82	0.70	1.97	0.29	1.26	0.10	0.73	0.03	0.32	0.00
28					12.49	25.10	7.00	6.14	5.08	2.82	3.04	0.81	2.12	0.34	1.36	0.11	0.78	0.03	0.34	0.00
30					13.38	28.51	7.50	6.98	5.45	3.20	3.26	0.92	2.27	0.38	1.46	0.13	0.84	0.03	0.37	0.00
35					15.61	37.92	8.75	9.28	6.35	4.26	3.80	1.22	2.65	0.51	1.70	0.17	0.98	0.04	0.43	0.01
40					17.84	48.55	10.00	11.88	7.26	5.45	4.35	1.56	3.03	0.65	1.94	0.22	1.12	0.06	0.49	0.01
45							11.25	14.78	8.17	6.78	4.89	1.94	3.41	0.81	2.19	0.27	1.26	0.07	0.55	0.01
50							12.51	17.96	9.08	8.24	5.43	2.36	3.78	0.98	2.43	0.33	1.40	0.09	0.62	0.01
55							13.76	21.42	9.99	9.83	5.98	2.82	4.16	1.17	2.67	0.40	1.53	0.10	0.68	0.01
60							15.01	25.16	10.89	11.54	6.52	3.31	4.54	1.37	2.91	0.47	1.67	0.12	0.74	0.02
65							16.26	29.18	11.80	13.38	7.06	3.84	4.92	1.59	3.16	0.54	1.81	0.14	0.80	0.02
70							17.51	33.47	12.71	15.35	7.61	4.40	5.30	1.83	3.40	0.62	1.95	0.16	0.86	0.02
75							18.76	38.02	13.62	17.44	8.15	5.00	5.68	2.08	3.64	0.71	2.09	0.18	0.92	0.03
80							20.01	42.84	14.52	19.65	8.69	5.64	6.06	2.34	3.89	0.80	2.23	0.21	0.98	0.03
85									15.43	21.99	9.24	6.31	6.43	2.62	4.13	0.89	2.37	0.23	1.05	0.03
90									16.34	24.44	9.78	7.01	6.81	2.91	4.37	0.99	2.51	0.26	1.11	0.04
95									17.25	27.01	10.32	7.75	7.19	3.22	4.61	1.09	2.65	0.28	1.17	0.04
100									18.16	29.70	10.87	8.52	7.57	3.54	4.86	1.20	2.79	0.31	1.23	0.04
110									19.97	35.42	11.95	10.16	8.33	4.22	5.34	1.43	3.07	0.37	1.35	0.05
120											13.04	11.93	9.08	4.95	5.83	1.68	3.35	0.44	1.48	0.06
130											14.12	13.84	9.84	5.74	6.31	1.95	3.63	0.51	1.60	0.07
140											15.21	15.87	10.60	6.59	6.80	2.24	3.91	0.58	1.72	0.08
150											16.30	18.03	11.35	7.49	7.29	2.54	4.19	0.66	1.85	0.09
160											17.38	20.32	12.11	8.44	7.77	2.87	4.47	0.74	1.97	0.10
170											18.47	22.73	12.87	9.44	8.26	3.21	4.74	0.83	2.09	0.11
180											19.56	25.27	13.63	10.49	8.74	3.56	5.02	0.93	2.22	0.13
190													14.38	11.59	9.23	3.94	5.30	1.02	2.34	0.14
200													15.14	12.75	9.71	4.33	5.58	1.12	2.46	0.15
225													17.03	15.85	10.93	5.39	6.28	1.40	2.77	0.19
250													18.92	19.26	12.14	6.54	6.98	1.70	3.08	0.23
275													20.82	22.97	13.36	7.81	7.67	2.03	3.38	0.28
300															14.57	9.17	8.37	2.38	3.69	0.33
325															15.79	10.63	9.07	2.76	4.00	0.38
350															17.00	12.20	9.77	3.17	4.31	0.43
375															18.21	13.86	10.46	3.60	4.62	0.49
400															19.43	15.61	11.16	4.05	4.92	0.55
425																	11.86	4.54	5.23	0.62
450																	12.56	5.04	5.54	0.69
475																	13.26	5.57	5.85	0.76
500																	13.95	6.13	6.15	0.84
550																	15.35	7.31	6.77	1.00
600																	16.74	8.58	7.38	1.17

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{C}{\sqrt{f}}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{C}\right)^{1.852} \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

Polyethylene (PE) SDR Pressure Rated Tube

(2306, 3206, 3306) SDR 7, 9, 11.5, 15 C=150

psi Loss per 100 Feet of Pipe (psi/100 ft)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size I.D.	1/2" 0.622		3/4" 0.824		1" 1.049		1 1/4" 1.380		1 1/2" 1.610		2" 2.067		2 1/2" 2.469		3" 3.068		4" 4.026		6" 6.065	
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	1.06	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.16	0.00	0.10	0.00	0.07	0.00	0.04	0.00	0.03	0.00	0.01	0.00
2	2.11	1.55	1.20	0.39	0.74	0.12	0.43	0.03	0.32	0.02	0.19	0.00	0.13	0.00	0.09	0.00	0.05	0.00	0.02	0.00
3	3.17	3.28	1.80	0.83	1.11	0.26	0.64	0.07	0.47	0.03	0.29	0.01	0.20	0.00	0.13	0.00	0.08	0.00	0.03	0.00
4	4.22	5.58	2.41	1.42	1.48	0.44	0.86	0.12	0.63	0.05	0.38	0.02	0.27	0.01	0.17	0.00	0.10	0.00	0.04	0.00
5	5.28	8.43	3.01	2.15	1.86	0.66	1.07	0.17	0.79	0.08	0.48	0.02	0.34	0.01	0.22	0.00	0.13	0.00	0.06	0.00
6	6.34	11.81	3.61	3.01	2.23	0.93	1.29	0.24	0.95	0.12	0.57	0.03	0.40	0.01	0.26	0.01	0.15	0.00	0.07	0.00
7	7.39	15.71	4.21	4.00	2.60	1.24	1.50	0.33	1.10	0.15	0.67	0.05	0.47	0.02	0.30	0.01	0.18	0.00	0.08	0.00
8	8.45	20.12	4.81	5.12	2.97	1.58	1.72	0.42	1.26	0.20	0.76	0.06	0.54	0.02	0.35	0.01	0.20	0.00	0.09	0.00
9	9.50	25.01	5.41	6.37	3.34	1.97	1.93	0.52	1.42	0.24	0.86	0.07	0.60	0.03	0.39	0.01	0.23	0.00	0.10	0.00
10	10.56	30.40	6.02	7.74	3.71	2.39	2.15	0.63	1.58	0.30	0.96	0.09	0.67	0.04	0.43	0.01	0.25	0.00	0.11	0.00
11	11.61	36.26	6.62	9.23	4.08	2.85	2.36	0.75	1.73	0.35	1.05	0.11	0.74	0.04	0.48	0.02	0.28	0.00	0.12	0.00
12	12.67	42.59	7.22	10.84	4.45	3.35	2.57	0.88	1.89	0.42	1.15	0.12	0.80	0.05	0.52	0.02	0.30	0.00	0.13	0.00
14	14.78	56.64	8.42	14.42	5.20	4.45	3.00	1.17	2.21	0.55	1.34	0.16	0.94	0.07	0.61	0.02	0.35	0.01	0.16	0.00
16	16.89	72.52	9.63	18.46	5.94	5.70	3.43	1.50	2.52	0.71	1.53	0.21	1.07	0.09	0.69	0.03	0.40	0.01	0.18	0.00
18	19.01	90.17	10.83	22.95	6.68	7.09	3.86	1.87	2.84	0.88	1.72	0.26	1.21	0.11	0.78	0.04	0.45	0.01	0.20	0.00
20			12.03	27.89	7.42	8.62	4.29	2.27	3.15	1.07	1.91	0.32	1.34	0.13	0.87	0.05	0.50	0.01	0.22	0.00
22			13.24	33.27	8.17	10.28	4.72	2.71	3.47	1.28	2.10	0.38	1.47	0.16	0.95	0.06	0.55	0.01	0.24	0.00
24			14.44	39.08	8.91	12.07	5.15	3.18	3.78	1.50	2.29	0.45	1.61	0.19	1.04	0.07	0.60	0.02	0.27	0.00
26			15.64	45.32	9.65	14.00	5.58	3.69	4.10	1.74	2.49	0.52	1.74	0.22	1.13	0.08	0.66	0.02	0.29	0.00
28			16.85	51.98	10.39	16.06	6.01	4.23	4.41	2.00	2.68	0.59	1.88	0.25	1.22	0.09	0.71	0.02	0.31	0.00
30			18.05	59.05	11.14	18.24	6.44	4.80	4.73	2.27	2.87	0.67	2.01	0.28	1.30	0.10	0.76	0.03	0.33	0.00
35					12.99	24.26	7.51	6.39	5.52	3.02	3.35	0.89	2.35	0.38	1.52	0.13	0.88	0.03	0.39	0.00
40					14.85	31.06	8.58	8.18	6.30	3.86	3.82	1.15	2.68	0.48	1.74	0.17	1.01	0.04	0.44	0.01
45					16.71	38.62	9.65	10.17	7.09	4.80	4.30	1.42	3.02	0.60	1.95	0.21	1.13	0.06	0.50	0.01
50					18.56	46.94	10.73	12.36	7.88	5.84	4.78	1.73	3.35	0.73	2.17	0.25	1.26	0.07	0.56	0.01
55							11.80	14.74	8.67	6.96	5.26	2.06	3.69	0.87	2.39	0.30	1.39	0.08	0.61	0.01
60							12.87	17.32	9.46	8.18	5.74	2.43	4.02	1.02	2.60	0.36	1.51	0.09	0.67	0.01
65							13.94	20.08	10.24	9.49	6.21	2.81	4.36	1.18	2.82	0.41	1.64	0.11	0.72	0.01
70							15.02	23.03	11.03	10.88	6.69	3.23	4.69	1.36	3.04	0.47	1.76	0.13	0.78	0.02
75							16.09	26.17	11.82	12.36	7.17	3.66	5.03	1.54	3.25	0.54	1.89	0.14	0.83	0.02
80							17.16	29.49	12.61	13.93	7.65	4.13	5.36	1.74	3.47	0.60	2.02	0.16	0.89	0.02
85							18.23	32.99	13.40	15.58	8.13	4.62	5.70	1.95	3.69	0.68	2.14	0.18	0.94	0.02
90							19.31	36.67	14.18	17.32	8.61	5.14	6.03	2.16	3.91	0.75	2.27	0.20	1.00	0.03
95									14.97	19.14	9.08	5.68	6.37	2.39	4.12	0.83	2.39	0.22	1.06	0.03
100									15.76	21.05	9.56	6.24	6.70	2.63	4.34	0.91	2.52	0.24	1.11	0.03
110									17.34	25.11	10.52	7.44	7.37	3.14	4.77	1.09	2.77	0.29	1.22	0.04
120									18.91	29.49	11.47	8.74	8.04	3.68	5.21	1.28	3.02	0.34	1.33	0.05
130											12.43	10.14	8.71	4.27	5.64	1.48	3.28	0.40	1.44	0.05
140											13.39	11.63	9.38	4.90	6.08	1.70	3.53	0.45	1.55	0.06
150											14.34	13.21	10.05	5.56	6.51	1.93	3.78	0.52	1.67	0.07
160											15.30	14.89	10.72	6.27	6.94	2.18	4.03	0.58	1.78	0.08
170											16.25	16.65	11.39	7.01	7.38	2.44	4.28	0.65	1.89	0.09
180											17.21	18.51	12.06	7.80	7.81	2.71	4.54	0.72	2.00	0.10
190											18.17	20.46	12.73	8.62	8.25	2.99	4.79	0.80	2.11	0.11
200											19.12	22.50	13.40	9.48	8.68	3.29	5.04	0.88	2.22	0.12
225													15.08	11.78	9.76	4.09	5.67	1.09	2.50	0.15
250													16.75	14.32	10.85	4.98	6.30	1.33	2.78	0.18
275													18.43	17.08	11.93	5.94	6.93	1.58	3.05	0.22
300															13.02	6.97	7.56	1.86	3.33	0.25
325															14.10	8.09	8.19	2.16	3.61	0.29
350															15.19	9.27	8.82	2.47	3.89	0.34
375															16.27	10.54	9.45	2.81	4.16	0.38
400															17.36	11.87	10.08	3.16	4.44	0.43
425															18.44	13.28	10.71	3.54	4.72	0.48
450															19.53	14.76	11.34	3.93	5.00	0.54
475																11.97	4.35	5.28	0.59	
500																12.60	4.78	5.55	0.65	
550																13.86	5.70	6.11	0.78	
600																15.12	6.70	6.66	0.91	

**Note:** Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{L}\right) 1.852 \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

Schedule 40 Standard Steel Pipe

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
O.D.	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
I.D.	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026		6.065	
Wall Thk	0.109		0.113		0.133		0.140		0.145		0.154		0.203		0.216		0.237		0.280	
Flow gpm	Velocity fps		psi Loss		Velocity fps		psi Loss		Velocity fps		psi Loss		Velocity fps		psi Loss		Velocity fps		psi Loss	
1	1.06	0.91	0.60	0.23	0.37	0.07	0.21	0.02	0.16	0.01	0.10	0.00	0.07	0.00	0.04	0.00	0.03	0.00	0.02	0.00
2	2.11	3.28	1.20	0.83	0.74	0.26	0.43	0.07	0.32	0.03	0.19	0.01	0.13	0.00	0.09	0.00	0.05	0.00	0.03	0.00
3	3.17	6.94	1.80	1.77	1.11	0.55	0.64	0.14	0.48	0.07	0.29	0.02	0.20	0.01	0.13	0.00	0.08	0.00	0.05	0.00
4	4.22	11.81	2.41	3.01	1.48	0.93	0.86	0.24	0.64	0.12	0.38	0.03	0.26	0.01	0.17	0.01	0.10	0.00	0.06	0.00
5	5.28	17.85	3.01	4.54	1.86	1.40	1.07	0.37	0.80	0.18	0.48	0.05	0.33	0.02	0.22	0.01	0.13	0.00	0.08	0.01
6	6.34	25.01	3.61	6.37	2.23	1.97	1.29	0.52	0.96	0.25	0.57	0.07	0.40	0.03	0.26	0.01	0.15	0.00	0.10	0.01
7	7.39	33.27	4.21	8.47	2.60	2.62	1.50	0.69	1.12	0.34	0.67	0.10	0.46	0.04	0.30	0.01	0.18	0.00	0.11	0.02
8	8.45	42.59	4.81	10.84	2.97	3.35	1.72	0.88	1.28	0.43	0.76	0.12	0.53	0.05	0.35	0.02	0.20	0.00	0.13	0.04
9	9.50	52.96	5.41	13.48	3.34	4.16	1.93	1.10	1.44	0.53	0.86	0.15	0.59	0.06	0.39	0.02	0.23	0.01	0.14	0.05
10	10.56	64.35	6.02	16.38	3.71	5.06	2.15	1.33	1.60	0.65	0.96	0.19	0.66	0.08	0.43	0.03	0.25	0.01	0.16	0.08
11	11.61	76.76	6.62	19.54	4.08	6.04	2.36	1.59	1.76	0.77	1.05	0.22	0.73	0.09	0.48	0.03	0.28	0.01	0.18	0.11
12	12.67	90.17	7.22	22.95	4.45	7.09	2.57	1.87	1.91	0.91	1.15	0.26	0.79	0.11	0.52	0.04	0.30	0.01	0.19	0.14
14	14.78	119.93	8.42	30.53	5.20	9.43	3.00	2.48	2.23	1.21	1.34	0.35	0.92	0.14	0.61	0.05	0.35	0.01	0.22	0.24
16	16.89	153.53	9.63	39.08	5.94	12.07	3.43	3.18	2.55	1.55	1.53	0.45	1.06	0.18	0.69	0.07	0.40	0.02	0.26	0.38
18	19.01	190.91	10.83	48.59	6.68	15.01	3.86	3.95	2.87	1.92	1.72	0.55	1.19	0.22	0.78	0.08	0.45	0.02	0.29	0.57
20			12.03	59.05	7.42	18.24	4.29	4.80	3.19	2.34	1.91	0.67	1.32	0.27	0.87	0.10	0.50	0.03	0.32	0.00
22			13.24	70.44	8.17	21.76	4.72	5.73	3.51	2.79	2.10	0.80	1.45	0.33	0.95	0.12	0.55	0.03	0.35	0.00
24			14.44	82.74	8.91	25.56	5.15	6.73	3.83	3.28	2.29	0.94	1.58	0.38	1.04	0.14	0.60	0.04	0.38	0.00
26			15.64	95.94	9.65	29.64	5.58	7.81	4.15	3.80	2.49	1.09	1.71	0.44	1.13	0.16	0.66	0.04	0.42	0.00
28			16.85	110.04	10.39	34.00	6.01	8.95	4.47	4.36	2.68	1.25	1.85	0.51	1.22	0.18	0.71	0.05	0.45	0.00
30			18.05	125.02	11.14	38.62	6.44	10.17	4.79	4.95	2.87	1.42	1.98	0.58	1.30	0.21	0.76	0.06	0.48	0.00
35					12.99	51.37	7.51	13.53	5.58	6.59	3.35	1.89	2.31	0.77	1.52	0.28	0.88	0.07	0.56	0.00
40					14.85	65.76	8.58	17.32	6.38	8.43	3.82	2.43	2.64	0.98	1.74	0.36	1.01	0.09	0.64	0.00
45					16.71	81.78	9.65	21.53	7.18	10.48	4.30	3.02	2.97	1.22	1.95	0.44	1.13	0.12	0.72	0.00
50					18.56	99.37	10.73	26.17	7.98	12.74	4.78	3.66	3.30	1.48	2.17	0.54	1.26	0.14	0.80	0.00
55							11.80	31.21	8.78	15.20	5.26	4.37	3.63	1.77	2.39	0.64	1.39	0.17	0.88	0.00
60							12.87	36.67	9.57	17.85	5.74	5.14	3.96	2.08	2.60	0.75	1.51	0.20	0.96	0.00
65							13.94	42.52	10.37	20.70	6.21	5.95	4.29	2.41	2.82	0.87	1.64	0.23	1.04	0.00
70							15.02	48.77	11.17	23.74	6.69	6.83	4.62	2.77	3.04	1.00	1.76	0.27	1.12	0.00
75							16.09	55.40	11.97	26.98	7.17	7.76	4.95	3.14	3.25	1.14	1.89	0.30	1.20	0.00
80							17.16	62.43	12.77	30.40	7.65	8.74	5.28	3.54	3.47	1.28	2.02	0.34	1.28	0.00
85							18.23	69.84	13.56	34.01	8.13	9.78	5.60	3.96	3.69	1.43	2.14	0.38	1.36	0.00
90							19.31	77.63	14.36	37.80	8.61	10.87	5.93	4.40	3.91	1.59	2.27	0.42	1.44	0.00
95									15.16	41.77	9.08	12.02	6.26	4.87	4.12	1.76	2.39	0.47	1.52	0.00
100									15.96	45.93	9.56	13.21	6.59	5.35	4.34	1.93	2.52	0.52	1.60	0.00
110									17.55	54.79	10.52	15.76	7.25	6.38	4.77	2.31	2.77	0.61	1.76	0.00
120									19.15	64.36	11.47	18.51	7.91	7.50	5.21	2.71	3.02	0.72	1.92	0.00
130											12.43	21.47	8.57	8.69	5.64	3.14	3.28	0.84	2.08	0.00
140											13.39	24.62	9.23	9.97	6.08	3.60	3.53	0.96	2.25	0.00
150											14.34	27.97	9.89	11.33	6.51	4.09	3.78	1.09	2.41	0.00
160											15.30	31.52	10.55	12.77	6.94	4.61	4.03	1.23	2.57	0.00
170											16.25	35.26	11.21	14.28	7.38	5.16	4.28	1.38	2.73	0.00
180											17.21	39.19	11.87	15.87	7.81	5.74	4.54	1.53	2.89	0.00
190											18.17	43.32	12.53	17.54	8.25	6.34	4.79	1.69	3.05	0.00
200											19.12	47.63	13.19	19.29	8.68	6.97	5.04	1.86	3.21	0.00
225													14.84	23.99	9.76	8.67	5.67	2.31	3.61	0.00
250													16.48	29.15	10.85	10.54	6.30	2.81	4.01	0.00
275													18.13	34.77	11.93	12.57	6.93	3.35	4.41	0.00
300															13.02	14.76	7.56	3.93	4.81	0.00
325															14.10	17.12	8.19	4.56	5.21	0.00
350															15.19	19.63	8.82	5.23	5.61	0.00
375															16.27	22.31	9.45	5.95	6.01	0.00
400															17.36	25.14	10.08	6.70	6.41	0.00
425															18.44	28.12	10.71	7.49	6.82	0.00
450															19.53	31.25	11.34	8.33	7.22	0.00
475																	11.97	9.21	7.62	0.00
500																	12.60	10.12	8.02	0.00
550																	13.86	12.08	8.82	0.00
600																	15.12	14.19	9.62	0.00

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{Q}{d} - 2$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{C}\right)^{1.852} \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

Type K Copper Water Tube

C=140

psi Loss per 100 Feet of Tube (psi/100 ft.)

Sizes 1/2" through 3" Flow 1 through 600 gpm

Size	1/2"	5/8"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"									
O.D.	0.625	0.750	0.875	1.125	1.375	1.625	2.125	2.625	3.125									
I.D.	0.5270	0.652	0.745	0.995	1.245	1.481	1.959	2.435	2.907									
Wall Thk	0.049	0.049	0.065	0.065	0.065	0.072	0.083	0.095	0.109									
Flow gpm	Velocity fps psi Loss		Velocity fps psi Loss		Velocity fps psi Loss		Velocity fps psi Loss		Velocity fps psi Loss									
1	1.47	1.09	0.96	0.39	0.74	0.20	0.41	0.05	0.26	0.02	0.19	0.01	0.11	0.00	0.07	0.00	0.05	0.00
2	2.94	3.94	1.92	1.40	1.47	0.73	0.83	0.18	0.53	0.06	0.37	0.03	0.21	0.01	0.14	0.00	0.10	0.00
3	4.41	8.34	2.88	2.96	2.21	1.55	1.24	0.38	0.79	0.13	0.56	0.05	0.32	0.01	0.21	0.00	0.15	0.00
4	5.88	14.20	3.84	5.04	2.94	2.63	1.65	0.64	1.05	0.22	0.74	0.09	0.43	0.02	0.28	0.01	0.19	0.00
5	7.35	21.46	4.80	7.62	3.68	3.98	2.06	0.97	1.32	0.33	0.93	0.14	0.53	0.04	0.34	0.01	0.24	0.01
6	8.83	30.06	5.77	10.67	4.42	5.58	2.48	1.36	1.58	0.46	1.12	0.20	0.64	0.05	0.41	0.02	0.29	0.01
7	10.30	39.98	6.73	14.20	5.15	7.42	2.89	1.82	1.84	0.61	1.30	0.26	0.75	0.07	0.48	0.02	0.34	0.01
8	11.77	51.19	7.69	18.17	5.89	9.50	3.30	2.32	2.11	0.78	1.49	0.34	0.85	0.09	0.55	0.03	0.39	0.01
9	13.24	63.65	8.65	22.60	6.62	11.81	3.71	2.89	2.37	0.97	1.68	0.42	0.96	0.11	0.62	0.04	0.44	0.02
10	14.71	77.35	9.61	27.46	7.36	14.35	4.13	3.51	2.64	1.18	1.86	0.51	1.06	0.13	0.69	0.05	0.48	0.02
11	16.18	92.26	10.57	32.76	8.10	17.12	4.54	4.19	2.90	1.41	2.05	0.60	1.17	0.16	0.76	0.05	0.53	0.02
12	17.65	108.38	11.53	38.48	8.83	20.11	4.95	4.92	3.16	1.65	2.23	0.71	1.28	0.18	0.83	0.06	0.58	0.03
14			13.45	51.17	10.30	26.75	5.78	6.54	3.69	2.20	2.61	0.94	1.49	0.24	0.96	0.08	0.68	0.04
16			15.38	65.51	11.78	34.24	6.60	8.38	4.22	2.82	2.98	1.21	1.70	0.31	1.10	0.11	0.77	0.05
18			17.30	81.46	13.25	42.58	7.43	10.42	4.74	3.50	3.35	1.50	1.92	0.39	1.24	0.13	0.87	0.06
20			19.22	98.99	14.72	51.74	8.25	12.66	5.27	4.25	3.72	1.83	2.13	0.47	1.38	0.16	0.97	0.07
22					16.19	61.72	9.08	15.10	5.80	5.07	4.10	2.18	2.34	0.56	1.52	0.19	1.06	0.08
24					17.66	72.50	9.90	17.74	6.33	5.96	4.47	2.56	2.55	0.66	1.65	0.23	1.16	0.10
26					19.14	84.07	10.73	20.57	6.85	6.91	4.84	2.97	2.77	0.76	1.79	0.26	1.26	0.11
28							11.55	23.59	7.38	7.93	5.21	3.41	2.98	0.87	1.93	0.30	1.35	0.13
30							12.38	26.80	7.91	9.01	5.59	3.87	3.19	0.99	2.07	0.34	1.45	0.15
35							14.44	35.65	9.22	11.98	6.52	5.15	3.73	1.32	2.41	0.46	1.69	0.19
40							16.50	45.64	10.54	15.34	7.45	6.59	4.26	1.69	2.76	0.59	1.93	0.25
45							18.57	56.75	11.86	19.07	8.38	8.19	4.79	2.10	3.10	0.73	2.18	0.31
50									13.18	23.17	9.31	9.96	5.32	2.55	3.44	0.89	2.42	0.37
55									14.49	27.64	10.24	11.88	5.85	3.05	3.79	1.06	2.66	0.45
60									15.81	32.47	11.17	13.95	6.39	3.58	4.13	1.24	2.90	0.52
65									17.13	37.65	12.11	16.18	6.92	4.15	4.48	1.44	3.14	0.61
70									18.45	43.18	13.04	18.56	7.45	4.76	4.82	1.65	3.38	0.70
75									19.77	49.06	13.97	21.08	7.98	5.41	5.17	1.88	3.63	0.79
80											14.90	23.76	8.52	6.09	5.51	2.11	3.87	0.89
85											15.83	26.58	9.05	6.81	5.86	2.37	4.11	1.00
90											16.76	29.54	9.58	7.58	6.20	2.63	4.35	1.11
95											17.69	32.65	10.11	8.37	6.55	2.91	4.59	1.23
100											18.62	35.90	10.64	9.21	6.89	3.19	4.83	1.35
110													11.71	10.98	7.58	3.81	5.32	1.61
120													12.77	12.90	8.27	4.48	5.80	1.89
130													13.84	14.96	8.96	5.19	6.28	2.19
140													14.90	17.15	9.65	5.95	6.77	2.51
150													15.97	19.49	10.33	6.76	7.25	2.86
160													17.03	21.96	11.02	7.62	7.73	3.22
170													18.10	24.57	11.71	8.53	8.22	3.60
180													19.16	27.31	12.40	9.48	8.70	4.00
190															13.09	10.47	9.18	4.42
200															13.78	11.52	9.67	4.86
225															15.50	14.32	10.88	6.05
250															17.22	17.40	12.08	7.35
275															18.95	20.76	13.29	8.77
300																	14.50	10.30
325																	15.71	11.94
350																	16.92	13.70
375																	18.13	15.56
400																	19.34	17.53
425																		
450																		
475																		
500																		
550																		

Note: Dark shaded area of chart indicates velocities over 5' per second. Use with caution

Velocity of flow values are computed from the general equation  $V = 408 \frac{Q}{d^2}$

Friction pressure loss values are computed from the equation:  $[hf = 0.2083 \left(\frac{100}{c}\right) 1.852 \frac{Q^{1.852}}{d^{4.866}}] \times 4.33$  for psi loss per 100' of pipe

## Pump Station Specification Guide for Low Profile and D-Series Pumps

Rain Bird® Low Profile (LP) Pump Stations													
Vertical Multi-Stage Pump Type													
Pump Model	hp	Flanged Connections Inlet/Disch.	(Differential Pressure- psiG) Boost at Maximum Flow (gpm)										
			15 psiG	20 psiG	30 psiG	40 psiG	50 psiG	60 psiG	70 psiG	80 psiG	90 psiG	100 psiG	110 psiG
CR3-3	0.5	2"	22	20	12								
CR3-4	0.75	2"			18	12							
CR3-5	0.75	2"				18	14						
CR5-2	0.75	2"	30	23									
CR10-1	0.75	2"	15										
CR3-6	1	2"					18	14	10				
CR5-3	1	2"		40	23								
CR3-7	1.5	2"						18	15	10			
CR5-4	1.5	2"			37	23							
CR5-5	1.5	2"				35	27	17					
CR10-2	1.5	2"		60	55								
CR3-10	2	2"								18	16	14	12
CR5-7	2	2"					37	34	27	20			
CR15-1	2	3"	110	80									
CR10-3	3	2"				60	45						
CR10-4	3	2"					60	55	45	30			
CR20-1	3	3"	130	110									
Horizontal End-Suction Pump Type													
Pump Model	hp	Flanged Connections Inlet/Disch.	(Differential Pressure- psiG) Boost at Maximum Flow (gpm)										
			15 psiG	20 psiG	30 psiG	40 psiG	50 psiG	60 psiG	70 psiG	80 psiG	90 psiG	100 psiG	110 psiG
CP0590T	1	2"		35									
CP0590T	2	3"			55	30							
1WC	2	2"				27-40	15-20						
1WC	3	2"					25-42	15-30					
CT1090T	3	3"			70	60	30						
CP1090T	5	3"				95	85	70	50				
1WC	5	2"						35-47	17-50	17-50	20-30		
1.5WH	5	4"			140-165	90-135	75-90						
1WC	7.5	2"								45-55	35-55	20-45	
1.25W	7.5	4"				140-160	105-160	65-125	65-75				
1.5WH	7.5	4"			170-215	140-195	95-165	80-125					
CP10150T	7.5	4"	180		190	190	170	130					
2WH	7.5	4"			200-235	115-185							
1.25Y	7.5	4"					145	125	100	65			
1.25Y	10	4"					150-160	130-160	105-145	70-125			
1.5WH	10	4"				200-235	170-215	130-190	90-150				
CP1090T	10	4"								105	88	60	
CP10150T	10	4"					215	204	180	130			
D Series Pumps													
Pump Model	hp	Flanged Connections Inlet/Disch.	(Differential Pressure- psiG) Boost at Maximum Flow (gpm)										
			15 psiG	20 psiG	30 psiG	40 psiG	50 psiG	60 psiG	70 psiG	80 psiG	90 psiG	100 psiG	110 psiG
Custom Builds No Model Numbers	5	2"							60	60	50		
	5	2"								60	50	50	
	5	2"									60		
	7.5	2"										60	
	5	3"		100	100	90	50						
	5	3"					100	90	80				
	7.5	3"							100	100	80		
	10	3"									100	100	
	10	3"											100
	5	3"		120	120	100							90
	7.5	3"					120	120					
	10	3"							120	120			
	2(5)	3"								120	120		
	3	4"		150								120	
	5	4"		180	130								
	7.5	4"			180	160	130						
	7.5	4"				180	150						
	7.5	4"					170	140					
	10	4"						180	160	140			
	2(5)	4"					220						
	2(7.5)	4"						200	200	200	160	120	
	2(10)	4"									200	200	
	2(10)	4"											200
	7.5	4"		260	260	190							180
	2(5)	4"				230							
	2(7.5)	4"					240	240					
	2(10)	4"							240	240	210		
	2(3)	6"		300									
2(5)	6"		360	240									
2(7.5)	6"			360	330	270							
2(7.5)	6"				360	310							
2(7.5)	6"					340	280						

Select Required Flow within the Desired Pressure Column

## Pump Station Specification Guide for LP and D-Series Pumps

		Pipe Diameter in Inches								
gpm	0.5	0.75	1	1.5	2	2.5	3	4	6	8
1	1.6	0.7	0.4	0.2	0.1	0.1	0	0	0	0
2	3.3	1.5	0.8	0.4	0.2	0.1	0.1	0.1	0	0
3	4.9	2.2	1.2	0.5	0.3	0.2	0.1	0.1	0	0
4	6.5	2.9	1.6	0.7	0.4	0.3	0.2	0.1	0	0
5	8.2	3.6	2	0.9	0.5	0.3	0.2	0.1	0.1	0
6	9.8	4.4	2.5	1.1	0.6	0.4	0.3	0.2	0.1	0
7	11.4	5.1	2.9	1.3	0.7	0.5	0.3	0.2	0.1	0
8	13.1	5.8	3.3	1.5	0.8	0.5	0.4	0.2	0.1	0.1
9	14.7	6.5	3.7	1.6	0.9	0.6	0.4	0.2	0.1	0.1
10	16.3	7.3	4.1	1.8	1	0.7	0.5	0.3	0.1	0.1
15	24.5	10.9	6.1	2.7	1.5	1	0.7	0.4	0.2	0.1
20	32.7	14.5	8.2	3.6	2	1.3	0.9	0.5	0.2	0.1
25	40.9	18.2	10.2	4.5	2.6	1.6	1.1	0.6	0.3	0.2
30	49	21.8	12.3	5.4	3.1	2	1.4	0.8	0.3	0.2
35	57.2	25.4	14.3	6.4	3.6	2.3	1.6	0.9	0.4	0.2
40	65.4	29	16.3	7.3	4.1	2.6	1.8	1	0.5	0.3
45	73.5	32.7	18.4	8.2	4.6	2.9	2	1.1	0.5	0.3
50	81.7	36.3	20.4	9.1	5.1	3.3	2.3	1.3	0.6	0.3
60	98	43.6	24.5	10.9	6.1	3.9	2.7	1.5	0.7	0.4
70	114.4	50.8	28.6	12.7	7.1	4.6	3.2	1.8	0.8	0.4
80	130.7	58.1	32.7	14.5	8.2	5.2	3.6	2	0.9	0.5
90	147.1	65.4	36.8	16.3	9.2	5.9	4.1	2.3	1	0.6
100	163.4	72.6	40.9	18.2	10.2	6.5	4.5	2.6	1.1	0.6
125	204.3	90.8	51.1	22.7	12.8	8.2	5.7	3.2	1.4	0.8
150	245.1	108.9	61.3	27.2	15.3	9.8	6.8	3.8	1.7	1
175	286	127.1	71.5	31.8	17.9	11.4	7.9	4.5	2	1.1
200	326.8	145.2	81.7	36.3	20.4	13.1	9.1	5.1	2.3	1.3
225	367.7	163.4	91.9	40.9	23	14.7	10.2	5.7	2.6	1.4
250	408.5	181.6	102.1	45.4	25.5	16.3	11.3	6.4	2.8	1.6
275	449.4	199.7	112.3	49.9	28.1	18	12.5	7	3.1	1.8
300	490.2	217.9	122.6	54.5	30.6	19.6	13.6	7.7	3.4	1.9
325	531.1	236	132.8	59	33.2	21.2	14.8	8.3	3.7	2.1
350	571.9	254.2	143	63.5	35.7	22.9	15.9	8.9	4	2.2
375	612.8	272.3	153.2	68.1	38.3	24.5	17	9.6	4.3	2.4
400	653.6	290.5	163.4	72.6	40.9	26.1	18.2	10.2	4.5	2.6
425	694.5	308.6	173.6	77.2	43.4	27.8	19.3	10.9	4.8	2.7
450	735.3	326.8	183.8	81.7	46	29.4	20.4	11.5	5.1	2.9
475	776.2	345	194	86.2	48.5	31	21.6	12.1	5.4	3
500	817	363.1	204.3	90.8	51.1	32.7	22.7	12.8	5.7	3.2

Flow Rate in Gallons per Minute (gpm)

Values represent velocity in feet per second

Orange = Recommended inlet/discharge velocity. Typical is 5.0 ft/s

## Customer Service

At Rain Bird, we believe when you purchase our products, you should also receive the support you need to ensure that they perform as designed. Like our products, Rain Bird customer service is designed to exceed expectations. When you call with questions about orders or new products, you get the support you need from the top water management professionals in the industry – support that originates from our headquarters in Azusa, California, or our Customer Service Center in Tucson, Arizona and is backed by our vast global network of distributor-partners.

## Worry-Free Warranties

Our comprehensive product warranties make it even easier to choose Rain Bird and relax. Most Rain Bird Landscape Irrigation products are warranted to the trade for a period of either three or five years from the date of original purchase. A Rain Bird warranty is hassle-free support that enables maximum peak performance by irrigation system professionals. For you, it's the added peace of mind of knowing Rain Bird is there when you need it.

### Rain Bird's Professional Customer Satisfaction Policy

Rain Bird will repair or replace at no charge any Rain Bird professional product that fails in normal use within the warranty period stated below. You must return it to the dealer or distributor where you bought it. Product failures due to acts of God including without limitation, lightning and flooding, are not covered by this warranty. This commitment to repair or replace is our sole and total warranty.

### Implied Warranties of Merchantability and Fitness, if Applicable, are Limited to One Year from the Date of Sale.

We will not, under any circumstances be liable for incidental or consequential damages, no matter how they occur.

### I. Landscape Irrigation Products

1800 Series Pop-Up Spray Heads, U-Series Nozzles, Brass MPR Nozzles, A-8S and PA-8S-PRS Shrub Adapters, and 1300 and 1400 Bubblers, 5000 Series Rotors, 5500 Series Rotors, 7005/8005 Rotors, Falcon® 6504 Series Rotors, RSD-BEX and RSD-CEx – 5 Years

Lake Management Aerator: LM10, LM11, LM20, LM30 – 3 years

Lake Management Aerator: LMM – 2 years

Lake Management Aerator Lights – 1 year

C2 Power Unit – 2 Years

All other Landscape Irrigation products – 3 years

### II. Golf Products

Golf Rotors: TG-25, DR, DH, DS, ESR, EAGLE™ Series and EAGLE IC™ Series Golf rotors - 3 years.

Additionally, any TG-25, DR, DH, DS, EAGLE™ Series and EAGLE IC™ Series Golf Rotor sold and installed in conjunction with a Rain Bird Swing Joint - 5 years. Proof of concurrent installation is required.

Swing Joints – 5 years

Brass And Plastic Valves: EFB and PE-B Remote Control Valves, and Brass

Quick Coupling Valves and Keys – 3 years

Filtration system controllers – 3 years

LINK Radios – 3 years

Lake Management Aerator: LM10, LM11, LM20, LM30 – 5 years

Lake Management Aerator: LMM – 2 years

Lake Management Aerator Lights – 1 year

Hose Reels – 2 years

All other golf products – 1 year

### III. Agricultural Products

LF Series Sprinklers – 5 years

Other Impact Sprinklers – 2 years

All other AG products – 1 year

### IV. Pump Stations

Rain Bird guarantees that its pump station will be free of manufacturer defects for one year from date of authorized start-up but not beyond sixteen months from date of invoice.

Start-up by other than Rain Bird Authorized personnel will void these terms and conditions.

Provided that all installation, start-up and operation responsibilities have been properly executed, Rain Bird will replace or repair, at Rain Bird's option, any part found to be defective under normal recommended use during this period. Repairs performed at Rain Bird's expense must be authorized by Rain Bird prior to repairs being performed. Upon request, Rain Bird shall provide advice on trouble-shooting a defect during the effective period of this Customer Satisfaction Policy. However, no service, replacement or repair under this Customer Satisfaction Policy will be rendered while the customer is in default of any payments due to Rain Bird.

Rain Bird will not accept responsibility for costs associated with the removal, replacement, or repair of equipment in difficult-to-access locations. Difficult-to-access locations include (but are not limited to) locations where any of the following are required:

- 1) Cranes larger than 15 tons
- 2) Divers

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- 3) Barges
- 4) Helicopters
- 5) Dredging
- 6) Any other unusual means or requirements

Such extraordinary cost shall be the responsibility of the customer, regardless of the reason requiring removal of the equipment from service.

The terms and conditions of this Customer Satisfaction Policy do not cover damage caused by or resulting from the following:

- 1) Misapplication, abuse, or failure to conduct routine maintenance (to include winterization/winter lay-up procedures)
- 2) Pumping of liquids other than fresh water as defined by the U.S. Environmental Protection Agency, unless the pump station is specifically designed to do so
- 3) Use of free chlorine or other strong biocides
- 4) Exposure to electrolysis, erosion, or abrasion
- 5) Presence of destructive gases or chemicals
- 6) Over voltage or low voltage
- 7) Electrical phase loss or reversal
- 8) Exposure to incoming power lacking circuit breaker or fused protection
- 9) Using the control panel as a service disconnect
- 10) Lightning or other Act of Nature.
- 11) Failure of pump packing seal (unless the failure occurs on initial start-up).

The foregoing terms and conditions constitute Rain Bird's entire Customer Satisfaction Policy. Rain Bird does not offer any other or additional warranty, with respect to the pumping system or its components. Rain Bird makes no implied warranty, with respect to fitness for a particular purpose or merchantability of the pumping system or its components. Components manufactured by others (as noted on the Pump Station Quotation) are covered solely by and to the extent of the warranty, if any, offered by the manufacturer. Rain Bird shall not be liable to the customer or any other person or entity for any liability, loss, or damage caused or alleged to be caused, directly or indirectly, by the pump system. Rain Bird shall not be responsible for incidental, consequential, collateral or indirect damages or loss of profit or damages related to the customer's business operations, nor for those caused by Acts of Nature. In no case and under no circumstances shall Rain Bird's liability exceed the Rain Bird Corporation's net sale price of the pump system.

Laws concerning customer warranties and disclaimers vary from state to state, and therefore some of the foregoing limitations may not apply to you.

## V. All Other Products - 1 year

**For more information, see your Rain Bird Distributor. To find the nearest authorized distributor in your area, visit [www.rainbird.com](http://www.rainbird.com) or call 1-800-RAINBIRD**

## References for pages 2-6

<sup>1</sup> Derived from Bernoulli's equation (5.19). Refer to Roberson/Crowe, *Engineering Fluid Mechanics (Fourth Edition)*, Houghton Mifflin Co., Boston MA 1990

<sup>2</sup> U-Series nozzle water savings based on manufacturer's testing. Rotary-type nozzles use 20-30% less water than traditional spray heads because they operate with lower precipitation rates, greater uniformity of distribution, and a greater radius of coverage, according to the Metropolitan Water District of Southern California. Savings of 22-41% were also shown with rotary-type nozzles (please see complete study at [http://www.cuwcc.org/landscape\\_task\\_force/Solomon\\_Kissinger\\_Landscape\\_Irrigation\\_Report\\_05-06-05](http://www.cuwcc.org/landscape_task_force/Solomon_Kissinger_Landscape_Irrigation_Report_05-06-05).)

<sup>3</sup> The 5000 PRS Rotor has been awarded the Smart Approved WaterMark Certification, Australia's outdoor water-saving labeling program for products that help reduce water use outside the home. An independent testing panel confirmed that the Rain Bird 5000 PRS delivers 15% to 45% water savings when compared to non-pressure regulated competitive rotors.

<sup>4</sup> Based on water agency (Irvine Ranch Water District, City of Santa Barbara, Cities of Boulder, Longmont, Greenley) and manufacturer case studies of ET-type controllers.

<sup>5</sup> Water savings confirmed in the *Water Efficient Irrigation Study Final Report (May 12, 2003)*, conducted by the Saving Water Partnership (a coalition of water purveyors in the Puget Sound Region of Washington).

<sup>6</sup> Bilderback, T.E., and M.A. Powell. *Efficient Irrigation*. North Carolina Extension Service, Publication Number AG-508-6, March 1996. 21 January 2005.

<sup>7</sup> Water savings are average values for multiple installations. Case studies verifying these water savings can be found on the LEED website as well as [www.rainbird.com/landscape/site\\_reports/index.htm](http://www.rainbird.com/landscape/site_reports/index.htm).

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**Good for our environment.  
Even better for your bottom line.**

The landscape irrigation industry is changing. More restrictions are placed on water use every year. In this challenging time, irrigation professionals have two options: adapt and prosper...or be left behind. As the industry leader in water-efficient irrigation, Rain Bird can help your business thrive.



**The Intelligent Use of Water™**

For years, Rain Bird has been dedicated to using water responsibly. We call it The Intelligent Use of Water.™ It's the thinking behind products, services and technology that efficiently source, support, schedule and apply this precious resource. Many of our irrigation products can even help earn your projects valuable LEED® points because of their superior water efficiency.

