

Plastic pipe: friction loss (in feet of head) per 100' of pipe

Feet of head is typically measured in terms of vertical lift. However the diameter and length of pipe can have a significant effect on the performance of the pump as well. (Especially if the pipe diameter is too small). A pump must have the power to not only push the water up to the vertical height of the waterfall, but to also overcome the friction loss created by the pipe. In most small ponds, with short pipe runs, friction loss is not typically a problem.

However, in a feature with long streams or high flow rates, friction loss can have a big impact on the performance of the pump. To determine the Total Dynamic head you would add the feet of head and the friction loss. The chart below lists the feet of head equivalent created by flow and pipe diameter.

(Figures shown are based on a 100' length of pipe.)

Example

We are pumping 70 GPM (4200 GPH). The chart shows that 70 GPM through 100' of 2" pipe equals 7.76" of head while a 3" pipe only equals 1.13" of head. If your waterfall is 10' high and 100' away, you will have a total head of 17.76' using 2" pipe but only 11.13' using 3" pipe.

10.00' Vertical Lift	10.00' Vertical Lift
+ 7.76' Friction Loss	+ 1.13' Friction Loss
= 17.76' Total Dynamic Head	= 11.13' Total Dynamic Head

GPM	GPH	1"	1 1/4"	1 1/2"	2"	3"	4"	6"	8"	10"
20	1,200	21.75	5.59	2.61	.76	.11				
30	1,800		11.85	5.53	1.62	.23				
40	2,400		20.18	9.43	2.75	.40	.12			
50	3,000			10.51	4.25	.66	.17			
60	3,600			19.98	5.84	.85	.25			
70	4,200				7.76	1.13	.33			
80	4,800				9.94	1.44	.41			
90	5,400				12.37	1.80	.52			
100	6,000				15.03	2.18	.63	.08		
125	7,500					3.31	.95	.13		
150	9,000					4.63	1.33	.18		
175	10,500					6.16	1.78	.23		
200	12,000					7.68	2.07	.30		
250	15,000					11.93	3.16	.45	.12	
300	18,000						4.45	.63	.17	
350	21,000						5.87	.84	.22	
400	24,000						7.52	1.08	.28	
500	30,000							1.66	.42	.14
600	36,000							2.35	.59	.19
700	42,000							3.65	.79	.26
800	48,000								1.02	.33
900	54,000								1.27	.41
1000	60,000								2.15	.50
1250	75,000								2.20	.73
1500	90,000								3.07	1.01

Confused? Give us a call and we will talk you through it!

Pipe Comparison

Many people mistakenly think that there really isn't much difference between (for example) 1 1/2" and 2" pipe or between 3" to 4" pipe. The chart to the right shows how many square inches of surface area are on the inside of flexible PVC pipe.

Pipe Size (dia.)	Square Inches of Surface Area
1"	.79
1 1/2"	1.77
2"	3.14
3"	7.07
4"	12.57
6"	28.27
8"	50.26

As you can see there is a big difference between 1 1/2" and 2" pipe - almost 80% more space. This shows why using the correct size pipe is important to the output of your pump.

