

FRICITION LOSS

SCH 40 - PLASTIC PIPE: FRICTION LOSS (IN FEET OF HEAD) PER 100 FT.

GPM	GPH	3/8" ft.	1/2" ft.	3/4" ft.	1" ft.	1 1/4" ft.	1 1/2" ft.	2" ft.	2 1/2" ft.	3" ft.	4" ft.	6" ft.	8" ft.	10" ft.
1	60	4.25	1.38	.356	.11									
2	120	15.13	4.83	1.21	.38	.10								
3	180	31.97	9.96	2.51	.77	.21	.10							
4	240	54.97	17.07	4.21	1.30	.35	.16							
5	300	84.41	25.76	6.33	1.92	.51	.24							
6	360		36.34	8.83	2.69	.71	.33	.10						
8	480		63.71	15.18	4.58	1.19	.55	.17						
10	600		97.52	25.98	6.88	1.78	.83	.25	.11					
15	900			49.68	14.63	3.75	1.74	.52	.22					
20	1,200			86.94	25.07	6.39	2.94	.86	.36	.13				
25	1,500				38.41	9.71	4.44	1.29	.54	.19				
30	1,800					13.62	6.26	1.81	.75	.26				
35	2,100					18.17	8.37	2.42	1.00	.35	.09			
40	2,400					23.55	10.70	3.11	1.28	.44	.12			
45	2,700					29.44	13.46	3.84	1.54	.55	.15			
50	3,000						16.45	4.67	1.93	.66	.17			
60	3,600						23.48	6.60	2.71	.93	.25			
70	4,200							8.83	3.66	1.24	.33			
80	4,800							11.43	4.67	1.58	.41			
90	5,400							14.26	5.82	1.98	.52			
100	6,000								7.11	2.42	.63	.08		
125	7,500								10.83	3.80	.95	.13		
150	9,000									5.15	1.33	.18		
175	10,500									6.90	1.78	.23		
200	12,000									8.90	2.27	.30		
250	15,000										3.36	.45	.12	
300	18,000										4.85	.63	.17	
350	21,000										6.53	.84	.22	
400	24,000											1.08	.28	
500	30,000											1.66	.42	.14
550	33,000											1.98	.50	.16
600	36,000											2.35	.59	.19
700	42,000												.79	.26
800	48,000												1.02	.33
900	54,000												1.27	.41
950	57,000													.46
1000	60,000													.50

NOTE: See page 5 for website addresses for pipe manufacturers - there are many types of new plastic pipe available now.

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STEEL PIPE: FRICTION LOSS (IN FEET OF HEAD) PER 100 FT.

GPM	GPH	¾"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"
		ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
1	60	4.30	1.86	.26											
2	120	15.00	4.78	1.21	.38										
3	180	31.80	10.00	2.50	.77										
4	240	54.90	17.10	4.21	1.30	.34									
5	300	83.50	25.80	6.32	1.93	.51	.24								
6	360		36.50	8.87	2.68	.70	.33	.10							
7	420		48.70	11.80	3.56	.93	.44	.13							
8	480		62.70	15.00	4.54	1.18	.56	.17							
9	540			18.80	5.65	1.46	.69	.21							
10	600			23.00	6.86	1.77	.83	.25	.11	.04					
12	720			32.60	9.62	2.48	1.16	.34	.15	.05					
15	900			49.70	14.70	3.74	1.75	.52	.22	.08					
20	1,200			86.10	25.10	6.34	2.94	.87	.36	.13					
25	1,500				38.60	9.65	4.48	1.30	.54	.19					
30	1,800				54.60	13.60	6.26	1.82	.75	.26					
35	2,100				73.40	18.20	8.37	2.42	1.00	.35					
40	2,400				95.00	23.50	10.79	3.10	1.28	.44					
45	2,700					30.70	13.45	3.85	1.60	.55					
70	4,200					68.80	31.30	8.86	3.63	1.22	.35				
100	6,000						62.20	17.40	7.11	2.39	.63				
150	9,000							38.00	15.40	5.14	1.32				
200	12,000							66.30	26.70	8.90	2.27	.736	.30	.08	
250	15,000							90.70	42.80	14.10	3.60	1.20	.49	.13	
300	18,000								58.50	19.20	4.89	1.58	.64	.16	.0542
350	21,000								79.20	26.90	6.72	2.18	.88	.23	.0719
400	24,000								103.00	33.90	8.47	2.72	1.09	.279	.0917
450	27,000								130.00	42.75	10.65	3.47	1.36	.348	.114
500	30,000								160.00	52.50	13.00	4.16	1.66	.424	.138
550	33,000								193.00	63.20	15.70	4.98	1.99	.507	.164
600	36,000								230.00	74.80	18.60	5.88	2.34	.597	.192
650	39,000									87.50	21.70	6.87	2.73	.694	.224
700	42,000									101.00	25.00	7.93	3.13	.797	.256
750	45,000									116.00	28.60	9.05	3.57	.907	.291
800	48,000									131.00	32.40	10.22	4.03	1.02	.328
850	51,000									148.00	36.50	11.50	4.53	1.147	.368
900	54,000									165.00	40.80	12.90	5.05	1.27	.410
950	57,000									184.00	45.30	14.30	5.60	1.41	.455
1000	60,000									204.00	50.20	15.80	6.17	1.56	.500

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COPPER PIPE: FRICTION LOSS (IN FEET OF HEAD) PER 100 FT.

GPM	GPH	¾"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
		ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
1	60	6.2	1.8	.39							
2	120	19.6	6.0	1.2							
5	300		30.0	5.8	1.6						
7	420		53.0	11.0	3.2	2.2					
10	600			19.6	5.3	3.9					
15	900			37.0	9.9	6.2	2.1				
18	1,080			55.4	16.1	6.9	3.2				
20	1,200				18.5	10.4	3.9				
25	1,500				27.7	14.3	5.3	1.5			
30	1,800				39.3	18.7	7.6	2.1			
35	2,100				48.5	25.4	10.2	2.8			
40	2,400					30.0	13.2	3.5	1.2		
45	2,700					39.3	16.2	4.2	1.6		
50	3,000						19.4	5.1	1.8		
60	3,600						27.7	6.9	2.5	1.1	
70	4,200						40.0	9.2	3.5	1.4	
75	4,500						41.6	9.9	3.7	1.6	
80	4,800						45.0	11.6	4.2	1.8	
90	5,400						50.8	13.9	4.8	2.2	
100	6,000							16.9	6.2	2.8	
125	7,500							25.4	8.6	3.7	
150	9,000							32.3	11.6	4.8	1.2
175	10,500							41.6	16.2	6.9	1.7
200	12,000							57.8	20.8	9.0	2.2
250	15,000								32.3	13.9	3.5
300	18,000								41.6	18.5	4.6
350	21,000									32.3	5.8
400	24,000									39.3	7.2
450	27,000									44.0	9.2
500	30,000										11.1
750	45,000										23.1
1000	60,000										37.0

RUBBER HOSE: FRICTION LOSS (IN FEET OF HEAD) PER 100 FT.

GPM	Actual Inside Diameter in Inches							
	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
15	70	23	5.8	2.5	.9	.2		
20	122	32	10	4.2	1.6	.5		
25	182	51	15	6.7	2.3	.7		
30	259	72	21.2	9.3	3.2	.9	.2	
40		122	35	15.5	5.5	1.4	.7	
50		185	55	23	8.3	2.3	1.2	
60		233	81	32	11.8	3.2	1.4	
70			104	44	15.2	4.2	1.8	
80			134	55	19.8	5.3	2.5	
90			164	70	25	7	3.5	.7
100			203	85	29	8.1	4	.9
125			305	127	46	12.2	5.8	1.4
150			422	180	62	17.3	8.1	1.6
175				230	85	23.1	10.6	2.5
200				308	106	30	13.6	3.2

GPM	Actual Inside Diameter in Inches							
	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
250					162	44	21	4.9
300					219	62	28	6.7
350					292	83	39	9.3
400						106	49	11.8
500						163	74	17.1
600						242	106	23
700						344	143	30
800						440	182	40
900							224	51
1000							270	63
1250							394	100
1500							525	141
1750								185
2000								230

FRICITION LOSS

EQUIVALENT NUMBER OF FEET STRAIGHT PIPE FOR DIFFERENT FITTINGS

Size of fittings, Inches	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"
90° Ell	1.5	2.0	2.7	3.5	4.3	5.5	6.5	8.0	10.0	14.0	15	20	25
45° Ell	0.8	1.0	1.3	1.7	2.0	2.5	3.0	3.8	5.0	6.3	7.1	9.4	12
Long Sweep Ell	1.0	1.4	1.7	2.3	2.7	3.5	4.2	5.2	7.0	9.0	11.0	14.0	
Close Return Bend	3.6	5.0	6.0	8.3	10.0	13.0	15.0	18.0	24.0	31.0	37.0	39.0	
Tee-Straight Run	1	2	2	3	3	4	5						
Tee-Side Inlet or Outlet or Pitless Adapter	3.3	4.5	5.7	7.6	9.0	12.0	14.0	17.0	22.0	27.0	31.0	40.0	
① Ball or Globe Valve Open	17.0	22.0	27.0	36.0	43.0	55.0	67.0	82.0	110.0	140.0	160.0	220.0	
① Angle Valve Open	8.4	12.0	15.0	18.0	22.0	28.0	33.0	42.0	58.0	70.0	83.0	110.0	
Gate Valve-Fully Open	0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.7	2.3	2.9	3.5	4.5	
Check Valve (Swing)	4	5	7	9	11	13	16	20	26	33	39	52	65
In Line Check Valve (Spring) or Foot Valve	4	6	8	12	14	19	23	32	43	58			

① There are many new, full port valve designs available today which are more efficient and create much less friction loss, consult with valve suppliers for new data.

Example:

(A) 100 ft. of 2" plastic pipe with one (1) 90° elbow and one (1) swing check valve.

90° elbow - equivalent to 5.5 ft. of straight pipe
 Swing check - equivalent to 13.0 ft. of straight pipe
 100 ft. of pipe - equivalent to 100 ft. of straight pipe
 118.5 ft. = Total equivalent pipe

(B) Assume flow to be 80 GPM through 2" plastic pipe.

1. Friction loss table shows 11.43 ft. loss per 100 ft. of pipe.
2. In step (A) above we have determined total ft. of pipe to be 118.5 ft.
3. Convert 118.5 ft. to percentage $118.5 \div 100 = 1.185$
4. Multiply 11.43×1.185
 13.54455 or 13.5 ft. = Total friction loss in this system.

Figure friction loss for 118.5 ft. of pipe.

OFFSET JET PUMP PIPE FRICTION

Where the jet pump is offset horizontally from the well site, add the additional friction loss from the chart below to the vertical lift to approximate what capacity the pump will produce.

PIPE FRICTION FOR OFFSET JET PUMPS

Additional Friction Loss in Feet Per 100 Feet Offset

JET SIZE HP	SUCTION AND PRESSURE PIPE SIZES (in inches)									
	1¼ x 1	1¼ x 1¼	1½ x 1¼	1½ x 1½	2 x 1½	2 x 2	2½ x 2	2½ x 2½	3 x 2½	3 x 3
⅓	12	8	6	4						
½	18	12	8	6	3	2				
¾		22	16	11	6	4				
1			25	16	9	6				
1½					13	8	5	3		
2					20	13	7	5		
3							13	9	6	4

NOTE: The amount of additional Friction Loss from the Table above is added to the Total Suction Lift on a Shallow Well System or the Depth to Jet Assembly on a Deep Well System.

Example: If using a 1 HP jet pump with a 150' offset from a deep well. Using 1 ½" and 1 ½" pipes will be the same as having an extra 16' of lift per 100' of pipe, so with a 150' offset ($150'/100' = 1.5$), you will have $1.5 \times 16' = 24'$ of additional lift. Add the 24' to the Depth to Jet Assembly to see what the performance will be. If you upsize to 2" & 2" pipe the additional friction loss will only be $1.5 \times 6' = 9'$.