

# ENGINEERING INFORMATION

# Velocity Head and Friction Loss in Feet per 100 Feet of Pipe

## Engineering Information

1"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'
1	0.4	---	0.1	0.4	---	0.1	---	---	---
2	0.7	---	0.4	0.7	---	0.4	0.7	---	0.4
3	1.2	---	0.8	1.2	---	0.7	1.2	---	0.8
4	1.5	---	1.3	1.5	---	1.0	1.5	---	1.3
5	1.9	0.1	1.9	1.9	0.1	1.6	1.9	0.1	1.9
6	2.3	0.1	2.7	2.2	0.1	2.2	2.2	0.1	2.7
7	2.6	0.1	3.6	2.6	0.1	2.9	2.6	0.1	3.6
8	3.0	0.1	4.6	3.0	0.1	3.7	3.0	0.1	4.7
9	3.4	0.2	5.8	3.4	0.2	4.6	3.4	0.2	5.8
10	3.8	0.2	6.9	3.8	0.2	5.5	3.8	0.2	7.0
12	4.5	0.3	9.6	4.5	0.3	7.7	4.5	0.3	9.8
14	5.2	0.4	12.8	5.2	0.4	10.4	5.2	0.4	13.1
16	5.9	0.5	16.5	5.9	0.5	13.4	5.9	0.5	16.8
18	6.7	0.7	20.6	6.7	0.7	16.5	6.7	0.7	20.8
20	7.4	0.9	25.1	7.4	0.9	19.7	7.4	0.9	25.1
22	8.2	1.1	30.2	8.2	1.0	23.9	8.2	1.1	30.1
24	8.9	1.2	35.6	8.9	1.2	28.1	8.9	1.2	35.6
26	9.7	1.5	41.6	9.7	1.5	32.2	9.7	1.5	41.3
28	10.4	1.7	47.9	10.4	1.7	37.9	10.4	1.7	47.2
30	11.1	1.9	54.6	11.1	1.9	41.8	11.1	1.9	53.4
32	11.9	2.2	61.8	11.9	2.2	47.0	11.9	2.2	60.5
34	12.6	2.5	69.4	12.6	2.5	53.0	12.6	2.5	67.8
36	13.4	2.8	77.4	13.4	2.8	58.8	13.4	2.8	75.0
38	14.1	3.0	86.0	14.1	3.1	65.0	14.1	3.0	83.0
40	14.8	3.4	95.0	14.8	3.4	71.4	14.8	3.4	91.1
42									
44									
46									
48									
50									
55									
60									
65									
70									
75									
80									
85									
90									
95									
100									

1 1/4"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'
2	0.4	---	0.1	0.4	---	0.1	0.5	---	0.2
3	0.6	---	0.2	0.6	---	0.2	0.7	---	0.3
4	0.9	---	0.3	0.9	---	0.3	1.0	---	0.5
5	1.1	---	0.5	1.1	---	0.4	1.2	---	0.7
6	1.3	---	0.7	1.3	---	0.6	1.5	---	1.0
7	1.5	---	0.9	1.5	---	0.7	1.7	---	1.4
8	1.7	---	1.2	1.7	---	1.0	2.0	0.1	1.7
9	1.9	0.1	1.5	1.9	0.1	1.2	2.2	0.1	2.2
10	2.2	0.1	1.8	2.2	0.1	1.4	2.5	0.1	2.6
12	2.6	0.1	2.5	2.6	0.1	2.0	2.9	0.1	3.7
14	3.0	0.1	3.3	3.0	0.1	2.7	3.4	0.2	4.8
16	3.4	0.2	4.2	3.4	0.2	3.5	3.9	0.2	6.4
18	3.9	0.2	5.2	3.9	0.2	4.3	4.4	0.3	7.9
20	4.3	0.3	6.3	4.3	0.3	5.2	4.9	0.4	9.4
22	4.7	0.3	7.6	4.7	0.3	6.0	5.5	0.5	11.4
24	5.2	0.4	8.9	5.2	0.4	7.1	5.9	0.5	13.4
26	5.6	0.5	10.4	5.6	0.5	8.3	6.4	0.6	15.5
28	6.0	0.6	11.9	6.0	0.6	9.5	6.9	0.7	17.6
30	6.4	0.6	13.6	6.4	0.6	10.8	7.3	0.8	19.9
32	6.9	0.7	15.3	6.9	0.7	12.4	7.9	1.0	22.5
34	7.3	0.8	17.2	7.3	0.8	13.9	8.3	1.1	25.2
36	7.7	0.9	19.2	7.7	0.9	15.5	8.9	1.2	28.0
38	8.2	1.0	21.3	8.2	1.0	17.1	9.3	1.3	31.0
40	8.6	1.1	23.5	8.6	1.1	18.8	9.8	1.5	34.0
42	9.0	1.3	25.8	9.0	1.3	20.6	10.3	1.7	37.4
44	9.4	1.4	28.2	9.4	1.4	22.5	10.8	1.8	40.9
46	9.9	1.5	30.7	9.9	1.5	24.5	11.3	2.0	44.4
48	10.3	1.7	33.3	10.3	1.7	26.4	11.8	2.1	48.0
50	10.7	1.8	36.0	10.7	1.8	28.2	12.2	2.3	51.4
55	11.8	2.2	43.2	11.8	2.2	33.8	13.5	2.8	61.5
60	12.9	2.6	51.0	12.9	2.6	40.0	14.7	3.4	72.1
65	13.9	3.0	59.6	13.9	3.0	46.7	15.9	3.9	84.0
70	15.0	3.5	68.8	15.0	3.5	53.1	17.1	4.5	96.0
75	16.1	4.0	78.7	16.1	4.0	60.6	18.3	5.2	108.0
80	17.2	4.6	89.2	17.2	4.6	68.2	19.6	6.0	123.0
85	18.2	5.2	100.2	18.2	5.2	77.0	20.8	6.7	130.0
90	19.3	5.8	112.0	19.3	5.8	84.6	22.0	7.5	153.0
95	20.4	6.5	124.0	21.4	6.5	92.2	23.2	8.4	169.0
100	21.5	7.2	138.0	21.5	7.2	102.0	24.4	9.2	186.0
110									

## Engineering Information

1 1/2"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'
10	1.6	---	0.8	1.6	---	0.7	1.8	0.1	1.2
12	1.9	0.1	1.2	1.9	0.1	0.9	2.1	0.1	1.6
14	2.2	0.1	1.5	2.2	0.1	1.3	2.5	0.1	2.2
16	2.5	0.1	2.0	2.5	0.1	1.6	2.8	0.1	2.8
18	2.8	0.1	2.4	2.8	0.1	2.0	3.1	0.2	3.5
20	3.2	0.2	2.9	3.2	0.2	2.4	3.5	0.2	4.2
22	3.5	0.2	3.5	3.5	0.2	2.8	3.9	0.2	5.0
24	3.8	0.2	4.1	3.8	0.2	3.2	4.2	0.3	5.8
26	4.1	0.3	4.8	4.1	0.3	3.8	4.6	0.3	6.7
28	4.4	0.3	5.5	4.4	0.3	4.5	4.9	0.4	7.8
30	4.7	0.3	6.3	4.7	0.4	5.2	5.3	0.4	8.8
32	5.0	0.4	7.1	5.0	0.4	5.8	5.6	0.5	10.0
34	5.4	0.4	7.9	5.4	0.5	6.6	6.0	0.6	11.2
36	5.7	0.5	8.8	5.7	0.5	7.3	6.3	0.6	12.5
38	6.0	0.6	9.8	6.0	0.6	8.1	6.7	0.7	13.7
40	6.3	0.6	10.8	6.3	0.6	8.8	7.0	0.8	15.0
42	6.6	0.7	11.8	6.6	0.7	9.7	7.4	0.8	16.5
44	6.9	0.7	12.9	7.0	0.8	10.6	7.7	0.9	18.0
46	7.3	0.8	14.0	7.3	0.8	11.4	8.1	1.0	19.5
48	7.6	0.9	15.2	7.5	0.9	12.4	8.4	1.1	21.1
50	7.9	1.0	16.4	7.9	1.0	13.3	8.8	1.2	22.7
55	8.7	1.2	19.7	8.7	1.2	16.0	9.6	1.4	27.2
60	9.5	1.4	23.2	9.4	1.4	18.6	10.5	1.7	31.8
65	10.2	1.6	27.1	10.2	1.6	21.6	11.4	2.0	36.8
70	11.0	1.9	31.3	11.0	1.9	24.9	12.3	2.4	42.4
75	11.8	2.2	35.8	11.8	2.2	28.2	13.1	2.7	48.1
80	12.6	2.5	40.5	12.7	2.5	32.0	14.0	3.0	54.2
85	13.4	2.8	45.6	13.4	2.8	35.3	14.9	3.5	60.5
90	14.2	3.1	51.0	14.2	3.1	39.5	15.8	3.9	67.3
95	15.0	3.5	56.5	15.0	3.5	43.7	16.6	4.3	74.3
100	15.8	3.9	62.2	15.7	3.9	47.9	17.5	4.8	82.0
110	17.3	4.7	74.5	17.3	4.7	57.3	19.3	5.8	97.5
120	18.9	5.6	88.3	18.9	5.5	67.2	21.0	6.9	115.0
130	20.5	6.5	103.0	20.5	6.5	78.0	22.8	8.1	133.0
140	22.1	7.6	119.0	22.0	7.5	89.3			
150	23.6	8.7	137.0						
160	25.2	9.9	156.0						
170	26.8	11.2	175.0						
180	28.4	12.5	196.0						
190	29.9	13.9	218.0						

2"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'
20	1.9	0.1	0.9	1.9	0.1	0.9	2.0	0.1	1.1
22	2.1	0.1	1.0	2.1	0.1	1.1	2.2	0.1	1.3
24	2.3	0.1	1.2	2.3	0.1	1.2	2.4	0.1	1.5
26	2.5	0.1	1.4	2.5	0.1	1.4	2.6	0.1	1.8
28	2.7	0.1	1.6	2.7	0.1	1.6	2.8	0.1	2.0
30	2.9	0.1	1.8	2.9	0.1	1.8	3.0	0.1	2.3
35	3.4	0.2	2.4	3.4	0.2	2.4	3.5	0.2	3.1
40	3.8	0.2	3.1	3.8	0.2	3.1	4.1	0.3	4.0
45	4.3	0.3	3.9	4.3	0.3	3.9	4.6	0.3	5.0
50	4.8	0.4	4.7	4.8	0.4	4.7	5.1	0.4	6.0
55	5.3	0.4	5.6	5.3	0.4	5.6	5.6	0.5	7.1
60	5.7	0.5	6.6	5.7	0.5	6.5	6.1	0.6	8.4
65	6.2	0.6	7.7	6.2	0.6	7.6	6.6	0.7	9.7
70	6.7	0.7	8.9	6.7	0.7	8.6	7.1	0.8	11.2
75	7.2	0.8	10.1	7.2	0.8	9.8	7.6	0.9	12.6
80	7.7	0.9	11.4	7.7	0.9	11.1	8.1	1.0	14.3
85	8.1	1.0	12.8	8.1	1.0	12.5	8.6	1.2	16.0
90	8.6	1.2	14.2	8.6	1.2	13.8	9.1	1.3	17.8
95	9.1	1.3	15.8	9.1	1.3	15.3	9.6	1.4	19.6
100	9.6	1.4	17.4	9.6	1.4	16.8	10.1	1.6	21.6
110	10.5	1.7	20.9	10.5	1.7	20.2	11.1	1.9	25.8
120	11.5	2.1	24.7	11.5	2.1	23.5	12.1	2.3	30.4
130	12.4	2.4	28.8	12.4	2.4	27.3	13.1	2.7	35.1
140	13.4	2.8	33.2	13.4	2.8	31.5	14.2	3.2	40.3
150	14.3	3.2	38.0	14.3	3.2	35.7	15.2	3.6	45.8
160	15.3	3.6	43.0	15.3	3.6	40.4	16.2	4.1	51.5
170	16.3	4.1	48.4	16.3	4.1	45.1	17.2	4.6	57.7
180	17.2	4.6	54.1	17.2	4.6	50.3	18.2	5.1	64.1
190	18.2	5.1	60.1	18.2	5.1	55.5	19.2	5.7	70.7
200	19.1	5.7	66.3	19.1	5.7	60.6	20.2	6.3	77.9
220	21.0	6.9	80.0	21.0	6.9	72.4	22.2	7.7	93.1
240	22.9	8.2	95.0	22.9	8.2	85.5	24.3	9.2	110.0
260	24.9	9.6	111.0	24.9	9.6	99.2	26.3	10.7	127.0
280	26.8	11.1	128.0				28.3	12.4	145.0
300	28.7	12.8	146.0				30.4	14.4	165.0
320	30.6	14.5	166.0						
340	32.5	16.4	187.0						
360	34.4	18.4	209.0						
380	36.3	20.5	233.0						
400	38.2	22.7	258.0						

# Velocity Head and Friction Loss in Feet per 100 Feet of Pipe

## Engineering Information

2½"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'
20	1.3	---	0.4	1.3	---	0.3	1.3	---	0.4
22	1.5	---	0.4	1.5	---	0.4	1.5	---	0.4
24	1.6	---	0.5	1.6	---	0.4	1.6	---	0.5
26	1.7	---	0.6	1.7	---	0.5	1.7	---	0.6
28	1.9	0.1	0.7	1.9	0.1	0.5	1.9	0.1	0.7
30	2.0	0.1	0.8	2.0	0.1	0.6	2.0	0.1	0.8
35	2.4	0.1	1.0	2.4	0.1	0.8	2.3	0.1	1.1
40	2.7	0.1	1.3	2.7	0.1	1.0	2.6	0.1	1.4
45	3.0	0.1	1.6	3.0	0.1	1.3	3.0	0.1	1.7
50	3.4	0.2	1.9	3.4	0.2	1.6	3.3	0.2	2.1
55	3.7	0.2	2.3	3.7	0.2	1.9	3.6	0.2	2.5
60	4.0	0.3	2.7	4.0	0.3	2.2	3.9	0.3	2.9
65	4.4	0.3	3.2	4.4	0.3	2.5	4.3	0.3	3.5
70	4.7	0.3	3.6	4.7	0.3	2.9	4.6	0.3	3.9
75	5.0	0.4	4.1	5.0	0.4	3.3	4.9	0.4	4.4
80	5.4	0.4	4.7	5.4	0.4	3.7	5.3	0.4	5.0
85	5.7	0.5	5.2	5.7	0.5	4.2	5.6	0.5	5.6
90	6.0	0.6	5.8	6.0	0.6	4.6	5.9	0.6	6.2
95	6.4	0.6	6.5	6.4	0.6	5.1	6.3	0.6	6.9
100	6.7	0.7	7.1	6.7	0.7	5.6	6.6	0.7	7.5
110	7.4	0.8	8.5	7.4	0.8	6.8	7.2	0.8	8.9
120	8.0	1.0	10.0	8.0	1.0	7.9	7.9	1.0	10.5
130	8.7	1.2	11.7	8.7	1.2	8.8	8.5	1.1	12.1
140	9.4	1.4	13.5	9.4	1.4	10.5	9.2	1.3	13.9
150	10.1	1.6	15.4	10.1	1.6	12.0	9.8	1.5	15.8
160	10.7	1.8	17.4	10.7	1.8	13.6	10.5	1.7	17.8
170	11.4	2.0	19.6	11.4	2.0	16.0	11.1	1.9	20.0
180	12.1	2.3	21.9	12.1	2.3	16.8	11.8	2.2	22.2
190	12.7	2.5	24.2	12.7	2.5	18.6	12.5	2.4	24.5
200	13.4	2.8	26.7	13.4	2.8	20.3	13.1	2.7	27.0
220	14.7	3.4	32.2	14.7	3.4	24.9	14.4	3.2	32.2
240	16.1	4.0	38.1	16.1	4.0	28.7	15.7	3.8	37.9
260	17.4	4.7	44.5	17.4	4.7	33.0	17.1	4.5	43.9
280	18.8	5.5	51.3	18.8	5.5	38.1	18.4	5.3	50.2
300	20.1	6.3	58.5	20.1	6.3	43.2	19.7	6.0	57.6
350	23.5	8.6	79.2	23.5	8.6	56.0	23.0	8.2	76.0
400	26.8	11.2	103.0	26.8	11.2	73.3	26.2	10.7	97.0
450	30.2	14.1	130.0				29.5	13.5	120.0
500	33.5	17.4	160.0				32.8	16.7	147.0
550	36.9	21.1	193.0						

3"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'	Vel. Ft./ Sec.	Vel. Hd. Ft.	Head Loss Ft./ 100'
50	2.2	0.1	0.7	2.2	0.1	0.7	2.3	0.1	0.9
60	2.6	0.1	0.9	2.6	0.1	0.9	2.8	0.1	1.2
70	3.0	0.1	1.2	3.0	0.1	1.2	3.2	0.2	1.6
80	3.5	0.2	1.6	3.5	0.2	1.5	3.7	0.2	2.1
90	3.9	0.2	2.0	3.9	0.2	1.9	4.1	0.3	2.6
100	4.3	0.3	2.4	4.3	0.3	2.3	4.6	0.3	3.2
110	4.8	0.4	2.9	4.8	0.4	2.8	5.1	0.4	3.8
120	5.2	0.4	3.4	5.2	0.4	3.3	5.5	0.5	4.4
130	5.6	0.5	3.9	5.6	0.5	3.8	6.0	0.6	5.1
140	6.1	0.6	4.5	6.1	0.6	4.3	6.4	0.6	5.9
150	6.5	0.7	5.1	6.5	0.7	4.9	6.9	0.7	6.7
160	6.9	0.7	5.8	6.9	0.7	5.5	7.3	0.8	7.6
170	7.4	0.8	6.5	7.4	0.8	6.3	7.8	0.9	8.3
180	7.8	0.9	7.3	7.8	0.9	6.6	8.3	1.1	9.4
190	8.3	1.1	8.1	8.3	1.1	7.3	8.7	1.2	10.4
200	8.7	1.2	8.9	8.7	1.2	8.4	9.2	1.3	11.4
220	9.6	1.4	10.7	9.6	1.4	10.0	10.1	1.6	13.6
240	10.4	1.7	12.6	10.4	1.7	11.8	11.0	1.9	16.0
260	11.3	2.0	14.7	11.3	2.0	13.7	11.9	2.2	18.5
280	12.2	2.3	16.9	12.2	2.3	15.7	12.8	2.5	21.3
300	13.0	2.6	19.2	13.0	2.6	17.9	13.7	2.9	24.2
320	13.9	3.0	22.0	13.9	3.0	20.1	14.7	3.4	27.2
340	14.8	3.4	24.8	14.8	3.4	22.5	15.6	3.8	30.4
360	15.6	3.8	27.7	15.6	3.8	24.9	16.5	4.2	33.8
380	16.5	4.2	30.7	16.5	4.2	27.7	17.4	4.7	37.4
400	17.4	4.7	33.9	17.4	4.7	30.6	18.3	5.2	41.2
420	18.2	5.2	37.3	18.2	5.2	33.2	19.2	5.7	45.0
440	19.1	5.7	40.9	19.1	5.7	36.3	20.1	6.3	49.1
460	20.0	6.2	44.6	20.0	6.2	39.5	21.1	6.9	53.4
480	20.8	6.7	48.5	20.8	6.7	42.8	22.0	7.5	57.9
500	21.7	7.3	52.5	21.7	7.3	46.1	22.9	8.1	62.1
550	23.9	8.9	63.2	23.9	8.9	55	25.2	9.9	74.1
600	26.0	10.5	74.8	26.0	10.5	64.4	27.5	11.7	87.0
650	28.2	12.4	87.5				29.8	13.8	101.0
700	30.4	14.3	101.0				32.1	16.0	116.0
750	32.5	16.5	116.0				34.4	18.4	132.0
800	34.7	18.7	131.0				36.6	20.8	148.0
850	36.9	21.1	148.0						
900	39.1	23.7	165.0						
950	41.2	26.4	184.0						

## Engineering Information

4"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'
100	2.5	0.1	0.6	2.5	0.1	0.6	2.6	0.1	0.8
110	2.8	0.1	0.7	2.8	0.1	0.7	2.9	0.1	1.0
120	3.0	0.1	0.9	3.0	0.1	0.8	3.2	0.1	1.2
130	3.3	0.2	1.0	3.3	0.2	0.9	3.4	0.2	1.3
140	3.5	0.2	1.2	3.5	0.2	1.1	3.7	0.2	1.5
150	3.8	0.2	1.3	3.8	0.2	1.2	4.0	0.3	1.7
160	4.0	0.3	1.5	4.0	0.3	1.4	4.2	0.3	1.9
170	4.3	0.3	1.7	4.3	0.3	1.5	4.5	0.3	2.2
180	4.5	0.3	1.9	4.5	0.3	1.7	4.7	0.4	2.4
190	4.8	0.4	2.1	4.8	0.4	1.9	5.0	0.4	2.7
200	5.0	0.4	2.3	5.0	0.4	2.1	5.3	0.4	2.9
220	5.5	0.5	2.7	5.5	0.5	2.4	5.8	0.5	3.5
240	6.1	0.6	3.2	6.1	0.6	2.9	6.3	0.6	4.1
260	6.6	0.7	3.7	6.6	0.7	3.3	6.9	0.7	4.8
280	7.1	0.8	4.3	7.1	0.8	3.9	7.4	0.9	5.5
300	7.6	0.9	4.9	7.6	0.9	4.4	7.9	1.0	6.2
320	8.1	1.0	5.5	8.1	1.0	4.9	8.4	1.1	7.0
340	8.6	1.1	6.2	8.6	1.1	5.5	9.0	1.3	7.8
360	9.1	1.3	6.9	9.1	1.3	6.2	9.5	1.4	8.7
380	9.6	1.4	7.7	9.6	1.4	6.6	10.0	1.6	9.7
400	10.1	1.6	8.5	10.1	1.6	7.5	10.5	1.7	10.6
420	10.6	1.7	9.3	10.6	1.7	8.3	11.1	1.9	11.6
440	11.1	1.9	10.2	11.1	1.9	9.0	11.6	2.1	12.6
460	11.6	2.1	11.1	11.6	2.1	9.8	12.1	2.3	13.7
480	12.1	2.3	12.0	12.1	2.3	10.6	12.6	2.5	14.8
500	12.6	2.5	13.0	12.6	2.5	11.3	13.2	2.7	15.9
550	13.9	3.0	15.7	13.9	3.0	13.5	14.5	3.3	19.1
600	15.1	3.6	18.6	15.1	3.6	15.8	15.8	3.9	22.4
650	16.4	4.2	21.7	16.4	4.2	18.3	17.1	4.5	26.0
700	17.6	4.8	25.0	17.6	4.8	21.1	18.4	5.3	29.9
750	18.9	5.6	28.6	18.9	5.6	24.0	19.8	6.1	33.8
800	20.2	6.3	32.4	20.2	6.3	26.8	21.1	6.9	38.1
850	21.4	7.1	36.5	21.4	7.1	30.1	22.4	7.8	42.6
900	22.7	8.0	40.8	22.7	8.0	33.4	23.7	8.7	47.3
950	23.9	8.9	45.3				25.0	9.7	52.3
1000	25.2	9.9	50.2				26.4	10.8	57.6
1100	27.7	11.9	60.2				29.0	13.1	68.7
1200	30.2	14.2	72.0				31.6	15.5	81.0
1300	32.8	16.7	84.3				34.2	18.2	93.5
1400	35.3	19.3	97.6				36.9	21.1	108.0

5"									
US GPM	IRON/STEEL Schedule 40			PLASTIC Schedule 40			COPPER Type M		
	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'	Vel. Ft./Sec.	Vel. Hd. Ft.	Head Loss Ft./100'
200	3.2	0.2	0.7				3.4	0.2	1.0
220	3.5	0.2	0.9				3.7	0.2	1.2
240	3.9	0.2	1.0				4.1	0.3	1.4
260	4.2	0.3	1.2				4.4	0.3	1.6
280	4.5	0.3	1.4				4.7	0.3	1.9
300	4.8	0.4	1.6				5.1	0.4	2.1
320	5.2	0.4	1.8				5.4	0.5	2.5
340	5.5	0.5	2.0				5.7	0.5	2.8
360	5.8	0.5	2.2				6.1	0.6	3.1
380	6.0	0.6	2.5				6.4	0.6	3.3
400	6.4	0.6	2.7				6.8	0.7	3.6
420	6.8	0.7	3.0				7.1	0.8	4.0
440	7.0	0.8	3.3				7.4	0.9	4.5
460	7.4	0.9	3.6				7.8	0.9	4.8
480	7.7	0.9	3.9				8.1	1.0	5.2
500	8.0	1.0	4.2				8.5	1.1	5.5
550	8.8	1.2	5.0				9.3	1.3	6.6
600	9.6	1.4	5.9				10.1	1.6	7.7
650	10.4	1.7	6.9				11.0	1.9	8.9
700	11.2	2.0	7.9				11.8	2.2	10.2
750	12.0	2.3	9.0				12.7	2.5	11.6
800	12.8	2.6	10.3				13.5	2.8	13.1
850	13.6	2.9	11.5				14.4	3.2	14.7
900	14.4	3.3	12.9				15.2	3.6	16.3
950	15.2	3.6	14.3				16.1	4.0	18.0
1000	16.0	4.0	15.8				16.9	4.4	19.8
1100	17.6	4.8	19.0				18.6	5.4	23.6
1200	19.2	5.8	22.5				20.3	6.4	27.7
1300	20.8	6.8	26.3				22.0	7.5	32.1
1400	22.5	7.8	30.4				23.7	8.7	36.8
1500	24.1	9.0	34.8				25.4	10.1	41.8
1600	25.7	10.2	39.5				27.0	11.3	47.2
1700	27.3	11.6	44.5				28.7	12.8	53.0
1800	28.8	12.9	49.7				30.4	14.4	58.7
1900	30.5	14.4	55.2				32.1	16.0	64.9
2000	32.1	16.0	61.0				33.8	17.7	71.2
2100	33.7	17.6	67.1				35.5	19.6	78.1
2200	35.3	19.3	73.5				37.2	21.5	85.0
2300	36.9	21.1	80.1				38.8	23.4	92.4
2400	38.5	23.0	87.0				40.5	25.5	99.8

# Equivalent Length (Feet) of Straight Pipe for Pipe Fittings

(Based on Hydraulic Institute Pipe Friction Manual)

## Engineering Information

	PIPE FITTINGS	PIPE DIAMETER									
		3/4	1	1¼	1½	2	2½	3	4	5	6
	SCREWED RETURN BEND OR REGULAR SCREWED ELBOW	4	6	6	7	9	9	11	14	-	-
	LONG RADIUS SCREWED ELBOW	2	3	3	3	4	4	4	5	-	-
	REGULAR SCREWED 45° ELBOW	1	1	2	2	3	3	4	5	-	-
	SCREWED T-LINE FLOW	2	3	5	6	8	10	13	18	-	-
	SCREWED T-BRANCH FLOW	5	7	8	10	12	14	17	22	-	-
	SCREWED INCREASER (1 PIPE SIZE)	1	3	1	3	2	4	10	-	-	-
	SCREWED GATE VALVE	1	1	1	1	1	2	2	3	-	-
	SCREWED GLOB VALVE	27	32	41	45	60	66	84	112	-	-
	SCREWED COUPLINGS & UNIONS	1	1	1	1	1	1	1	-	-	-
	SCREWED SWING CHECK VALVE	9	11	13	15	19	23	28	40	-	-
	SCREWED ANGLE VALVE	16	16	18	18	18	18	20	20	-	-
	INWARD PROJECTING PIPE OR SUDDEN INCREASE	3	4	5	6	9	11	14	20	26	33
	REDUCERS	1	1	1	1	2	2	3	4	4	7
	FOOT VALVE	-	3	4	5	7	9	11	16	21	26
	BELL MOUTHED INLET	0	0	0	0	0	1	1	1	1	2
	SQUARE EDGED INLET	1	2	3	3	4	5	7	10	13	16
	REGULAR FLANGED RETURN BEND OR REGULAR FLANGED ELBOW	-	2	2	3	3	4	5	6	8	9
	LONG RADIUS FLANGED RETD. BEND OR LONG RADIUS FLANGED ELBOW	-	2	2	2	3	3	4	4	5	6
	LONG RADIUS FLANGED 45° ELBOW	-	1	1	1	2	2	3	4	5	5
	FLANGED T-LINE FLOW	-	1	1	1	2	2	2	3	3	4
	FLANGED T-BRANCH FLOW	-	4	5	6	7	8	10	14	16	19
	FLANGED INCREASER	-	-	-	1	1	1	1	1	1	1
	FLANGED GATE VALVE	-	-	-	-	3	3	3	3	3	3
	FLANGED GLOBE VALVE	-	45	57	63	74	83	98	120	156	192
	FLANGED SWING CHECK VALVE	-	7	10	13	18	22	28	40	53	65
	FLANGED ANGLE VALVE	-	16	18	18	21	23	30	39	53	65
	BASKET STRAINER	-	-	10	11	13	14	17	22	25	28

PROPERTIES OF WATER							
Temp. °F	Absolute Vapor Pressure		Specific Gravity (Water at 39.2°F = 1.000)	Temp. °F	Absolute Vapor Pressure		Specific Gravity (Water at 39.2°F = 1.000)
	Psi	Ft. Water			Psi	Ft. Water	
60	0.26	0.59	0.999	205	12.77	30.6	0.961
70	0.36	0.89	0.998	206	13.03	31.2	0.960
80	0.51	1.2	0.997	207	13.30	32.0	0.960
85	0.60	1.4	0.996	208	13.57	32.6	0.960
90	0.70	1.6	0.995	209	13.84	33.2	0.959
100	0.95	2.2	0.993	210	14.12	33.9	0.959
110	1.27	3.0	0.991	211	14.41	34.6	0.958
120	1.69	3.9	0.989	212	14.70	35.4	0.958
130	2.22	5.0	0.986	213	14.99	36.2	0.957
140	2.89	6.8	0.983	214	15.29	37.0	0.957
150	3.72	8.8	0.981	215	15.59	37.7	0.957
151	3.81	9.0	0.981	216	15.90	38.4	0.956
152	3.90	9.2	0.980	217	16.22	39.2	0.956
153	4.00	9.4	0.980	218	16.54	40.0	0.956
154	4.10	9.7	0.979	219	16.86	40.8	0.955
155	4.20	9.9	0.979	220	17.19	41.6	0.955
156	4.31	10.1	0.979	221	17.52	42.5	0.955
157	4.41	10.4	0.978	222	17.86	43.3	0.954
158	4.52	10.7	0.978	223	18.21	44.2	0.954
159	4.63	10.9	0.978	224	18.56	45.0	0.953
160	4.74	11.2	0.977	225	18.92	45.9	0.953
161	4.85	11.5	0.977	226	19.28	46.8	0.953
162	4.97	11.7	0.977	227	19.65	47.7	0.952
163	5.09	12.0	0.976	228	20.02	48.6	0.952
164	5.21	12.3	0.976	229	20.04	49.5	0.951
165	5.33	12.6	0.976	230	20.78	50.5	0.951
166	5.46	12.9	0.975	231	21.17	51.4	0.951
167	5.59	13.3	0.975	232	21.57	52.5	0.950
168	5.72	13.6	0.974	233	21.97	53.5	0.950
169	5.85	13.9	0.974	234	22.38	54.5	0.950
170	5.99	14.2	0.974	235	22.80	55.5	0.949
171	6.13	14.5	0.973	236	23.22	56.6	0.949
172	6.27	14.9	0.973	237	23.65	57.8	0.948
173	6.42	15.2	0.973	238	24.09	58.8	0.948
174	6.56	15.6	0.972	239	24.53	59.8	0.948
175	6.71	15.9	0.972	240	24.97	61.0	0.947
176	6.87	16.3	0.972	241	25.43	62.1	0.947
177	7.02	16.7	0.971	242	25.89	63.3	0.946
178	7.18	17.1	0.971	243	26.36	64.5	0.946
179	7.34	17.4	0.971	244	26.83	65.6	0.946
180	7.51	17.8	0.970	245	27.31	66.8	0.945
181	7.68	18.3	0.970	250	29.83	73.2	0.943
182	7.85	18.7	0.970	260	35.44	87.4	0.938
183	8.02	19.1	0.969	270	41.87	103.6	0.933
184	8.20	19.5	0.969	280	49.22	122.8	0.927
185	8.38	20.0	0.969	290	57.57	144.0	0.923
186	8.57	20.4	0.968	300	67.0	168.6	0.918
187	8.76	20.9	0.968	310	77.7	197.0	0.913
188	8.95	21.4	0.967	320	89.7	228.4	0.908
189	9.14	21.8	0.967	330	103.0	264.0	0.902
190	9.34	22.3	0.966	340	118.0	305.0	0.896
191	9.54	22.8	0.966	350	134.6	349.0	0.891
192	9.75	23.3	0.965	360	153.0	399.0	0.886
193	9.96	23.8	0.965	380	195.8	517.7	0.874
194	10.17	24.3	0.965	400	247.3	663.9	0.861
195	10.38	24.9	0.964	420	308.8	842.4	0.847
196	10.60	25.4	0.964	440	381.6	1058.5	0.833
197	10.83	25.9	0.963	460	466.9	1318.0	0.818
198	11.06	26.6	0.963	480	566.1	1630.5	0.802
199	11.29	27.1	0.963	500	680.8	2000.1	0.786
200	11.53	27.6	0.963	520	812.4	2445.5	0.767
201	11.77	28.2	0.962	540	962.5	2980.4	0.746
202	12.01	28.8	0.962				
203	12.26	29.4	0.962				
204	12.51	30.0	0.961				

ATMOSPHERIC PRESSURE AND BOILING POINT OF WATER AT VARIOUS ALTITUDES				
Altitude (Feet)	Barometer inches Mercury	Atmospheric Pressure		Boiling Point °F
		PSIA	(ft. water)	
-1000	31.0	15.2	32.5	213.8
-500	30.5	15.0	34.6	212.9
0	29.9	14.7	33.9	212.0
+500	29.4	14.4	33.3	211.1
+1000	28.9	14.2	32.8	210.2
+1500	28.3	13.9	32.1	209.3
+2000	27.8	13.7	31.5	208.4
+2500	27.3	13.4	31.0	207.4
+3000	26.8	13.2	30.4	206.5
+3500	26.3	12.9	29.8	205.6
+4000	25.8	12.7	29.2	204.7
+4500	25.4	12.4	28.8	203.8
+5000	24.9	12.2	28.2	202.9
+5500	24.4	12.0	27.6	201.9
+6000	24.0	11.8	27.2	201.0
+6500	23.5	11.5	26.7	200.1
+7000	23.1	11.3	26.2	199.2
+7500	22.7	11.1	25.7	198.3
+8000	22.2	10.9	25.2	197.4
+8500	21.8	10.7	24.7	196.5
+9000	21.4	10.5	24.3	195.5
+9500	21.0	10.3	23.8	194.6
+10000	20.6	10.1	23.4	193.7
+15000	16.9	8.3	19.2	184.0

VACUUM CONVERSION DATA				
Vacuum inches Mercury	Equivalents			PSIA
	PSIG	Inches of Water	Feet of Water	
30	14.7	407.70	33.90	0.00
29	14.21	393.60	32.80	.49
28	13.72	380.05	31.60	.98
27	13.23	366.40	30.50	1.47
26	12.74	352.90	29.40	1.96
25	12.25	339.30	28.30	2.45
24	11.76	325.70	27.10	2.94
23	11.27	312.10	26.00	3.43
22	10.78	298.60	24.90	3.92
21	10.29	285.00	23.70	4.41
20	9.80	271.40	22.60	4.90
19	9.31	257.80	21.50	5.39
18	8.82	244.30	20.30	5.88
17	8.33	230.70	19.20	6.37
16	7.84	217.70	18.00	6.86
15	7.35	203.60	17.00	7.35
14	6.86	190.02	15.80	7.84
13	6.37	176.40	14.70	8.33
12	5.88	162.80	13.50	8.82
11	5.39	149.30	12.40	9.31
10	4.90	135.70	11.30	9.80
9	4.41	122.10	10.20	10.29
8	3.92	108.50	9.00	10.78
7	3.43	95.00	7.90	11.27
6	2.94	81.40	6.80	11.76
5	2.45	67.80	5.70	12.25
4	1.96	54.20	4.50	12.74
3	1.47	40.70	3.40	13.23
2	0.98	27.10	2.30	13.72
1	0.49	13.60	1.13	14.21
0	0.00	0.00	0.00	14.70

## Engineering Information

PRESSURE TO FEET OF HEAD	
Lbs. Per Sq. In.	Feet Head
1	2.31
2	4.62
3	6.93
4	9.24
5	11.54
6	13.85
7	16.16
8	18.47
9	20.78
10	23.09
15	34.63
20	46.18
25	57.72
30	69.27
40	92.36
50	115.45
60	138.54
70	161.63
80	184.72
90	207.81
100	230.90
110	253.98
120	277.07
125	288.62
130	300.16
140	323.25
150	346.34
160	369.43
170	392.52
180	415.61
190	438.90
200	461.78
225	519.51
250	577.24
275	643.03
300	692.69
325	750.41
350	808.13
375	865.89
400	922.58
500	1154.48
1000	2309.00

FEET OF HEAD TO PRESSURE	
Feet Head	Lbs Per Sq. In.
1	.43
2	.87
3	1.30
4	1.73
5	2.17
6	2.60
7	3.03
8	3.46
9	3.90
10	4.33
20	8.66
30	12.99
40	17.32
50	21.65
60	25.99
70	30.32
80	34.65
90	38.98
100	43.31
110	47.65
120	51.97
130	56.30
140	60.63
150	64.96
160	69.29
170	73.63
180	77.96
190	82.29
200	86.62
225	97.45
250	108.27
275	119.10
300	129.93
325	140.75
350	151.58
400	173.24
500	216.55
600	259.85
700	303.16
800	346.47
900	389.78
1000	433.09



## Engineering Information

PRESSURE							
	In Water	Ft. Water	PSI	In Hg.	MM Hg	Atm	Kg/Sq. Cm
In. Water =	1.0	0.083	0.0361	0.0736	1.87	0.353	0.0025
Ft. Water =	12.0	1.0	0.433	0.883	22.43	0.0295	0.0304
PSI =	27.72	2.31	1.0	2.040	51.816	0.068	0.0703
In Hg =	13.596	1.133	0.491	1.0	25.40	0.0334	0.0345
MM Hg =	0.535	0.0446	0.0193	0.0394	1.0	0.00132	0.0014
Atm =	2.829	33.947	14.7	29.921	760.0	1.0	1.0033
Kg/Sq. Cm =	393.6	32.80	14.22	28.97	736.03	0.968	1.0

VOLUME							
	U.S. Gal.	Imp. Gal.	Cu. Ft.	Lb. Water @ 60°F	Cu. M	Quart	Liter
U.S. Gal. =	1.0	0.833	0.134	8.33	0.00379	4.0	3.785
Imp. Gal. =	1.2	1.0	0.161	10.0	0.00455	4.8	4.546
Cu. Ft. =	7.481	6.232	1.0	62.37	0.0283	29.92	28.32
Lb. Water @ 60°F =	0.12	0.10	0.016	1.0	0.00045	0.48	0.454
Cu. M =	264.2	220.0	35.31	2,202.9	1.0	1,057.0	1,000.0
Quart =	0.25	0.208	0.0334	2.086	0.00095	1.0	0.946
Liter =	0.264	0.22	0.0353	2.204	0.001	1,057.0	1.0

POWER						
	HP	Metric HP	kW	HP Hr.	kW Hr	BTU
HP =	1.0	1.014	0.746	---	---	---
Metric HP =	0.986	1.0	0.736	---	---	---
Kw =	1.341	1.36	1.0	---	---	---
HP Hr. =	---	---	---	1.0	0.746	2,545.0
Kw Hr. =	---	---	---	1.341	1.0	3,413.0
BTU	---	---	---	0.000393	0.000293	1.0

LENGTH							
	mm	cm	m	in	ft	yd	mi
mm =	1.0	0.1	0.001	0.0394	0.00328	---	---
cm =	10.0	1.0	0.01	0.394	0.0328	---	---
m =	1,000.0	100.0	1.0	39.37	3.281	1.094	---
km =	---	---	1,000.0	---	---	---	0.621

AREA					
	Sq. cm	Sq. m	Sq. in.	Sq. ft.	Sq. yd.
Sq. cm =	1.0	---	0.155	---	---
Sq. m =	10,000.0	1.0	1,550.0	10.76	1.196

### ABBREVIATIONS

Atm. = Atmosphere	Kg = Kilogram
BTU = British Thermal Unit	KM = Kilometer
cm = Centimeter	Kw = Kilowatt
Cu. = Cubic	Lb. = Pound
Ft. = Foot	m = Meter
Gal. = Gallon	Mi. = Mile
Hg. = Mercury	ml = Milliliter
HP = Horsepower	mm = Millimeter
Hr. = Hour	PSI = Pounds per Square inch
Imp. = Imperial	Sq. = Square
in. = inch	yd. = Yard

## Engineering Information

### SPECIFIC GRAVITY

Direct ratio of any liquid's weight to the weight of water at 62°F. Water at 62°F weighs 8.33 lbs per gallon and is designated 1.0 sp. gr.

**NOTE:** A centrifugal pump develops head, not pressure. All pressure figures should be converted to feet of head taking into consideration the sp. gr.  
(Ft. HD - PSI x 2.31 ÷ Sp. Gr.)

### VISCOSITY

Property of a liquid that resists any force tending to produce flow.

It is the evidence of cohesion between the particles of a fluid which causes a liquid to offer resistance analogous to friction. An increase in the temperature reduces the viscosity; conversely, a temperature reduction increases the viscosity. Pipe friction loss increases as viscosity increases.

### EFFECTS OF VISCOSITY

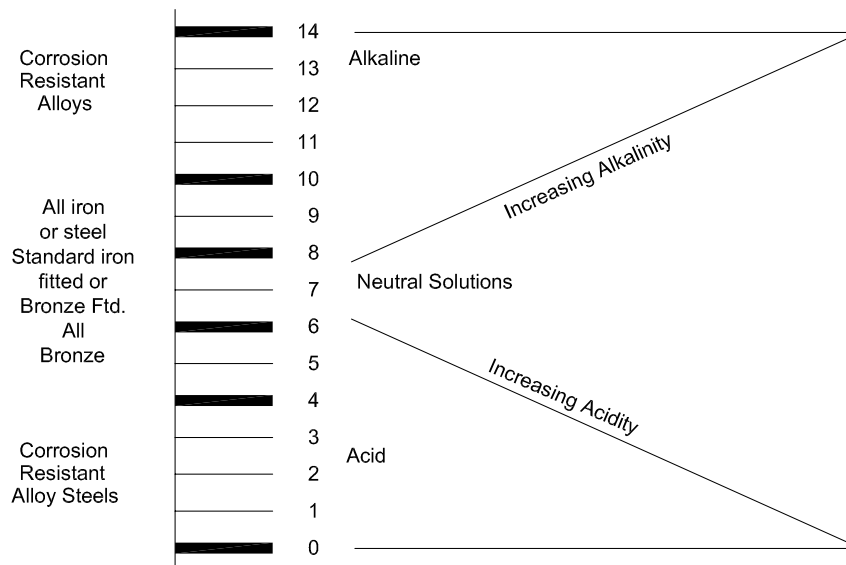
Viscous liquids tend to increase pump HP, reduce efficiency, reduce capacity and head and increase pipe friction.

## VISCOSITY - CENTRIFUGAL PUMP PERCENTAGE OF WATER CHARACTERISTICS - APPROXIMATE GUIDE

Viscosity S.S.U.	Capacity	Head	Efficiency
31.5	100%	100%	100%
500	95%	98%	80%
1000	92%	97%	70%
2000	89%	94%	60%

NOTE: Viscosities higher than 500 SSU should be referred to manufacture.

## pH VALUE Of Solutions - General Guide For Pump Construction



**NOTE:** There is no substitute for experience in selecting materials for pump construction. Previous experience in handling a particular solution should be the main criterion in determining the optimal construction.

## Engineering Information

NPSH combines all the factors limiting the suction side of a pump; internal pump losses, static suction lift, friction losses, vapor pressure and atmospheric conditions. It is important to differentiate between REQUIRED NPSH and AVAILABLE NPSH.

### NPSH REQUIRED

REQUIRED NPSH is a factor designed into pump and measurable in the test laboratory by the manufacturer. Testing facilities can determine losses in the suction piping static lift and barometric pressures.

### NPSH AVAILABLE (Ft.)

The term for providing sufficient pressure on the suction, at the impeller eye, to prevent "boiling" is known as NPSH AVAILABLE. It is a function of the pumping system and consists of pressure on the liquid at its source, the elevation of the liquid with respect to the impeller centerline, losses in the suction piping and vapor pressure of the liquid. If the available NPSH is not equal to, or greater than that required by the pump, it must be increased. This is usually done by increasing the static head, Hz.

### NPSH FORMULAS

#### Determining NPSH AVAILABLE

$$\text{NPSH} = (\text{Barometer} + \text{Gauge} - \text{Vapor Pressure}) \times (2.31 \div \text{Specific Gravity}) \pm \text{Static Height} - \text{Pipe Loss.}$$

**BAROMETER** value in pounds per square inch absolute (PSIA) should be lowest likely reading for the area where the pump will be installed. (Use table, page 8 of section 11, to convert barometer reading in inches of mercury to PSIA).

**GAUGE PRESSURE** (PSIG) is the pressure in pounds per square inch ABOVE atmospheric pressure on the surface of the liquid in the supply vessel.

**VAPOR PRESSURE** is the value in pounds per square inch absolute (PSIA) at which the liquid will boil at given temperature.

**STATIC HEIGHT** is the distance in feet between the pump suction centerline and the surface level of the liquid in the supply vessel. If the surface level of the liquid is higher than the pump suction, static height is positive. If the surface level of the liquid is lower than the pump suction, static height is negative.

**PIPE LOSS** is the friction in feet between the supply vessel and the pump.

### MAXIMUM WORKING PRESSURE

#### DEFINITIONS

**WORKING PRESSURE** - The maximum pressure of the pumping system.

**OPERATING PRESSURE** - The pressure added to the pumping system by the pump (total head of the pump).

#### EXAMPLE:

A pump used for booster service takes liquid from a 50 p.s.i. (335kpa) source and adds 150 p.s.i. (1034kpa). This gives a final discharge pressure of 200 p.s.i. (1379kpa). The system is functioning at 200 p.s.i. (1379kpa) WORKING PRESSURE and the pump is operating at 150 p.s.i. (1034kpa) OPERATING PRESSURE.

**OPERATING PRESSURE** is a function of the basic hydraulic design considerations of the pump, and is determined by capacity and head requirements at given horsepower loads, as established in catalog ratings of the pump.

**MAXIMUM SAFE WORKING PRESSURE** is governed by safe and reasonable life expectancy limits of such items as: mechanical shaft seal, stuffing box, gasket design, bolt strength, bursting strength of case and frame castings, etc.

**DATA:** The following table lists the maximum recommended safe working pressure for BURKS pumps.

PUMP SERIES	MAX. WORKING PRESSURE	MAX. INLET PRESSURE
G, GA, GB, GN, GV, DF, WG	200 PSI (1379 KPA)	100 PSI (690 KPA)
WA	100 PSI (690 KPA)	40 PSI (276 KPA)
WT3, WPT3	165 PSI (1138 KPA)	100 PSI (690 KPA)
WT5, WPT5, WST5	165 PSI (1138 KPA)	100 PSI (690 KPA)
WT5X, WPT5X, WST5X	60 PSI (414 KPA)	15 PSI (103 KPA)
CR	150 PSI (1034 KPA)	50 PSI (335 KPA)
CT, ET, CS, ES	250 PSI (1724 KPA)	100 PSI (690 KPA)
EC, ED	200 PSI (1379 KPA)	50 PSI (335 KPA)

# Boiler Rating & Pump Capacity Required



## Engineering Information

EQUIVALENT BOILER HP	BTU/hr. (1000's)	STREAM Lb/per hr.	EDR RATING Sq., Ft.	Cond. Rate GPM	PUMP Cap. * Reqd. GPM
20	670	690	2790	1.38	3
30	1005	1035	4185	2.07	6
40	1340	1380	5580	2.76	9
50	1675	1725	6975	3.45	9
60	2010	2070	8370	4.14	12
70	2345	2415	9765	4.38	15
80	2680	2760	11160	5.52	15
100	3350	3450	13950	6.90	22.5
125	4185	4313	17438	8.62	22.5
150	5025	5175	20935	10.40	30
200	6695	6900	27915	13.80	45
250	8370	8625	34895	17.30	45
300	10045	10350	41875	20.70	60
350	11720	12075	48825	24.20	75
400	13390	13800	55830	27.60	75
450	15064	15520	63000	31.10	97.5
500	16740	17250	69790	34.50	97.5
550	18411	18975	77000	37.95	120
600	20085	20700	83750	41.40	120
650	21759	22425	91000	44.85	150
700	23432	24150	98000	48.30	150
750	25106	25875	105000	51.75	150
800	26780	27600	112000	55.20	187.5
1000	33475	34500	140000	69.00	200

(\*) NOTE: Boiler HP x .069 GPM of feed water required to maintain boiler water level at 100% load. Pumps should be selected to provide two to three times the condensate rate shown in the above Table.  
Pump capacity listed in the Table are based on an approximate 3 to 1 ratio.

### SIZING RECEIVER FOR BOILER FEED PUMPS

Receiver capacity is determined by allowing 1 gal. of gross capacity per boiler HP.\*

Maximum working capacity recommended is 75% of gross capacity.

(\*) General Service Administration specs.

### USEFUL CONVERSION DATA

1 Boiler HP = 34.5 lbs. of water evaporated per hour from and at 212°F.

1 Boiler HP = 33,475 BTUH or 970 BTUH per lb. of water.

1 Boiler HP = 140 sq. ft. EDR

1 BTU is required to raise 1 lb. of water 1°F between 32°F and 212°F

## Engineering Information

Capacity, discharge pressure, suction conditions, temperature and duty cycle are determined by the application and/or the installation.

Name, viscosity, abrasiveness, specific gravity, vapor pressure, materials of construction - are properties of, or determined by the liquid to be handled.

The following list of liquids are known to be handled by BURKS pumps. Some liquids require special construction, shaft seals, etc., depending on the liquid, its concentration, temperature, ambient conditions, etc. We have attempted to be accurate in making the list but it is not to be considered infallible.

- Acetone
- Admixtures for concrete - WRDA, Daratard, Darex AEA
- Alcohol
- Ammonia
- Beer
- Carbon Tetrachloride
- Caustics
- Condensate
- Cooking Oil
- Cutting Oil
- Deionized water
- Demineralized water
- Deodorants
- Detergents
- Diesel Fuel
- Dimethyl formamide
- Distilled water
- Electrolytes - EDM machine tools
- Ethylene Glycol - antifreeze
- Freon - with limitations
- Heat transfer fluids (oils) - Dowtherm, Thermanal, Ucon Mobiltherm, Cellutherm and others
- Hexane
- Hydraulic fluid
- Ink
- Insecticides
- Jet fuel
- Kerosene
- Liquid car wax
- Methyl ethyl ketone - MEK
- Mineral Spirits
- Naptha
- Oakite products
- Perchloroethylene
- Rust inhibitors
- Salt brine
- Sea water
- Stoddard solvent
- Tea
- Toluene
- Transformer oil
- Transmission fluid
- Trichloroethane (Clorothene)
- Trichloroethylene
- Water
- Turpentine
- Vegetable oil
- Water soluble oils
- Whiskey
- Xylene, Xylol

## Engineering Information

We can generalize by saying BURKS Pumps are sold everywhere. There definitely is a wide range of applications within major industries. We have listed some of the industries and applications below for your consideration as you search for the industrial pump market in your area.

### AERONAUTICAL & SPACE INDUSTRY

Wash down  
Cooling

### AGRICULTURE INDUSTRY

Insecticide - grain processing  
Liquid fertilizer  
Brooder houses  
High pressure cleaning  
Weed killers  
Irrigation  
Commercial farms  
Fish farms  
Dewatering  
Disinfecting

### AIR CONDITIONING & REFRIGERATION INDUSTRY

Cooling towers  
Circulating  
Brine handling  
Mist cooling for greenhouses

### AUTOMOBILE INDUSTRY

Solvents - transfer & circulating  
Anti-freeze  
Radiator cleaning  
Pressure testing  
Flushing  
Car wash  
Transmission fluid  
Liquid car wax

### BOATS & BARGES (MARINE)

Fresh water  
Wash down  
Sanitary system  
Bilge  
Fire

### CHEMICAL INDUSTRY

Soaps  
Cleaners  
Solvents  
Detergents  
Agricultural chemicals

### CHILLER & HEATER EXCHANGER

Radar, sonar, TV and radio transmitter cooling  
TV tube manufacturing - gun cooling  
Slicing & sawing blade cooling  
Hot water, hot oil, ethylene glycol  
Chillers - brine handling  
Laser beam cooler  
Automobile welding  
Deicing

### CONCRETE AND PAVING INDUSTRY

Additives (admixture) metering  
Wash down - spray pumps  
Booster  
Circulating

### CONSTRUCTION

Heat pump - well source  
Dewatering  
Solar heating  
Condensate return

### FOOD PROCESSING INDUSTRY

Can & bottle warmers  
Can & bottle washers  
Bakeries  
Circulating  
Dairies  
Creameries  
Canneries  
Bottling  
Meat Packing  
Seafood processing  
Transferring & circulating cooking oil & lard  
Boiler feed for sterilizing  
Condensate return for cooking kettles-steam jacketing  
Soft drink and beverage bottlers  
Heat transfer  
Brine injection (pickling)  
Breweries  
Caustic handling

### FOUNDRIES

Scrubbers  
Spraying

### LAUNDRY & DRY CLEANING INDUSTRY

Boiler feed  
Condensate return  
Transfer  
Filtration  
Washing machines  
Water reclamation  
Coin-op laundries  
Car wash  
Circulating hot & cold water  
Perc & solvent pumping  
Pressing establishments  
Carpet cleaning - hot water spray  
Commercial throw rug washing machines  
Institutional laundries  
Department stores  
Alteration shops

### LUMBER INDUSTRY

Plywood curing

### **MACHINE INDUSTRY**

EDM (electrical discharge machines) electrolyte  
Circulating cutting & cooling oils  
Hydraulic press operation  
Slicing & sawing blades cooling  
Filtering Welding (plasma arc)

### **MANUFACTURING - GENERAL**

Sprinkler systems  
Air conditioning  
Transfer  
Booster  
Condensation return  
Dewatering  
Testing valves, water lines, etc.  
Blows the whistle @D.P.Co.

### **MEAT PACKING**

Brine injection - pickling hams  
Wash down  
Circulation  
Booster service

### **MEDICAL, DENTAL & HOSPITALS & HEALTH SERVICES**

Sterilizers  
Electric boiler  
Nursing homes

### **MINING INDUSTRY**

Dewatering

### **MUNICIPALITIES**

Industrial & Commercial Park Development  
Water works  
Water treatment facilities  
Testing equipment for water mains  
Jockey pumps for fire pumps  
Deicing ponds, boat areas, etc.

### **PAPER & PULP INDUSTRY**

Paper mills  
Coating

### **PLASTICS & RUBBER INDUSTRY**

High transfer in molding - high temperature heating & cooling  
Tire recapping  
Boiler Feed

### **PLATING INDUSTRY**

Circulation  
Dewatering

### **PRINTING INDUSTRY**

Photo engraving  
Plate making

### **RECREATION INDUSTRY**

Water falls  
Balloon making  
Hydraulic motors for animation  
Shooting galleries  
Ice rinks  
Golf courses  
Deicing marinas  
Ski lodges & lifts  
Race tracks  
Weed killers (lily pads)

### **REFINERIES & STORAGE PLANTS**

Process  
Transfer Cooling - heat exchanger  
Loading & unloading

### **SEWAGE PLANTS**

Wash down  
Screen cleaning

### **TEXTILE INDUSTRY**

Dyeing, washing

### **WATER & WASTEWATER TREATMENT**

Scrubbers - anti-pollution equipment  
Froth spray pumps  
Brine circulation  
Chlorine injector system  
Water reclamation  
Water softener regenerating plants  
Filtration  
Circulating  
Booster  
Dewatering  
Car wash  
Aspirators

## Engineering Information

Date: \_\_\_\_\_  
 Name of Firm \_\_\_\_\_ By \_\_\_\_\_  
 Address \_\_\_\_\_  
 Reply Attention of \_\_\_\_\_ Title \_\_\_\_\_  
 Date Quotation is Required \_\_\_\_\_  
 Number of Pumps Required \_\_\_\_\_ Estimated Yearly Requirements \_\_\_\_\_

**THE FOLLOWING OUTLINES THE INFORMATION NECESSARY FOR PROPER PUMP RECOMMENDATION  
 COPY THIS PAGE AND USE BACK OF SHEET FOR FURTHER DATA AND SKETCHES**

**LIQUID:**  
 What is it? \_\_\_\_\_ pH \_\_\_\_\_  
 Specific Gravity \_\_\_\_\_  
 Temperature - Max \_\_\_\_\_ (F/C). Min. \_\_\_\_\_ (F/C). Oper. \_\_\_\_\_  
 Viscosity @ Max. Temp \_\_\_\_\_ Min. Temp. \_\_\_\_\_ Oper. Temp. \_\_\_\_\_  
 Vapor Pressure @ Max. Temp. \_\_\_\_\_ Min. Temp. \_\_\_\_\_ Oper. Temp. \_\_\_\_\_  
 Liquid Purity (other liquids - solids, their size & quantity - abrasives or other contaminants - hazardous):  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**DUTY:**  
 Capacity Required \_\_\_\_\_ GPM (l/s)  
 Total Head Required \_\_\_\_\_ Ft. (m)  
 NPSH Available \_\_\_\_\_ Ft. (m)

**MOTOR CHARACTERISTICS:**  
 HP \_\_\_\_\_ Volts \_\_\_\_\_  
 Phase \_\_\_\_\_ Hertz \_\_\_\_\_  
 RPM \_\_\_\_\_ Enclosure \_\_\_\_\_

**INLET (Suction) CONDITIONS:**  
 Static Liquid Level Above/Below Inlet \_\_\_\_\_ Ft. (m)  
 Pressure on Supply Liquid \_\_\_\_\_ PSIG (kpa)  
 Barometric Pressure (or altitude) \_\_\_\_\_  
 Piping Components (Sizes, Lengths, Number and type of fittings, etc. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**PUMP BEING REPLACED:**  
 Manufacture \_\_\_\_\_  
 Type \_\_\_\_\_  
 Model \_\_\_\_\_  
 Why being replaced? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**OUTLET (Discharge) CONDITIONS:**  
 Static Liquid Level Above/Below Outlet \_\_\_\_\_ Ft. (m)  
 Pressure At Point of Use \_\_\_\_\_ PSIG (kpa)  
 Piping Components (Sizes, Lengths, \_\_\_\_\_  
 Number and type fittings, etc. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**ENVIRONMENTAL CONDITIONS:**  
 Dust, Moisture, Fumes \_\_\_\_\_  
 Fire Hazards, etc. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**NOTES:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_