Table 7-1 Suction Intake Pipe Losses (feet) 4" Aluminum Pipe (wall thickness = .072")

Flow Rate (gpm)	Length Of Suction Line (feet)					
	5	**7**	**9**	**11**	**13**	**15**
50	0.09	0.10	0.10	0.11	0.11	0.12
100	0.36	0.38	0.39	0.41	0.43	0.45
150	0.80	0.84	0.88	0.91	0.95	0.99
200	1.41	1.48	1.54	1.61	1.67	1.74
250	2.19	2.29	2.39	2.49	2.59	2.68
300	3.15	3.28	3.42	3.56	3.70	3.83
350	4.27	4.45	4.63	4.82	5.00	5.18
400	5.56	5.79	6.03	6.26	6.50	6.73
450	7.02	7.31	7.60	7.89	8.19	8.48
500	8.65	9.00	9.36	9.71	10.06	10.42
550	10.44	10.87	11.29	11.71	12.13	12.56
600	12.41	12.90	13.40	13.90	14.39	14.89
650	14.54	15.12	15.69	16.27	16.84	17.42
700	16.84	17.50	18.16	18.82	19.48	20.14
750	19.30	20.05	20.80	21.55	22.30	23.05
800	21.94	22.78	23.63	24.47	25.32	26.16
850	24.74	25.68	26.63	27.57	28.52	29.46
900	27.70	28.75	29.81	30.86	31.91	32.96

Assume valves: C=130, foot valve k = 0.8, strainer k = 1.05, 90 degree elbow k=0.6, sudden contraction to 5-inch intake, 1.5 feet pipe length between elbow and pump.

Table 7-2 Suction Intake Pipe Losses (feet) 5" Aluminum Pipe (wall thickness = .078")

Flow Rate (gpm)	Length Of Suction Line (feet)					
	5	**7**	**9**	**11**	**13**	**15**
50	0.03	0.04	0.04	0.04	0.04	0.04
100	0.13	0.14	0.15	0.15	0.16	0.16
150	0.30	0.31	0.32	0.34	0.35	0.36
200	0.53	0.55	0.57	0.59	0.62	0.64
250	0.82	0.86	0.89	0.92	0.95	0.99
300	1.18	1.23	1.27	1.32	1.36	1.41
350	1.60	1.66	1.72	1.79	1.85	1.91
400	2.09	2.17	2.24	2.32	2.40	2.48
450	2.64	2.73	2.83	2.93	3.03	3.12
500	3.25	3.37	3.49	3.60	3.72	3.84
550	3.93	4.07	4.21	4.35	4.49	4.63
600	4.67	4.83	5.00	5.16	5.33	5.49
650	5.47	5.66	5.85	6.04	6.23	6.43
700	6.33	6.55	6.77	6.99	7.21	7.43
750	7.26	7.51	7.76	8.01	8.26	8.51
800	8.25	8.54	8.82	9.10	9.38	9.66
850	9.31	9.62	9.94	10.25	10.57	10.88
900	10.43	10.78	11.13	11.48	11.82	12.17

Assume valves: C=130, foot valve k = 0.8, strainer k = 0.95, 90 degree elbow k=0.6, sudden contraction to 4-inch intake, 1.5 feet pipe length between elbow and pump.

Table 7-3 Suction Intake Pipe Losses (feet) 6" Aluminum Pipe (wall thickness = .090")

Flow Rate (gpm)	Length Of Suction Line (feet)					
	5	**7**	**9**	**11**	**13**	**15**
50	0.02	0.02	0.02	0.02	0.02	0.02
100	0.06	0.06	0.06	0.07	0.07	0.07
150	0.13	0.14	0.14	0.15	0.15	0.16
200	0.24	0.25	0.25	0.26	0.27	0.28
250	0.37	0.38	0.40	0.41	0.42	0.44
300	0.53	0.55	0.57	0.59	0.60	0.62
350	0.72	0.74	0.77	0.79	0.82	0.84
400	0.94	0.97	1.00	1.03	1.06	1.10
450	1.18	1.22	1.26	1.30	1.34	1.38
500	1.46	1.51	1.55	1.60	1.65	1.70
550	1.76	1.82	1.88	1.93	1.99	2.05
600	2.09	2.16	2.23	2.30	2.36	2.43
650	2.45	2.53	2.61	2.69	2.77	2.84
700	2.84	2.93	3.02	3.11	3.20	3.29
750	3.26	3.36	3.46	3.57	3.67	3.77
800	3.71	3.82	3.94	4.05	4.16	4.28
850	4.18	4.31	4.44	4.56	4.69	4.82
900	4.68	4.82	4.97	5.11	5.25	5.39

Assume valves: C=130, foot valve k = 0.8, strainer k = 0.85, 90 degree elbow k=0.6, sudden contraction to 5-inch intake, 1.5 feet pipe length between elbow and pump.

Table 7-4

Allowable Suction Head for Aluminum Pipe

Determined from Critical Buckling Analysis (i.e. Pipe Collapse)

Design Limits, Aluminum Pipe, Factor Safety = 4.0						
Outside Diameter	Thickness	Dimension Ratio	Critical Buckling Pressure (P_{cr})		Allowable Suction Head	
(in)	(in)		(ft)	(psi)	(ft)	(psi)
4.00	0.050	80.0	104.6	45.3	26.2	11.3
4.00	0.072	55.6	312.4	135.2	78.1	33.8
5.00	0.052	96.2	60.2	26.1	15.1	6.5
5.00	0.078	64.1	203.3	88.0	50.8	22.0
6.00	0.058	103.4	48.4	20.9	12.1	5.2
6.00	0.083	72.3	141.8	61.4	35.4	15.3
8.00	0.064	125.0	27.4	11.9	6.9	3.0
8.00	0.094	85.1	86.9	37.6	21.7	9.4
10.00	0.064	156.3	14.0	6.1	3.5	1.5
10.00	0.094	106.4	44.5	19.3	11.1	4.8
12.00	0.064	187.5	8.1	3.5	2.0	0.9
12.00	0.072	166.7	11.6	5.0	2.9	1.3
12.00	0.094	127.7	25.7	11.1	6.4	2.8

Notes: $P_{cr} = (2E/(1-\lambda^2))(t/D)^3$; Allowable Suction Head = $P_{cr}/4$,
Assumed values: E = 10,300,000; $\lambda = 0.334$

Table 7-5

Atmospheric Pressure at Various Altitudes

Altitude (feet)	Absolute Pressure psi	Absolute Pressure feet
0	14.7	34.0
500	14.4	33.3
1000	14.2	32.8
1500	13.9	32.2
2000	13.7	31.6
2500	13.4	31.0
3000	13.2	30.5
3500	12.9	29.8
4000	12.7	29.4
5000	12.2	28.2
6000	11.8	27.3
7000	11.3	26.2

Table 7-6

Vapor Pressures at Various Water Temperatures

Temperature ° F	Vapor Pressure (feet)
50	0.4
60	0.6
70	0.8
75	1.0
80	1.2
90	1.6
100	2.2
110	3.0
130	5.2
150	8.7
170	14.2
190	22.3
210	34.0