



















HYDRONIC SCHEMATIC SYMBOLS

	back flow preventer		floating air vent
	swing check valve		air separator
	flow check valve		3 way mixing valve
	spring loaded check valve		diverting 3 way valve
	isolating valve		thermostatic 3 way valve
	gate valve		motorized 3 way valve
	globe valve		4 way mixing valve
	thermostatic valve		motorized 4 way valve
	motorized valve		pressure gauge

HYDRONIC SCHEMATIC SYMBOLS



pressure reducing valve



temperature gauge



pressure balancing  
bypass valve



thermo-pressure gauge



pressure relief valve



circulator



drain valve



circulator with  
isolating flanges

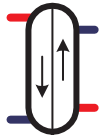


manual air vent

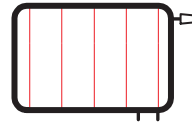


expansion tank

HYDRONIC SCHEMATIC SYMBOLS



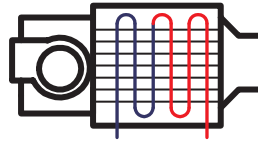
heat exchanger



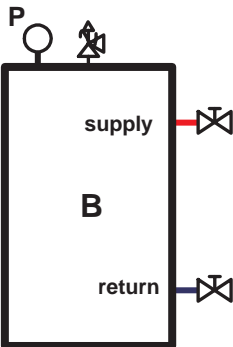
radiator



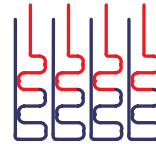
base board



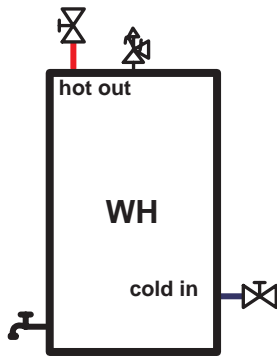
fan coil



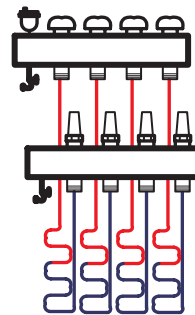
boiler



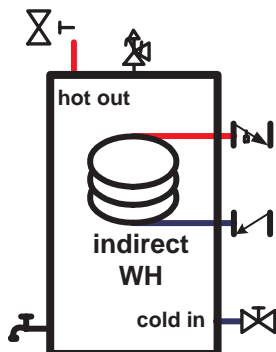
radiant floor piping



water heater

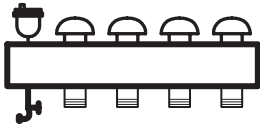


manifold set

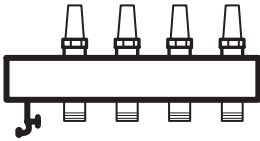


indirect water heater

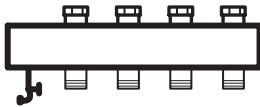
HYDRONIC SCHEMATIC SYMBOLS



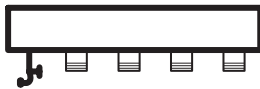
supply manifold



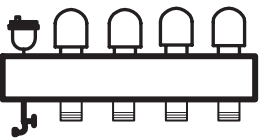
return manifold balancing, flow indicator



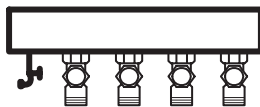
manifold with balancing valves



plain manifold



manifold with actuator valves

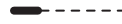


manifold with isolating valves

ELECTRICAL SYMBOLS



thermostat



sensor



valve actuator (power head)



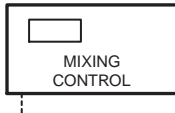
electrical heating element



valve actuator (power head) with end switch



transformer



controller



single switch

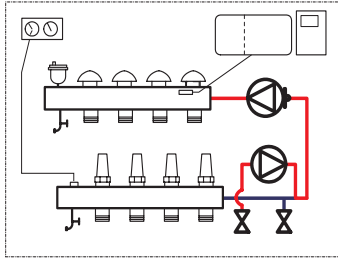


combination snow/ice sensor

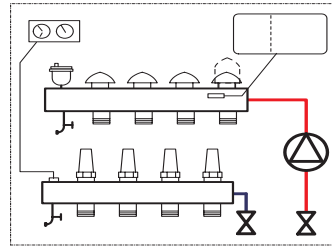


temperature sensitive switch

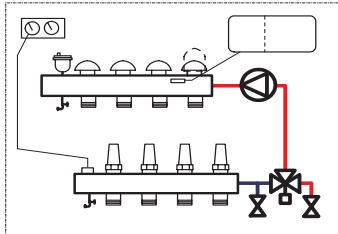
CONTROL PANEL SCHEMATIC SYMBOLS



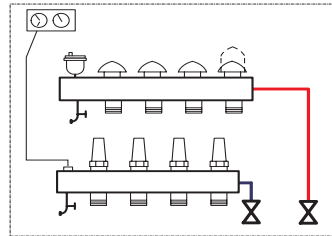
injection  
mixing control  
panel



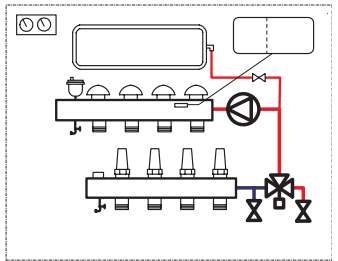
manifold  
station with  
circulator



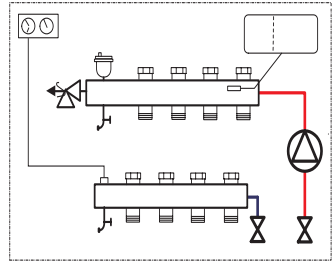
recirculating  
zone control  
panel



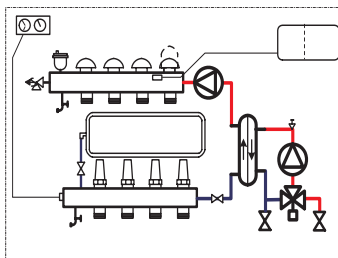
manifold  
station



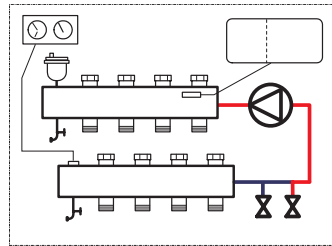
recirculating  
zone control  
panel with  
expansion tank



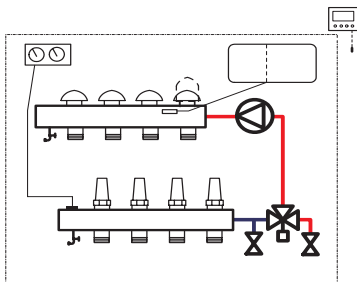
snowmelt /  
industrial  
control panel



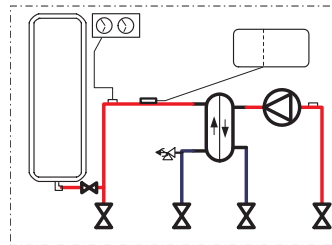
control panel  
with heat  
exchanger



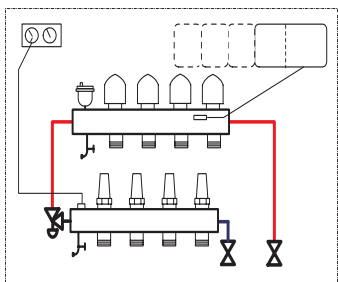
injection  
mixing  
secondary  
control panel



floor warming  
control panel



isolation  
module



multi zone  
manifold  
station







HEAD LOSS CALCULATIONS FOR XPA PIPE AND PEX TUBING

The following Appendix provides head loss information for XPA pipe and PEX tubing over a range of flow rates and liquid temperatures. Tables have been developed for 100% water as well as for a range of glycol/water mixtures typically used in hydronic systems. For operating conditions not covered by the following tables contact IPEX for further information.

IPEX follows ASHRAE principles for head loss calculation. In particular, the Friction Factor formula used is a function of the Reynold's Number - see below.

**friction factor**

$f = 64 / Re\#$	if	$Re\# < 3,000$
$f = 0.3164 / Re\#^{0.25}$	if	$3,000 < Re\# < 10,000$
$f = 0.0032 + 0.221 / Re\#^{0.237}$	if	$Re\# > 10,000$

**Reynolds #**

$Re\# = v d D / u$

v = velocity  
d = inside diameter  
D = density  
u = viscosity

**velocity (ft/sec)**

$v = y / A$

y = flowrate  
A = cross section area

**head loss (m)**

$H = f (L/D) (v^2 / 2g)$

v = velocity  
L = length  
D = diameter  
f = friction factor  
g = 9.81

**3/8" XPA Pipe / 10% Glycol / 80 Deg F (27 Deg C)**

Diameter inch	Flowrate GPM	Density kg/m <sup>3</sup>	Viscosity 10 <sup>6</sup> Pa s	Reynolds Number	Friction Factor	Loss / 100ft PSI	Velocity ft/s	Flowrate L / min	Loss /100m kPa	Head Loss m	Velocity m / s
0.346	0.1	1004	1200	764.7	0.0837	0.23	0.34	0.39	5.17	0.00	0.10
0.346	0.2	1004	1200	1529.5	0.0418	0.46	0.68	0.78	10.3	0.00	0.21
0.346	0.3	1004	1200	2294.2	0.0279	0.69	1.02	1.17	15.5	0.00	0.31
0.346	0.4	1004	1200	3059.0	0.0245	1.86	1.36	1.56	42.0	0.01	0.42
0.346	0.5	1004	1200	3823.7	0.0202	2.74	1.71	1.95	62.1	0.02	0.52
0.346	0.6	1004	1200	4588.4	0.0184	3.78	2.05	2.33	85.4	0.03	0.62
0.346	0.7	1004	1200	5353.2	0.0169	4.94	2.39	2.72	112	0.03	0.73
0.346	0.8	1004	1200	6117.9	0.0157	6.25	2.73	3.11	141	0.04	0.83
0.346	0.9	1004	1200	6882.7	0.0147	7.68	3.07	3.50	174	0.05	0.94
0.346	1.0	1004	1200	7647.4	0.0138	9.23	3.41	3.89	209	0.06	1.04
0.346	1.1	1004	1200	8412.2	0.0130	10.9	3.75	4.28	247	0.08	1.14
0.346	1.2	1004	1200	9176.9	0.0123	12.7	4.09	4.67	287	0.09	1.25
0.346	1.3	1004	1200	9941.6	0.0117	13.0	4.44	5.06	294	0.09	1.35
0.346	1.4	1004	1200	10706.4	0.0112	14.8	4.78	5.45	336	0.10	1.46
0.346	1.5	1004	1200	11471.1	0.0107	16.8	5.12	5.84	380	0.12	1.56
0.346	1.6	1004	1200	12235.9	0.0103	18.8	5.46	6.22	426	0.13	1.66
0.346	1.7	1004	1200	13000.6	0.0099	21.0	5.80	6.61	475	0.15	1.77
0.346	1.8	1004	1200	13765.3	0.0096	23.3	6.14	7.00	526	0.16	1.87
0.346	1.9	1004	1200	14530.1	0.0093	25.6	6.48	7.39	580	0.18	1.98
0.346	2.0	1004	1200	15294.8	0.0091	28.1	6.82	7.78	636	0.20	2.08

**APPENDIX B**

**HEAD LOSS - 3/8" XPA PIPE**

**100% Water**

**3/8" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.16	0.34	0.39	3.73	0.10
0.2	0.33	0.68	0.78	7.45	0.21
0.3	1.03	1.02	1.17	23.3	0.31
0.4	1.70	1.36	1.56	38.5	0.42
0.5	2.51	1.71	1.95	56.9	0.52
0.6	3.46	2.05	2.33	78.3	0.62
0.7	4.53	2.39	2.72	102	0.73
0.8	5.72	2.73	3.11	129	0.83
0.9	7.03	3.07	3.50	159	0.94
1.0	7.54	3.41	3.89	171	1.04
1.1	8.94	3.75	4.28	202	1.14
1.2	10.5	4.09	4.67	236	1.25
1.3	12.1	4.44	5.06	273	1.35
1.4	13.8	4.78	5.45	312	1.46
1.5	15.6	5.12	5.84	353	1.56
1.6	17.5	5.46	6.22	396	1.66
1.7	19.5	5.80	6.61	441	1.77
1.8	21.6	6.14	7.00	489	1.87
1.9	23.8	6.48	7.39	539	1.98
2.0	26.1	6.82	7.78	591	2.08

**3/8" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.09	0.34	0.39	2.10	0.10
0.2	0.43	0.68	0.78	9.81	0.21
0.3	0.88	1.02	1.17	20.0	0.31
0.4	1.46	1.36	1.56	33.0	0.42
0.5	2.16	1.71	1.95	48.8	0.52
0.6	2.65	2.05	2.33	59.9	0.62
0.7	3.49	2.39	2.72	79.0	0.73
0.8	4.44	2.73	3.11	100	0.83
0.9	5.48	3.07	3.50	124	0.94
1.0	6.62	3.41	3.89	150	1.04
1.1	7.85	3.75	4.28	178	1.14
1.2	9.18	4.09	4.67	208	1.25
1.3	10.6	4.44	5.06	240	1.35
1.4	12.1	4.78	5.45	274	1.46
1.5	13.7	5.12	5.84	310	1.56
1.6	15.4	5.46	6.22	348	1.66
1.7	17.2	5.80	6.61	388	1.77
1.8	19.0	6.14	7.00	430	1.87
1.9	21.0	6.48	7.39	474	1.98
2.0	23.0	6.82	7.78	520	2.08

**3/8" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.13	0.34	0.39	2.95	0.10
0.2	0.26	0.68	0.78	5.90	0.21
0.3	0.97	1.02	1.17	21.89	0.31
0.4	1.60	1.36	1.56	36.2	0.42
0.5	2.37	1.71	1.95	53.5	0.52
0.6	3.25	2.05	2.33	73.6	0.62
0.7	4.26	2.39	2.72	96.4	0.73
0.8	4.80	2.73	3.11	109	0.83
0.9	5.93	3.07	3.50	134	0.94
1.0	7.16	3.41	3.89	162	1.04
1.1	8.49	3.75	4.28	192	1.14
1.2	9.93	4.09	4.67	225	1.25
1.3	11.5	4.44	5.06	259	1.35
1.4	13.1	4.78	5.45	296	1.46
1.5	14.8	5.12	5.84	335	1.56
1.6	16.6	5.46	6.22	376	1.66
1.7	18.5	5.80	6.61	419	1.77
1.8	20.5	6.14	7.00	465	1.87
1.9	22.6	6.48	7.39	512	1.98
2.0	24.8	6.82	7.78	561	2.08

**3/8" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.08	0.34	0.39	1.72	0.10
0.2	0.41	0.68	0.78	9.30	0.21
0.3	0.84	1.02	1.17	18.9	0.31
0.4	1.38	1.36	1.56	31.3	0.42
0.5	1.83	1.71	1.95	41.3	0.52
0.6	2.53	2.05	2.33	57.2	0.62
0.7	3.34	2.39	2.72	75.5	0.73
0.8	4.24	2.73	3.11	95.9	0.83
0.9	5.24	3.07	3.50	118	0.94
1.0	6.33	3.41	3.89	143	1.04
1.1	7.51	3.75	4.28	170	1.14
1.2	8.77	4.09	4.67	198	1.25
1.3	10.1	4.44	5.06	229	1.35
1.4	11.6	4.78	5.45	262	1.46
1.5	13.1	5.12	5.84	296	1.56
1.6	14.7	5.46	6.22	333	1.66
1.7	16.4	5.80	6.61	371	1.77
1.8	18.2	6.14	7.00	411	1.87
1.9	20.0	6.48	7.39	453	1.98
2.0	22.0	6.82	7.78	497	2.08

**3/8" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.11	0.34	0.39	2.41	0.10
0.2	0.45	0.68	0.78	10.2	0.21
0.3	0.92	1.02	1.17	20.7	0.31
0.4	1.52	1.36	1.56	34.3	0.42
0.5	2.24	1.71	1.95	50.7	0.52
0.6	3.08	2.05	2.33	69.7	0.62
0.7	3.61	2.39	2.72	81.7	0.73
0.8	4.58	2.73	3.11	104	0.83
0.9	5.66	3.07	3.50	128	0.94
1.0	6.84	3.41	3.89	155	1.04
1.1	8.11	3.75	4.28	184	1.14
1.2	9.48	4.09	4.67	215	1.25
1.3	10.9	4.44	5.06	248	1.35
1.4	12.5	4.78	5.45	283	1.46
1.5	14.2	5.12	5.84	320	1.56
1.6	15.9	5.46	6.22	360	1.66
1.7	17.7	5.80	6.61	401	1.77
1.8	19.6	6.14	7.00	444	1.87
1.9	21.6	6.48	7.39	490	1.98
2.0	23.7	6.82	7.78	537	2.08

**3/8" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.07	0.34	0.39	1.49	0.10
0.2	0.39	0.68	0.78	8.92	0.21
0.3	0.80	1.02	1.17	18.1	0.31
0.4	1.18	1.36	1.56	26.7	0.42
0.5	1.76	1.71	1.95	39.8	0.52
0.6	2.44	2.05	2.33	55.2	0.62
0.7	3.22	2.39	2.72	72.8	0.73
0.8	4.09	2.73	3.11	92.5	0.83
0.9	5.05	3.07	3.50	114	0.94
1.0	6.10	3.41	3.89	138	1.04
1.1	7.24	3.75	4.28	164	1.14
1.2	8.47	4.09	4.67	192	1.25
1.3	9.78	4.44	5.06	221	1.35
1.4	11.2	4.78	5.45	253	1.46
1.5	12.7	5.12	5.84	286	1.56
1.6	14.2	5.46	6.22	321	1.66
1.7	15.8	5.80	6.61	358	1.77
1.8	17.6	6.14	7.00	397	1.87
1.9	19.4	6.48	7.39	438	1.98
2.0	21.2	6.82	7.78	480	2.08

**APPENDIX B**

**HEAD LOSS - 1/2" XPA PIPE**

**100% Water**

**1/2" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.16	0.39	0.85	0.05
0.2	0.08	0.33	0.78	1.71	0.10
0.3	0.11	0.49	1.17	2.56	0.15
0.4	0.30	0.65	1.56	6.70	0.20
0.5	0.44	0.82	1.95	9.90	0.25
0.6	0.60	0.98	2.33	13.6	0.30
0.7	0.79	1.14	2.72	17.8	0.35
0.8	1.00	1.31	3.11	22.5	0.40
0.9	1.22	1.47	3.50	27.7	0.45
1.0	1.47	1.63	3.89	33.3	0.50
1.1	1.74	1.80	4.28	39.3	0.55
1.2	2.02	1.96	4.67	45.8	0.60
1.3	2.33	2.12	5.06	52.7	0.65
1.4	2.36	2.29	5.45	53.4	0.70
1.5	2.67	2.45	5.84	60.4	0.75
1.6	3.00	2.61	6.22	67.8	0.80
1.7	3.34	2.78	6.61	75.6	0.85
1.8	3.70	2.94	7.00	83.8	0.90
1.9	4.08	3.10	7.39	92.3	0.95
2.0	4.47	3.27	7.78	101	1.00

**1/2" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.16	0.39	0.48	0.05
0.2	0.04	0.33	0.78	0.96	0.10
0.3	0.15	0.49	1.17	3.47	0.15
0.4	0.25	0.65	1.56	5.74	0.20
0.5	0.38	0.82	1.95	8.49	0.25
0.6	0.52	0.98	2.33	11.7	0.30
0.7	0.68	1.14	2.72	15.3	0.35
0.8	0.76	1.31	3.11	17.2	0.40
0.9	0.94	1.47	3.50	21.2	0.45
1.0	1.13	1.63	3.89	25.6	0.50
1.1	1.34	1.80	4.28	30.4	0.55
1.2	1.57	1.96	4.67	35.6	0.60
1.3	1.81	2.12	5.06	41.0	0.65
1.4	2.07	2.29	5.45	46.9	0.70
1.5	2.35	2.45	5.84	53.0	0.75
1.6	2.63	2.61	6.22	59.6	0.80
1.7	2.94	2.78	6.61	66.4	0.85
1.8	3.25	2.94	7.00	73.6	0.90
1.9	3.58	3.10	7.39	81.1	0.95
2.0	3.93	3.27	7.78	88.9	1.00

**1/2" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.16	0.39	0.68	0.05
0.2	0.06	0.33	0.78	1.35	0.10
0.3	0.09	0.49	1.17	2.03	0.15
0.4	0.28	0.65	1.56	6.30	0.20
0.5	0.41	0.82	1.95	9.31	0.25
0.6	0.57	0.98	2.33	12.8	0.30
0.7	0.74	1.14	2.72	16.8	0.35
0.8	0.94	1.31	3.11	21.2	0.40
0.9	1.15	1.47	3.50	26.0	0.45
1.0	1.38	1.63	3.89	31.3	0.50
1.1	1.46	1.80	4.28	32.9	0.55
1.2	1.70	1.96	4.67	38.5	0.60
1.3	1.96	2.12	5.06	44.4	0.65
1.4	2.24	2.29	5.45	50.7	0.70
1.5	2.54	2.45	5.84	57.4	0.75
1.6	2.85	2.61	6.22	64.4	0.80
1.7	3.17	2.78	6.61	71.8	0.85
1.8	3.52	2.94	7.00	79.5	0.90
1.9	3.87	3.10	7.39	87.6	0.95
2.0	4.25	3.27	7.78	96.1	1.00

**1/2" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.16	0.39	0.39	0.05
0.2	0.03	0.33	0.78	1.62	0.10
0.3	0.15	0.49	1.17	3.29	0.15
0.4	0.24	0.65	1.56	5.44	0.20
0.5	0.36	0.82	1.95	8.04	0.25
0.6	0.49	0.98	2.33	11.1	0.30
0.7	0.57	1.14	2.72	12.9	0.35
0.8	0.73	1.31	3.11	16.4	0.40
0.9	0.90	1.47	3.50	20.3	0.45
1.0	1.08	1.63	3.89	24.5	0.50
1.1	1.28	1.80	4.28	29.1	0.55
1.2	1.50	1.96	4.67	34.0	0.60
1.3	1.73	2.12	5.06	39.2	0.65
1.4	1.98	2.29	5.45	44.8	0.70
1.5	2.24	2.45	5.84	50.7	0.75
1.6	2.52	2.61	6.22	56.9	0.80
1.7	2.81	2.78	6.61	63.5	0.85
1.8	3.11	2.94	7.00	70.3	0.90
1.9	3.43	3.10	7.39	77.5	0.95
2.0	3.76	3.27	7.78	85.0	1.00

**1/2" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.16	0.39	0.55	0.05
0.2	0.05	0.33	0.78	1.11	0.10
0.3	0.16	0.49	1.17	3.61	0.15
0.4	0.26	0.65	1.56	5.97	0.20
0.5	0.39	0.82	1.95	8.82	0.25
0.6	0.54	0.98	2.33	12.1	0.30
0.7	0.70	1.14	2.72	15.9	0.35
0.8	0.89	1.31	3.11	20.1	0.40
0.9	0.97	1.47	3.50	21.9	0.45
1.0	1.17	1.63	3.89	26.5	0.50
1.1	1.39	1.80	4.28	31.4	0.55
1.2	1.62	1.96	4.67	36.7	0.60
1.3	1.87	2.12	5.06	42.4	0.65
1.4	2.14	2.29	5.45	48.4	0.70
1.5	2.42	2.45	5.84	54.8	0.75
1.6	2.72	2.61	6.22	61.5	0.80
1.7	3.03	2.78	6.61	68.6	0.85
1.8	3.36	2.94	7.00	76.0	0.90
1.9	3.70	3.10	7.39	83.8	0.95
2.0	4.06	3.27	7.78	91.8	1.00

**1/2" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.16	0.39	0.34	0.05
0.2	0.07	0.33	0.78	1.55	0.10
0.3	0.14	0.49	1.17	3.15	0.15
0.4	0.23	0.65	1.56	5.22	0.20
0.5	0.34	0.82	1.95	7.71	0.25
0.6	0.42	0.98	2.33	9.46	0.30
0.7	0.55	1.14	2.72	12.5	0.35
0.8	0.70	1.31	3.11	15.8	0.40
0.9	0.86	1.47	3.50	19.6	0.45
1.0	1.04	1.63	3.89	23.6	0.50
1.1	1.24	1.80	4.28	28.0	0.55
1.2	1.45	1.96	4.67	32.8	0.60
1.3	1.67	2.12	5.06	37.8	0.65
1.4	1.91	2.29	5.45	43.2	0.70
1.5	2.16	2.45	5.84	48.9	0.75
1.6	2.43	2.61	6.22	54.9	0.80
1.7	2.71	2.78	6.61	61.3	0.85
1.8	3.00	2.94	7.00	67.9	0.90
1.9	3.31	3.10	7.39	74.8	0.95
2.0	3.63	3.27	7.78	82.0	1.00

**APPENDIX B**

**HEAD LOSS - 5/8" XPA PIPE**

**100% Water**

**5/8" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.33	0.03
0.2	0.03	0.20	0.78	0.67	0.06
0.3	0.04	0.31	1.17	1.00	0.09
0.4	0.06	0.41	1.56	1.33	0.12
0.5	0.07	0.51	1.95	1.66	0.16
0.6	0.20	0.61	2.33	4.44	0.19
0.7	0.26	0.71	2.72	5.82	0.22
0.8	0.32	0.82	3.11	7.35	0.25
0.9	0.40	0.92	3.50	9.03	0.28
1.0	0.48	1.02	3.89	10.9	0.31
1.1	0.57	1.12	4.28	12.8	0.34
1.2	0.66	1.22	4.67	14.9	0.37
1.3	0.76	1.33	5.06	17.2	0.40
1.4	0.86	1.43	5.45	19.6	0.44
1.5	0.98	1.53	5.84	22.1	0.47
1.6	1.09	1.63	6.22	24.7	0.50
1.7	1.21	1.73	6.61	27.5	0.53
1.8	1.20	1.84	7.00	27.1	0.56
1.9	1.32	1.94	7.39	29.8	0.59
2.0	1.44	2.04	7.78	32.7	0.62

**5/8" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.19	0.03
0.2	0.02	0.20	0.78	0.37	0.06
0.3	0.05	0.31	1.17	1.13	0.09
0.4	0.08	0.41	1.56	1.87	0.12
0.5	0.12	0.51	1.95	2.77	0.16
0.6	0.17	0.61	2.33	3.81	0.19
0.7	0.22	0.71	2.72	4.99	0.22
0.8	0.28	0.82	3.11	6.30	0.25
0.9	0.34	0.92	3.50	7.74	0.28
1.0	0.37	1.02	3.89	8.28	0.31
1.1	0.43	1.12	4.28	9.83	0.34
1.2	0.51	1.22	4.67	11.5	0.37
1.3	0.59	1.33	5.06	13.3	0.40
1.4	0.67	1.43	5.45	15.1	0.44
1.5	0.76	1.53	5.84	17.1	0.47
1.6	0.85	1.63	6.22	19.2	0.50
1.7	0.95	1.73	6.61	21.4	0.53
1.8	1.05	1.84	7.00	23.7	0.56
1.9	1.16	1.94	7.39	26.2	0.59
2.0	1.27	2.04	7.78	28.7	0.62

**5/8" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.26	0.03
0.2	0.02	0.20	0.78	0.53	0.06
0.3	0.03	0.31	1.17	0.79	0.09
0.4	0.05	0.41	1.56	1.05	0.12
0.5	0.13	0.51	1.95	3.04	0.16
0.6	0.18	0.61	2.33	4.18	0.19
0.7	0.24	0.71	2.72	5.47	0.22
0.8	0.31	0.82	3.11	6.91	0.25
0.9	0.38	0.92	3.50	8.49	0.28
1.0	0.45	1.02	3.89	10.2	0.31
1.1	0.53	1.12	4.28	12.1	0.34
1.2	0.62	1.22	4.67	14.1	0.37
1.3	0.71	1.33	5.06	16.2	0.40
1.4	0.72	1.43	5.45	16.4	0.44
1.5	0.82	1.53	5.84	18.5	0.47
1.6	0.92	1.63	6.22	20.8	0.50
1.7	1.03	1.73	6.61	23.2	0.53
1.8	1.14	1.84	7.00	25.7	0.56
1.9	1.25	1.94	7.39	28.3	0.59
2.0	1.37	2.04	7.78	31.0	0.62

**5/8" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.15	0.03
0.2	0.02	0.20	0.78	0.31	0.06
0.3	0.05	0.31	1.17	1.07	0.09
0.4	0.08	0.41	1.56	1.77	0.12
0.5	0.12	0.51	1.95	2.62	0.16
0.6	0.16	0.61	2.33	3.61	0.19
0.7	0.21	0.71	2.72	4.73	0.22
0.8	0.26	0.82	3.11	5.97	0.25
0.9	0.29	0.92	3.50	6.55	0.28
1.0	0.35	1.02	3.89	7.91	0.31
1.1	0.41	1.12	4.28	9.38	0.34
1.2	0.48	1.22	4.67	11.0	0.37
1.3	0.56	1.33	5.06	12.7	0.40
1.4	0.64	1.43	5.45	14.5	0.44
1.5	0.72	1.53	5.84	16.4	0.47
1.6	0.81	1.63	6.22	18.4	0.50
1.7	0.91	1.73	6.61	20.5	0.53
1.8	1.00	1.84	7.00	22.7	0.56
1.9	1.11	1.94	7.39	25.0	0.59
2.0	1.21	2.04	7.78	27.4	0.62

**5/8" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.22	0.03
0.2	0.02	0.20	0.78	0.43	0.06
0.3	0.03	0.31	1.17	0.65	0.09
0.4	0.09	0.41	1.56	1.95	0.12
0.5	0.13	0.51	1.95	2.88	0.16
0.6	0.17	0.61	2.33	3.96	0.19
0.7	0.23	0.71	2.72	5.18	0.22
0.8	0.29	0.82	3.11	6.55	0.25
0.9	0.36	0.92	3.50	8.05	0.28
1.0	0.43	1.02	3.89	9.68	0.31
1.1	0.51	1.12	4.28	11.4	0.34
1.2	0.52	1.22	4.67	11.9	0.37
1.3	0.61	1.33	5.06	13.7	0.40
1.4	0.69	1.43	5.45	15.6	0.44
1.5	0.78	1.53	5.84	17.7	0.47
1.6	0.88	1.63	6.22	19.9	0.50
1.7	0.98	1.73	6.61	22.2	0.53
1.8	1.08	1.84	7.00	24.5	0.56
1.9	1.20	1.94	7.39	27.0	0.59
2.0	1.31	2.04	7.78	29.6	0.62

**5/8" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.13	0.03
0.2	0.01	0.20	0.78	0.27	0.06
0.3	0.05	0.31	1.17	1.03	0.09
0.4	0.08	0.41	1.56	1.70	0.12
0.5	0.11	0.51	1.95	2.52	0.16
0.6	0.15	0.61	2.33	3.46	0.19
0.7	0.20	0.71	2.72	4.53	0.22
0.8	0.23	0.82	3.11	5.12	0.25
0.9	0.28	0.92	3.50	6.32	0.28
1.0	0.34	1.02	3.89	7.63	0.31
1.1	0.40	1.12	4.28	9.05	0.34
1.2	0.47	1.22	4.67	10.6	0.37
1.3	0.54	1.33	5.06	12.2	0.40
1.4	0.62	1.43	5.45	14.0	0.44
1.5	0.70	1.53	5.84	15.8	0.47
1.6	0.78	1.63	6.22	17.7	0.50
1.7	0.87	1.73	6.61	19.8	0.53
1.8	0.97	1.84	7.00	21.9	0.56
1.9	1.07	1.94	7.39	24.1	0.59
2.0	1.17	2.04	7.78	26.5	0.62

**APPENDIX B**

**HEAD LOSS - 3/4" XPA PIPE**

**100% Water**

**3/4" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.13	0.02
0.2	0.01	0.13	0.78	0.25	0.04
0.3	0.02	0.19	1.17	0.38	0.06
0.4	0.02	0.25	1.56	0.51	0.08
0.5	0.03	0.31	1.95	0.63	0.10
0.6	0.03	0.38	2.33	0.76	0.12
0.7	0.08	0.44	2.72	1.85	0.13
0.8	0.10	0.50	3.11	2.33	0.15
0.9	0.13	0.57	3.50	2.87	0.17
1.0	0.15	0.63	3.89	3.45	0.19
1.1	0.18	0.69	4.28	4.07	0.21
1.2	0.21	0.75	4.67	4.74	0.23
1.3	0.24	0.82	5.06	5.45	0.25
1.4	0.27	0.88	5.45	6.21	0.27
1.5	0.31	0.94	5.84	7.01	0.29
1.6	0.35	1.01	6.22	7.84	0.31
1.7	0.39	1.07	6.61	8.72	0.33
1.8	0.43	1.13	7.00	9.64	0.35
1.9	0.47	1.19	7.39	10.6	0.36
2.0	0.51	1.26	7.78	11.6	0.38

**3/4" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.07	0.02
0.2	0.01	0.13	0.78	0.14	0.04
0.3	0.01	0.19	1.17	0.21	0.06
0.4	0.03	0.25	1.56	0.59	0.08
0.5	0.04	0.31	1.95	0.88	0.10
0.6	0.05	0.38	2.33	1.21	0.12
0.7	0.07	0.44	2.72	1.58	0.13
0.8	0.09	0.50	3.11	2.00	0.15
0.9	0.11	0.57	3.50	2.46	0.17
1.0	0.13	0.63	3.89	2.95	0.19
1.1	0.15	0.69	4.28	3.49	0.21
1.2	0.18	0.75	4.67	4.07	0.23
1.3	0.18	0.82	5.06	4.16	0.25
1.4	0.21	0.88	5.45	4.76	0.27
1.5	0.24	0.94	5.84	5.38	0.29
1.6	0.27	1.01	6.22	6.04	0.31
1.7	0.30	1.07	6.61	6.73	0.33
1.8	0.33	1.13	7.00	7.46	0.35
1.9	0.36	1.19	7.39	8.22	0.36
2.0	0.40	1.26	7.78	9.01	0.38

**3/4" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.10	0.02
0.2	0.01	0.13	0.78	0.20	0.04
0.3	0.01	0.19	1.17	0.30	0.06
0.4	0.02	0.25	1.56	0.40	0.08
0.5	0.02	0.31	1.95	0.50	0.10
0.6	0.06	0.38	2.33	1.33	0.12
0.7	0.08	0.44	2.72	1.74	0.13
0.8	0.10	0.50	3.11	2.19	0.15
0.9	0.12	0.57	3.50	2.70	0.17
1.0	0.14	0.63	3.89	3.24	0.19
1.1	0.17	0.69	4.28	3.83	0.21
1.2	0.20	0.75	4.67	4.46	0.23
1.3	0.23	0.82	5.06	5.13	0.25
1.4	0.26	0.88	5.45	5.84	0.27
1.5	0.29	0.94	5.84	6.59	0.29
1.6	0.33	1.01	6.22	7.38	0.31
1.7	0.36	1.07	6.61	8.20	0.33
1.8	0.36	1.13	7.00	8.07	0.35
1.9	0.39	1.19	7.39	8.89	0.36
2.0	0.43	1.26	7.78	9.75	0.38

**3/4" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.06	0.02
0.2	0.01	0.13	0.78	0.12	0.04
0.3	0.01	0.19	1.17	0.18	0.06
0.4	0.02	0.25	1.56	0.56	0.08
0.5	0.04	0.31	1.95	0.83	0.10
0.6	0.05	0.38	2.33	1.15	0.12
0.7	0.07	0.44	2.72	1.50	0.13
0.8	0.08	0.50	3.11	1.89	0.15
0.9	0.10	0.57	3.50	2.33	0.17
1.0	0.12	0.63	3.89	2.80	0.19
1.1	0.13	0.69	4.28	2.95	0.21
1.2	0.15	0.75	4.67	3.45	0.23
1.3	0.18	0.82	5.06	3.98	0.25
1.4	0.20	0.88	5.45	4.54	0.27
1.5	0.23	0.94	5.84	5.14	0.29
1.6	0.26	1.01	6.22	5.77	0.31
1.7	0.28	1.07	6.61	6.43	0.33
1.8	0.32	1.13	7.00	7.13	0.35
1.9	0.35	1.19	7.39	7.85	0.36
2.0	0.38	1.26	7.78	8.61	0.38

**3/4" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.08	0.02
0.2	0.01	0.13	0.78	0.16	0.04
0.3	0.01	0.19	1.17	0.25	0.06
0.4	0.01	0.25	1.56	0.33	0.08
0.5	0.04	0.31	1.95	0.91	0.10
0.6	0.06	0.38	2.33	1.26	0.12
0.7	0.07	0.44	2.72	1.65	0.13
0.8	0.09	0.50	3.11	2.08	0.15
0.9	0.11	0.57	3.50	2.55	0.17
1.0	0.14	0.63	3.89	3.07	0.19
1.1	0.16	0.69	4.28	3.63	0.21
1.2	0.19	0.75	4.67	4.22	0.23
1.3	0.21	0.82	5.06	4.86	0.25
1.4	0.24	0.88	5.45	5.53	0.27
1.5	0.25	0.94	5.84	5.56	0.29
1.6	0.28	1.01	6.22	6.24	0.31
1.7	0.31	1.07	6.61	6.96	0.33
1.8	0.34	1.13	7.00	7.71	0.35
1.9	0.38	1.19	7.39	8.49	0.36
2.0	0.41	1.26	7.78	9.31	0.38

**3/4" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.05	0.02
0.2	0.00	0.13	0.78	0.10	0.04
0.3	0.01	0.19	1.17	0.33	0.06
0.4	0.02	0.25	1.56	0.54	0.08
0.5	0.04	0.31	1.95	0.80	0.10
0.6	0.05	0.38	2.33	1.10	0.12
0.7	0.06	0.44	2.72	1.44	0.13
0.8	0.08	0.50	3.11	1.82	0.15
0.9	0.10	0.57	3.50	2.23	0.17
1.0	0.11	0.63	3.89	2.40	0.19
1.1	0.13	0.69	4.28	2.84	0.21
1.2	0.15	0.75	4.67	3.32	0.23
1.3	0.17	0.82	5.06	3.84	0.25
1.4	0.19	0.88	5.45	4.38	0.27
1.5	0.22	0.94	5.84	4.96	0.29
1.6	0.25	1.01	6.22	5.57	0.31
1.7	0.27	1.07	6.61	6.21	0.33
1.8	0.30	1.13	7.00	6.88	0.35
1.9	0.33	1.19	7.39	7.58	0.36
2.0	0.37	1.26	7.78	8.31	0.38

**APPENDIX B**

**HEAD LOSS - 3/4" XPA SUPPLY PIPE**

**100% Water**

**3/4" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.15	0.63	3.89	3.45	0.19
2.0	0.51	1.26	7.78	11.6	0.38
3.0	0.94	1.89	11.7	21.2	0.58
4.0	1.57	2.52	15.6	35.5	0.77
5.0	2.35	3.14	19.5	53.1	0.96
6.0	3.25	3.77	23.3	73.6	1.15
7.0	4.29	4.40	27.2	97.1	1.34
8.0	5.46	5.03	31.1	123	1.53
9.0	6.74	5.66	35.0	153	1.73
10.0	8.15	6.29	38.9	184	1.92
11.0	9.68	6.92	42.8	219	2.11
12.0	11.3	7.55	46.7	256	2.30
13.0	13.1	8.17	50.6	296	2.49
14.0	14.9	8.80	54.5	338	2.68
15.0	16.9	9.43	58.4	383	2.88
16.0	19.0	10.1	62.2	430	3.07
17.0	21.2	10.7	66.1	480	3.26
18.0	23.5	11.3	70.0	532	3.45
19.0	25.9	11.9	73.9	586	3.64
20.0	28.4	12.6	77.8	643	3.83

**3/4" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.13	0.63	3.89	2.95	0.19
2.0	0.40	1.26	7.78	9.01	0.38
3.0	0.82	1.89	11.7	18.6	0.58
4.0	1.38	2.52	15.6	31.3	0.77
5.0	2.06	3.14	19.5	46.7	0.96
6.0	2.87	3.77	23.3	64.8	1.15
7.0	3.78	4.40	27.2	85.6	1.34
8.0	4.81	5.03	31.1	109	1.53
9.0	5.95	5.66	35.0	135	1.73
10.0	7.20	6.29	38.9	163	1.92
11.0	8.55	6.92	42.8	193	2.11
12.0	10.0	7.55	46.7	226	2.30
13.0	11.6	8.17	50.6	261	2.49
14.0	13.2	8.80	54.5	299	2.68
15.0	15.0	9.43	58.4	339	2.88
16.0	16.8	10.1	62.2	380	3.07
17.0	18.8	10.7	66.1	424	3.26
18.0	20.8	11.3	70.0	471	3.45
19.0	22.9	11.9	73.9	519	3.64
20.0	25.2	12.6	77.8	570	3.83

**3/4" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.14	0.63	3.89	3.24	0.19
2.0	0.43	1.26	7.78	9.75	0.38
3.0	0.89	1.89	11.7	20.2	0.58
4.0	1.49	2.52	15.6	33.8	0.77
5.0	2.23	3.14	19.5	50.4	0.96
6.0	3.09	3.77	23.3	70.0	1.15
7.0	4.08	4.40	27.2	92.3	1.34
8.0	5.19	5.03	31.1	117	1.53
9.0	6.42	5.66	35.0	145	1.73
10.0	7.76	6.29	38.9	175	1.92
11.0	9.21	6.92	42.8	208	2.11
12.0	10.8	7.55	46.7	244	2.30
13.0	12.4	8.17	50.6	282	2.49
14.0	14.2	8.80	54.5	322	2.68
15.0	16.1	9.43	58.4	365	2.88
16.0	18.1	10.1	62.2	410	3.07
17.0	20.2	10.7	66.1	457	3.26
18.0	22.4	11.3	70.0	507	3.45
19.0	24.7	11.9	73.9	559	3.64
20.0	27.1	12.6	77.8	613	3.83

**3/4" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.12	0.63	3.89	2.80	0.19
2.0	0.38	1.26	7.78	8.61	0.38
3.0	0.79	1.89	11.7	17.8	0.58
4.0	1.32	2.52	15.6	29.9	0.77
5.0	1.97	3.14	19.5	44.7	0.96
6.0	2.74	3.77	23.3	62.0	1.15
7.0	3.62	4.40	27.2	81.9	1.34
8.0	4.61	5.03	31.1	104	1.53
9.0	5.70	5.66	35.0	129	1.73
10.0	6.89	6.29	38.9	156	1.92
11.0	8.19	6.92	42.8	185	2.11
12.0	9.58	7.55	46.7	217	2.30
13.0	11.1	8.17	50.6	250	2.49
14.0	12.7	8.80	54.5	286	2.68
15.0	14.3	9.43	58.4	324	2.88
16.0	16.1	10.1	62.2	365	3.07
17.0	18.0	10.7	66.1	407	3.26
18.0	19.9	11.3	70.0	451	3.45
19.0	22.0	11.9	73.9	498	3.64
20.0	24.1	12.6	77.8	546	3.83

**3/4" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.14	0.63	3.89	3.07	0.19
2.0	0.41	1.26	7.78	9.31	0.38
3.0	0.85	1.89	11.7	19.3	0.58
4.0	1.43	2.52	15.6	32.3	0.77
5.0	2.13	3.14	19.5	48.2	0.96
6.0	2.96	3.77	23.3	66.9	1.15
7.0	3.91	4.40	27.2	88.3	1.34
8.0	4.97	5.03	31.1	112	1.53
9.0	6.14	5.66	35.0	139	1.73
10.0	7.43	6.29	38.9	168	1.92
11.0	8.82	6.92	42.8	199	2.11
12.0	10.3	7.55	46.7	233	2.30
13.0	11.9	8.17	50.6	270	2.49
14.0	13.6	8.80	54.5	308	2.68
15.0	15.4	9.43	58.4	349	2.88
16.0	17.3	10.1	62.2	392	3.07
17.0	19.4	10.7	66.1	438	3.26
18.0	21.5	11.3	70.0	485	3.45
19.0	23.7	11.9	73.9	535	3.64
20.0	26.0	12.6	77.8	587	3.83

**3/4" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.12	0.63	3.89	2.69	0.19
2.0	0.37	1.26	7.78	8.31	0.38
3.0	0.76	1.89	11.7	17.2	0.58
4.0	1.28	2.52	15.6	28.9	0.77
5.0	1.91	3.14	19.5	43.1	0.96
6.0	2.65	3.77	23.3	59.9	1.15
7.0	3.50	4.40	27.2	79.1	1.34
8.0	4.45	5.03	31.1	101	1.53
9.0	5.51	5.66	35.0	125	1.73
10.0	6.66	6.29	38.9	151	1.92
11.0	7.91	6.92	42.8	179	2.11
12.0	9.26	7.55	46.7	209	2.30
13.0	10.7	8.17	50.6	242	2.49
14.0	12.2	8.80	54.5	277	2.68
15.0	13.9	9.43	58.4	314	2.88
16.0	15.6	10.1	62.2	353	3.07
17.0	17.4	10.7	66.1	393	3.26
18.0	19.3	11.3	70.0	436	3.45
19.0	21.3	11.9	73.9	481	3.64
20.0	23.4	12.6	77.8	528	3.83

**APPENDIX B**

**HEAD LOSS - 1" XPA PIPE**

**100% Water**

**1" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.05	0.01
0.2	0.00	0.08	0.78	0.09	0.02
0.3	0.01	0.12	1.17	0.14	0.04
0.4	0.01	0.15	1.56	0.19	0.05
0.5	0.01	0.19	1.95	0.24	0.06
0.6	0.01	0.23	2.33	0.28	0.07
0.7	0.01	0.27	2.72	0.33	0.08
0.8	0.02	0.31	3.11	0.38	0.09
0.9	0.04	0.35	3.50	0.89	0.11
1.0	0.05	0.38	3.89	1.07	0.12
1.1	0.06	0.42	4.28	1.26	0.13
1.2	0.06	0.46	4.67	1.47	0.14
1.3	0.07	0.50	5.06	1.69	0.15
1.4	0.08	0.54	5.45	1.92	0.16
1.5	0.10	0.58	5.84	2.17	0.18
1.6	0.11	0.61	6.22	2.42	0.19
1.7	0.12	0.65	6.61	2.70	0.20
1.8	0.13	0.69	7.00	2.98	0.21
1.9	0.14	0.73	7.39	3.28	0.22
2.0	0.16	0.77	7.78	3.58	0.23

**1" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.03	0.01
0.2	0.00	0.08	0.78	0.05	0.02
0.3	0.00	0.12	1.17	0.11	0.04
0.4	0.01	0.15	1.56	0.18	0.05
0.5	0.01	0.19	1.95	0.27	0.06
0.6	0.02	0.23	2.33	0.37	0.07
0.7	0.02	0.27	2.72	0.49	0.08
0.8	0.03	0.31	3.11	0.62	0.09
0.9	0.03	0.35	3.50	0.76	0.11
1.0	0.04	0.38	3.89	0.91	0.12
1.1	0.05	0.42	4.28	1.08	0.13
1.2	0.06	0.46	4.67	1.26	0.14
1.3	0.06	0.50	5.06	1.45	0.15
1.4	0.07	0.54	5.45	1.65	0.16
1.5	0.08	0.58	5.84	1.86	0.18
1.6	0.09	0.61	6.22	2.08	0.19
1.7	0.09	0.65	6.61	2.06	0.20
1.8	0.10	0.69	7.00	2.28	0.21
1.9	0.11	0.73	7.39	2.51	0.22
2.0	0.12	0.77	7.78	2.76	0.23

**1" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.04	0.01
0.2	0.00	0.08	0.78	0.07	0.02
0.3	0.00	0.12	1.17	0.11	0.04
0.4	0.01	0.15	1.56	0.15	0.05
0.5	0.01	0.19	1.95	0.19	0.06
0.6	0.01	0.23	2.33	0.22	0.07
0.7	0.02	0.27	2.72	0.54	0.08
0.8	0.03	0.31	3.11	0.68	0.09
0.9	0.04	0.35	3.50	0.83	0.11
1.0	0.04	0.38	3.89	1.00	0.12
1.1	0.05	0.42	4.28	1.18	0.13
1.2	0.06	0.46	4.67	1.38	0.14
1.3	0.07	0.50	5.06	1.59	0.15
1.4	0.08	0.54	5.45	1.81	0.16
1.5	0.09	0.58	5.84	2.04	0.18
1.6	0.10	0.61	6.22	2.28	0.19
1.7	0.11	0.65	6.61	2.54	0.20
1.8	0.12	0.69	7.00	2.80	0.21
1.9	0.14	0.73	7.39	3.08	0.22
2.0	0.15	0.77	7.78	3.37	0.23

**1" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.02	0.01
0.2	0.00	0.08	0.78	0.04	0.02
0.3	0.00	0.12	1.17	0.07	0.04
0.4	0.01	0.15	1.56	0.17	0.05
0.5	0.01	0.19	1.95	0.26	0.06
0.6	0.02	0.23	2.33	0.35	0.07
0.7	0.02	0.27	2.72	0.46	0.08
0.8	0.03	0.31	3.11	0.59	0.09
0.9	0.03	0.35	3.50	0.72	0.11
1.0	0.04	0.38	3.89	0.87	0.12
1.1	0.05	0.42	4.28	1.02	0.13
1.2	0.05	0.46	4.67	1.19	0.14
1.3	0.06	0.50	5.06	1.37	0.15
1.4	0.06	0.54	5.45	1.39	0.16
1.5	0.07	0.58	5.84	1.57	0.18
1.6	0.08	0.61	6.22	1.77	0.19
1.7	0.09	0.65	6.61	1.97	0.20
1.8	0.10	0.69	7.00	2.18	0.21
1.9	0.11	0.73	7.39	2.40	0.22
2.0	0.12	0.77	7.78	2.63	0.23

**1" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.03	0.01
0.2	0.00	0.08	0.78	0.06	0.02
0.3	0.00	0.12	1.17	0.09	0.04
0.4	0.01	0.15	1.56	0.12	0.05
0.5	0.01	0.19	1.95	0.15	0.06
0.6	0.02	0.23	2.33	0.39	0.07
0.7	0.02	0.27	2.72	0.51	0.08
0.8	0.03	0.31	3.11	0.64	0.09
0.9	0.03	0.35	3.50	0.79	0.11
1.0	0.04	0.38	3.89	0.95	0.12
1.1	0.05	0.42	4.28	1.12	0.13
1.2	0.06	0.46	4.67	1.31	0.14
1.3	0.07	0.50	5.06	1.50	0.15
1.4	0.08	0.54	5.45	1.71	0.16
1.5	0.09	0.58	5.84	1.93	0.18
1.6	0.10	0.61	6.22	2.16	0.19
1.7	0.11	0.65	6.61	2.40	0.20
1.8	0.12	0.69	7.00	2.66	0.21
1.9	0.13	0.73	7.39	2.92	0.22
2.0	0.13	0.77	7.78	2.85	0.23

**1" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.04	0.39	0.02	0.01
0.2	0.00	0.08	0.78	0.04	0.02
0.3	0.00	0.12	1.17	0.06	0.04
0.4	0.01	0.15	1.56	0.17	0.05
0.5	0.01	0.19	1.95	0.25	0.06
0.6	0.02	0.23	2.33	0.34	0.07
0.7	0.02	0.27	2.72	0.44	0.08
0.8	0.02	0.31	3.11	0.56	0.09
0.9	0.03	0.35	3.50	0.69	0.11
1.0	0.04	0.38	3.89	0.83	0.12
1.1	0.04	0.42	4.28	0.98	0.13
1.2	0.04	0.46	4.67	1.02	0.14
1.3	0.05	0.50	5.06	1.17	0.15
1.4	0.06	0.54	5.45	1.34	0.16
1.5	0.07	0.58	5.84	1.52	0.18
1.6	0.08	0.61	6.22	1.70	0.19
1.7	0.08	0.65	6.61	1.90	0.20
1.8	0.09	0.69	7.00	2.10	0.21
1.9	0.10	0.73	7.39	2.32	0.22
2.0	0.11	0.77	7.78	2.54	0.23

**APPENDIX B**

**HEAD LOSS - 1" XPA SUPPLY PIPE**

**100% Water**

**1" XPA Pipe / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.05	0.38	3.89	1.07	0.12
2.0	0.16	0.77	7.78	3.58	0.23
3.0	0.29	1.15	11.7	6.49	0.35
4.0	0.48	1.53	15.6	10.9	0.47
5.0	0.72	1.92	19.5	16.2	0.58
6.0	0.99	2.30	23.3	22.5	0.70
7.0	1.31	2.68	27.2	29.7	0.82
8.0	1.67	3.07	31.1	37.7	0.94
9.0	2.06	3.45	35.0	46.6	1.05
10.0	2.49	3.84	38.9	56.3	1.17
11.0	2.95	4.22	42.8	66.8	1.29
12.0	3.46	4.60	46.7	78.2	1.40
13.0	3.99	4.99	50.6	90.3	1.52
14.0	4.56	5.37	54.5	103	1.64
15.0	5.16	5.75	58.4	117	1.75
16.0	5.80	6.14	62.2	131	1.87
17.0	6.47	6.52	66.1	146	1.99
18.0	7.17	6.90	70.0	162	2.10
19.0	7.91	7.29	73.9	179	2.22
20.0	8.67	7.67	77.8	196	2.34

**1" XPA Pipe / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.04	0.38	3.89	0.91	0.12
2.0	0.12	0.77	7.78	2.76	0.23
3.0	0.25	1.15	11.7	5.70	0.35
4.0	0.42	1.53	15.6	9.55	0.47
5.0	0.63	1.92	19.5	14.3	0.58
6.0	0.88	2.30	23.3	19.8	0.70
7.0	1.15	2.68	27.2	26.1	0.82
8.0	1.47	3.07	31.1	33.2	0.94
9.0	1.82	3.45	35.0	41.1	1.05
10.0	2.20	3.84	38.9	49.7	1.17
11.0	2.61	4.22	42.8	59.0	1.29
12.0	3.05	4.60	46.7	69.0	1.40
13.0	3.52	4.99	50.6	79.7	1.52
14.0	4.03	5.37	54.5	91.1	1.64
15.0	4.56	5.75	58.4	103	1.75
16.0	5.13	6.14	62.2	116	1.87
17.0	5.72	6.52	66.1	129	1.99
18.0	6.34	6.90	70.0	143	2.10
19.0	6.99	7.29	73.9	158	2.22
20.0	7.67	7.67	77.8	174	2.34

**1" XPA Pipe / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.04	0.38	3.89	1.00	0.12
2.0	0.15	0.77	7.78	3.37	0.23
3.0	0.27	1.15	11.7	6.17	0.35
4.0	0.46	1.53	15.6	10.3	0.47
5.0	0.68	1.92	19.5	15.4	0.58
6.0	0.95	2.30	23.3	21.4	0.70
7.0	1.25	2.68	27.2	28.2	0.82
8.0	1.59	3.07	31.1	35.9	0.94
9.0	1.96	3.45	35.0	44.3	1.05
10.0	2.37	3.84	38.9	53.6	1.17
11.0	2.81	4.22	42.8	63.6	1.29
12.0	3.29	4.60	46.7	74.4	1.40
13.0	3.80	4.99	50.6	85.9	1.52
14.0	4.34	5.37	54.5	98.2	1.64
15.0	4.92	5.75	58.4	111	1.75
16.0	5.52	6.14	62.2	125	1.87
17.0	6.16	6.52	66.1	139	1.99
18.0	6.83	6.90	70.0	154	2.10
19.0	7.53	7.29	73.9	170	2.22
20.0	8.26	7.67	77.8	187	2.34

**1" XPA Pipe / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.04	0.38	3.89	0.87	0.12
2.0	0.12	0.77	7.78	2.63	0.23
3.0	0.24	1.15	11.7	5.45	0.35
4.0	0.40	1.53	15.6	9.13	0.47
5.0	0.60	1.92	19.5	13.6	0.58
6.0	0.84	2.30	23.3	18.9	0.70
7.0	1.10	2.68	27.2	25.0	0.82
8.0	1.41	3.07	31.1	31.8	0.94
9.0	1.74	3.45	35.0	39.3	1.05
10.0	2.10	3.84	38.9	47.5	1.17
11.0	2.50	4.22	42.8	56.5	1.29
12.0	2.92	4.60	46.7	66.1	1.40
13.0	3.37	4.99	50.6	76.3	1.52
14.0	3.86	5.37	54.5	87.3	1.64
15.0	4.37	5.75	58.4	98.8	1.75
16.0	4.91	6.14	62.2	111	1.87
17.0	5.48	6.52	66.1	124	1.99
18.0	6.08	6.90	70.0	137	2.10
19.0	6.70	7.29	73.9	152	2.22
20.0	7.35	7.67	77.8	166	2.34

**1" XPA Pipe / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.04	0.38	3.89	0.95	0.12
2.0	0.13	0.77	7.78	2.85	0.23
3.0	0.26	1.15	11.7	5.89	0.35
4.0	0.44	1.53	15.6	9.87	0.47
5.0	0.65	1.92	19.5	14.7	0.58
6.0	0.90	2.30	23.3	20.4	0.70
7.0	1.19	2.68	27.2	27.0	0.82
8.0	1.52	3.07	31.1	34.3	0.94
9.0	1.87	3.45	35.0	42.4	1.05
10.0	2.27	3.84	38.9	51.3	1.17
11.0	2.69	4.22	42.8	60.9	1.29
12.0	3.15	4.60	46.7	71.2	1.40
13.0	3.64	4.99	50.6	82.2	1.52
14.0	4.16	5.37	54.5	94.0	1.64
15.0	4.71	5.75	58.4	106	1.75
16.0	5.29	6.14	62.2	120	1.87
17.0	5.90	6.52	66.1	133	1.99
18.0	6.54	6.90	70.0	148	2.10
19.0	7.21	7.29	73.9	163	2.22
20.0	7.91	7.67	77.8	179	2.34

**1" XPA Pipe / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.04	0.38	3.89	0.83	0.12
2.0	0.11	0.77	7.78	2.54	0.23
3.0	0.23	1.15	11.7	5.26	0.35
4.0	0.39	1.53	15.6	8.82	0.47
5.0	0.58	1.92	19.5	13.2	0.58
6.0	0.81	2.30	23.3	18.3	0.70
7.0	1.07	2.68	27.2	24.1	0.82
8.0	1.36	3.07	31.1	30.7	0.94
9.0	1.68	3.45	35.0	38.0	1.05
10.0	2.03	3.84	38.9	45.9	1.17
11.0	2.41	4.22	42.8	54.6	1.29
12.0	2.82	4.60	46.7	63.8	1.40
13.0	3.26	4.99	50.6	73.8	1.52
14.0	3.73	5.37	54.5	84.3	1.64
15.0	4.22	5.75	58.4	95.5	1.75
16.0	4.75	6.14	62.2	107	1.87
17.0	5.30	6.52	66.1	120	1.99
18.0	5.87	6.90	70.0	133	2.10
19.0	6.48	7.29	73.9	147	2.22
20.0	7.11	7.67	77.8	161	2.34



**APPENDIX B**

**HEAD LOSS - 3/8" PEX TUBING**

**100% Water**

**3/8" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.16	0.34	0.39	3.73	0.10
0.2	0.33	0.68	0.78	7.45	0.21
0.3	1.03	1.02	1.17	23.3	0.31
0.4	1.70	1.36	1.56	38.5	0.42
0.5	2.51	1.71	1.95	56.9	0.52
0.6	3.46	2.05	2.33	78.3	0.62
0.7	4.53	2.39	2.72	102	0.73
0.8	5.72	2.73	3.11	129	0.83
0.9	7.03	3.07	3.50	159	0.94
1.0	7.54	3.41	3.89	171	1.04
1.1	8.94	3.75	4.28	202	1.14
1.2	10.5	4.09	4.67	236	1.25
1.3	12.1	4.44	5.06	273	1.35
1.4	13.8	4.78	5.45	312	1.46
1.5	15.6	5.12	5.84	353	1.56
1.6	17.5	5.46	6.22	396	1.66
1.7	19.5	5.80	6.61	441	1.77
1.8	21.6	6.14	7.00	489	1.87
1.9	23.8	6.48	7.39	539	1.98
2.0	26.1	6.82	7.78	591	2.08

**3/8" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.09	0.34	0.39	2.10	0.10
0.2	0.43	0.68	0.78	9.81	0.21
0.3	0.88	1.02	1.17	20.0	0.31
0.4	1.46	1.36	1.56	33.0	0.42
0.5	2.16	1.71	1.95	48.8	0.52
0.6	2.65	2.05	2.33	59.9	0.62
0.7	3.49	2.39	2.72	79.0	0.73
0.8	4.44	2.73	3.11	100	0.83
0.9	5.48	3.07	3.50	124	0.94
1.0	6.62	3.41	3.89	150	1.04
1.1	7.85	3.75	4.28	178	1.14
1.2	9.18	4.09	4.67	208	1.25
1.3	10.6	4.44	5.06	240	1.35
1.4	12.1	4.78	5.45	274	1.46
1.5	13.7	5.12	5.84	310	1.56
1.6	15.4	5.46	6.22	348	1.66
1.7	17.2	5.80	6.61	388	1.77
1.8	19.0	6.14	7.00	430	1.87
1.9	21.0	6.48	7.39	474	1.98
2.0	23.0	6.82	7.78	520	2.08

**3/8" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.13	0.34	0.39	2.95	0.10
0.2	0.26	0.68	0.78	5.90	0.21
0.3	0.97	1.02	1.17	21.9	0.31
0.4	1.60	1.36	1.56	36.2	0.42
0.5	2.37	1.71	1.95	53.5	0.52
0.6	3.25	2.05	2.33	73.6	0.62
0.7	4.26	2.39	2.72	96.4	0.73
0.8	4.80	2.73	3.11	109	0.83
0.9	5.93	3.07	3.50	134	0.94
1.0	7.16	3.41	3.89	162	1.04
1.1	8.49	3.75	4.28	192	1.14
1.2	9.93	4.09	4.67	225	1.25
1.3	11.5	4.44	5.06	259	1.35
1.4	13.1	4.78	5.45	296	1.46
1.5	14.8	5.12	5.84	335	1.56
1.6	16.6	5.46	6.22	376	1.66
1.7	18.5	5.80	6.61	419	1.77
1.8	20.5	6.14	7.00	465	1.87
1.9	22.6	6.48	7.39	512	1.98
2.0	24.8	6.82	7.78	561	2.08

**3/8" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.08	0.34	0.39	1.72	0.10
0.2	0.41	0.68	0.78	9.30	0.21
0.3	0.84	1.02	1.17	18.9	0.31
0.4	1.38	1.36	1.56	31.3	0.42
0.5	1.83	1.71	1.95	41.3	0.52
0.6	2.53	2.05	2.33	57.2	0.62
0.7	3.34	2.39	2.72	75.5	0.73
0.8	4.24	2.73	3.11	95.9	0.83
0.9	5.24	3.07	3.50	118	0.94
1.0	6.33	3.41	3.89	143	1.04
1.1	7.51	3.75	4.28	170	1.14
1.2	8.77	4.09	4.67	198	1.25
1.3	10.1	4.44	5.06	229	1.35
1.4	11.6	4.78	5.45	262	1.46
1.5	13.1	5.12	5.84	296	1.56
1.6	14.7	5.46	6.22	333	1.66
1.7	16.4	5.80	6.61	371	1.77
1.8	18.2	6.14	7.00	411	1.87
1.9	20.0	6.48	7.39	453	1.98
2.0	22.0	6.82	7.78	497	2.08

**3/8" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.11	0.34	0.39	2.41	0.10
0.2	0.45	0.68	0.78	10.2	0.21
0.3	0.92	1.02	1.17	20.7	0.31
0.4	1.52	1.36	1.56	34.3	0.42
0.5	2.24	1.71	1.95	50.7	0.52
0.6	3.08	2.05	2.33	69.7	0.62
0.7	3.61	2.39	2.72	81.7	0.73
0.8	4.58	2.73	3.11	104	0.83
0.9	5.66	3.07	3.50	128	0.94
1.0	6.84	3.41	3.89	155	1.04
1.1	8.11	3.75	4.28	184	1.14
1.2	9.48	4.09	4.67	215	1.25
1.3	10.9	4.44	5.06	248	1.35
1.4	12.5	4.78	5.45	283	1.46
1.5	14.2	5.12	5.84	320	1.56
1.6	15.9	5.46	6.22	360	1.66
1.7	17.7	5.80	6.61	401	1.77
1.8	19.6	6.14	7.00	444	1.87
1.9	21.6	6.48	7.39	490	1.98
2.0	23.7	6.82	7.78	537	2.08

**3/8" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.07	0.34	0.39	1.49	0.10
0.2	0.39	0.68	0.78	8.92	0.21
0.3	0.80	1.02	1.17	18.1	0.31
0.4	1.18	1.36	1.56	26.7	0.42
0.5	1.76	1.71	1.95	39.8	0.52
0.6	2.44	2.05	2.33	55.2	0.62
0.7	3.22	2.39	2.72	72.8	0.73
0.8	4.09	2.73	3.11	92.5	0.83
0.9	5.05	3.07	3.50	114	0.94
1.0	6.10	3.41	3.89	138	1.04
1.1	7.24	3.75	4.28	164	1.14
1.2	8.47	4.09	4.67	192	1.25
1.3	9.78	4.44	5.06	221	1.35
1.4	11.2	4.78	5.45	253	1.46
1.5	12.7	5.12	5.84	286	1.56
1.6	14.2	5.46	6.22	321	1.66
1.7	15.8	5.80	6.61	358	1.77
1.8	17.6	6.14	7.00	397	1.87
1.9	19.4	6.48	7.39	438	1.98
2.0	21.2	6.82	7.78	480	2.08

APPENDIX B

HEAD LOSS - 1/2" PEX TUBING

100% Water

1/2" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.17	0.39	0.97	0.05
0.2	0.09	0.35	0.78	1.93	0.11
0.3	0.13	0.52	1.17	2.90	0.16
0.4	0.34	0.69	1.56	7.74	0.21
0.5	0.51	0.87	1.95	11.4	0.26
0.6	0.70	1.04	2.33	15.7	0.32
0.7	0.91	1.22	2.72	20.6	0.37
0.8	1.15	1.39	3.11	26.0	0.42
0.9	1.41	1.56	3.50	32.0	0.48
1.0	1.70	1.74	3.89	38.5	0.53
1.1	2.01	1.91	4.28	45.5	0.58
1.2	2.34	2.08	4.67	52.9	0.64
1.3	2.69	2.26	5.06	60.9	0.69
1.4	2.80	2.43	5.45	63.3	0.74
1.5	3.16	2.60	5.84	71.6	0.79
1.6	3.55	2.78	6.22	80.4	0.85
1.7	3.96	2.95	6.61	89.6	0.90
1.8	4.39	3.13	7.00	99.2	0.95
1.9	4.83	3.30	7.39	109	1.01
2.0	5.30	3.47	7.78	120	1.06

1/2" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.17	0.39	0.54	0.05
0.2	0.05	0.35	0.78	1.09	0.11
0.3	0.18	0.52	1.17	4.01	0.16
0.4	0.29	0.69	1.56	6.64	0.21
0.5	0.43	0.87	1.95	9.81	0.26
0.6	0.60	1.04	2.33	13.5	0.32
0.7	0.78	1.22	2.72	17.7	0.37
0.8	0.90	1.39	3.11	20.4	0.42
0.9	1.11	1.56	3.50	25.2	0.48
1.0	1.34	1.74	3.89	30.4	0.53
1.1	1.59	1.91	4.28	36.0	0.58
1.2	1.86	2.08	4.67	42.1	0.64
1.3	2.15	2.26	5.06	48.6	0.69
1.4	2.45	2.43	5.45	55.5	0.74
1.5	2.78	2.60	5.84	62.8	0.79
1.6	3.12	2.78	6.22	70.5	0.85
1.7	3.48	2.95	6.61	78.7	0.90
1.8	3.85	3.13	7.00	87.1	0.95
1.9	4.25	3.30	7.39	96.0	1.01
2.0	4.65	3.47	7.78	105	1.06

1/2" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.17	0.39	0.76	0.05
0.2	0.07	0.35	0.78	1.53	0.11
0.3	0.10	0.52	1.17	2.29	0.16
0.4	0.32	0.69	1.56	7.28	0.21
0.5	0.48	0.87	1.95	10.8	0.26
0.6	0.65	1.04	2.33	14.8	0.32
0.7	0.86	1.22	2.72	19.4	0.37
0.8	1.08	1.39	3.11	24.5	0.42
0.9	1.33	1.56	3.50	30.1	0.48
1.0	1.60	1.74	3.89	36.2	0.53
1.1	1.72	1.91	4.28	39.0	0.58
1.2	2.01	2.08	4.67	45.6	0.64
1.3	2.33	2.26	5.06	52.6	0.69
1.4	2.66	2.43	5.45	60.1	0.74
1.5	3.00	2.60	5.84	68.0	0.79
1.6	3.37	2.78	6.22	76.3	0.85
1.7	3.76	2.95	6.61	85.1	0.90
1.8	4.17	3.13	7.00	94.2	0.95
1.9	4.59	3.30	7.39	104	1.01
2.0	5.03	3.47	7.78	114	1.06

1/2" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.17	0.39	0.45	0.05
0.2	0.08	0.35	0.78	1.87	0.11
0.3	0.17	0.52	1.17	3.80	0.16
0.4	0.28	0.69	1.56	6.29	0.21
0.5	0.41	0.87	1.95	9.29	0.26
0.6	0.57	1.04	2.33	12.8	0.32
0.7	0.68	1.22	2.72	15.3	0.37
0.8	0.86	1.39	3.11	19.5	0.42
0.9	1.06	1.56	3.50	24.0	0.48
1.0	1.28	1.74	3.89	29.0	0.53
1.1	1.52	1.91	4.28	34.4	0.58
1.2	1.78	2.08	4.67	40.2	0.64
1.3	2.05	2.26	5.06	46.4	0.69
1.4	2.35	2.43	5.45	53.1	0.74
1.5	2.65	2.60	5.84	60.0	0.79
1.6	2.98	2.78	6.22	67.4	0.85
1.7	3.32	2.95	6.61	75.2	0.90
1.8	3.68	3.13	7.00	83.3	0.95
1.9	4.06	3.30	7.39	91.8	1.01
2.0	4.45	3.47	7.78	101	1.06

1/2" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.17	0.39	0.63	0.05
0.2	0.06	0.35	0.78	1.25	0.11
0.3	0.18	0.52	1.17	4.17	0.16
0.4	0.30	0.69	1.56	6.90	0.21
0.5	0.45	0.87	1.95	10.2	0.26
0.6	0.62	1.04	2.33	14.0	0.32
0.7	0.81	1.22	2.72	18.4	0.37
0.8	1.03	1.39	3.11	23.2	0.42
0.9	1.15	1.56	3.50	26.0	0.48
1.0	1.39	1.74	3.89	31.4	0.53
1.1	1.65	1.91	4.28	37.2	0.58
1.2	1.92	2.08	4.67	43.5	0.64
1.3	2.22	2.26	5.06	50.2	0.69
1.4	2.54	2.43	5.45	57.4	0.74
1.5	2.87	2.60	5.84	64.9	0.79
1.6	3.22	2.78	6.22	72.9	0.85
1.7	3.59	2.95	6.61	81.3	0.90
1.8	3.98	3.13	7.00	90.0	0.95
1.9	4.39	3.30	7.39	99.2	1.01
2.0	4.81	3.47	7.78	109	1.06

1/2" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.17	0.39	0.39	0.05
0.2	0.08	0.35	0.78	1.79	0.11
0.3	0.16	0.52	1.17	3.65	0.16
0.4	0.27	0.69	1.56	6.03	0.21
0.5	0.39	0.87	1.95	8.91	0.26
0.6	0.50	1.04	2.33	11.2	0.32
0.7	0.65	1.22	2.72	14.8	0.37
0.8	0.83	1.39	3.11	18.8	0.42
0.9	1.02	1.56	3.50	23.2	0.48
1.0	1.24	1.74	3.89	28.0	0.53
1.1	1.47	1.91	4.28	33.2	0.58
1.2	1.72	2.08	4.67	38.8	0.64
1.3	1.98	2.26	5.06	44.8	0.69
1.4	2.26	2.43	5.45	51.2	0.74
1.5	2.56	2.60	5.84	57.9	0.79
1.6	2.88	2.78	6.22	65.1	0.85
1.7	3.21	2.95	6.61	72.6	0.90
1.8	3.55	3.13	7.00	80.4	0.95
1.9	3.92	3.30	7.39	88.6	1.01
2.0	4.29	3.47	7.78	97.2	1.06

APPENDIX B

HEAD LOSS - 5/8" PEX TUBING

100% Water

5/8" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.12	0.39	0.46	0.04
0.2	0.04	0.24	0.78	0.92	0.07
0.3	0.06	0.36	1.17	1.38	0.11
0.4	0.08	0.48	1.56	1.84	0.15
0.5	0.21	0.60	1.95	4.73	0.18
0.6	0.29	0.72	2.33	6.51	0.22
0.7	0.38	0.84	2.72	8.53	0.26
0.8	0.48	0.96	3.11	10.8	0.29
0.9	0.59	1.08	3.50	13.2	0.33
1.0	0.70	1.20	3.89	15.9	0.37
1.1	0.83	1.32	4.28	18.8	0.40
1.2	0.97	1.44	4.67	21.9	0.44
1.3	1.11	1.56	5.06	25.2	0.47
1.4	1.27	1.68	5.45	28.7	0.51
1.5	1.43	1.80	5.84	32.4	0.55
1.6	1.60	1.92	6.22	36.2	0.58
1.7	1.59	2.04	6.61	35.9	0.62
1.8	1.76	2.16	7.00	39.8	0.66
1.9	1.94	2.28	7.39	43.8	0.69
2.0	2.12	2.40	7.78	48.1	0.73

5/8" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.12	0.39	0.26	0.04
0.2	0.02	0.24	0.78	0.52	0.07
0.3	0.07	0.36	1.17	1.66	0.11
0.4	0.12	0.48	1.56	2.75	0.15
0.5	0.18	0.60	1.95	4.06	0.18
0.6	0.25	0.72	2.33	5.58	0.22
0.7	0.32	0.84	2.72	7.31	0.26
0.8	0.41	0.96	3.11	9.24	0.29
0.9	0.50	1.08	3.50	11.4	0.33
1.0	0.54	1.20	3.89	12.2	0.37
1.1	0.64	1.32	4.28	14.5	0.40
1.2	0.75	1.44	4.67	16.9	0.44
1.3	0.86	1.56	5.06	19.5	0.47
1.4	0.98	1.68	5.45	22.3	0.51
1.5	1.11	1.80	5.84	25.2	0.55
1.6	1.25	1.92	6.22	28.3	0.58
1.7	1.39	2.04	6.61	31.5	0.62
1.8	1.54	2.16	7.00	34.9	0.66
1.9	1.70	2.28	7.39	38.5	0.69
2.0	1.87	2.40	7.78	42.2	0.73

5/8" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.12	0.39	0.36	0.04
0.2	0.03	0.24	0.78	0.73	0.07
0.3	0.05	0.36	1.17	1.09	0.11
0.4	0.13	0.48	1.56	3.01	0.15
0.5	0.20	0.60	1.95	4.45	0.18
0.6	0.27	0.72	2.33	6.12	0.22
0.7	0.35	0.84	2.72	8.02	0.26
0.8	0.45	0.96	3.11	10.1	0.29
0.9	0.55	1.08	3.50	12.5	0.33
1.0	0.66	1.20	3.89	15.0	0.37
1.1	0.78	1.32	4.28	17.7	0.40
1.2	0.91	1.44	4.67	20.6	0.44
1.3	0.93	1.56	5.06	21.1	0.47
1.4	1.07	1.68	5.45	24.1	0.51
1.5	1.21	1.80	5.84	27.3	0.55
1.6	1.35	1.92	6.22	30.6	0.58
1.7	1.51	2.04	6.61	34.1	0.62
1.8	1.67	2.16	7.00	37.8	0.66
1.9	1.84	2.28	7.39	41.6	0.69
2.0	2.02	2.40	7.78	45.6	0.73

5/8" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.12	0.39	0.21	0.04
0.2	0.02	0.24	0.78	0.42	0.07
0.3	0.07	0.36	1.17	1.57	0.11
0.4	0.12	0.48	1.56	2.60	0.15
0.5	0.17	0.60	1.95	3.85	0.18
0.6	0.23	0.72	2.33	5.29	0.22
0.7	0.31	0.84	2.72	6.93	0.26
0.8	0.35	0.96	3.11	7.80	0.29
0.9	0.43	1.08	3.50	9.64	0.33
1.0	0.51	1.20	3.89	11.6	0.37
1.1	0.61	1.32	4.28	13.8	0.40
1.2	0.71	1.44	4.67	16.1	0.44
1.3	0.82	1.56	5.06	18.6	0.47
1.4	0.94	1.68	5.45	21.3	0.51
1.5	1.06	1.80	5.84	24.1	0.55
1.6	1.20	1.92	6.22	27.0	0.58
1.7	1.33	2.04	6.61	30.1	0.62
1.8	1.48	2.16	7.00	33.4	0.66
1.9	1.63	2.28	7.39	36.8	0.69
2.0	1.78	2.40	7.78	40.4	0.73

5/8" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.12	0.39	0.30	0.04
0.2	0.03	0.24	0.78	0.59	0.07
0.3	0.04	0.36	1.17	0.89	0.11
0.4	0.13	0.48	1.56	2.85	0.15
0.5	0.19	0.60	1.95	4.22	0.18
0.6	0.26	0.72	2.33	5.80	0.22
0.7	0.34	0.84	2.72	7.60	0.26
0.8	0.42	0.96	3.11	9.60	0.29
0.9	0.52	1.08	3.50	11.8	0.33
1.0	0.63	1.20	3.89	14.2	0.37
1.1	0.66	1.32	4.28	14.9	0.40
1.2	0.77	1.44	4.67	17.5	0.44
1.3	0.89	1.56	5.06	20.2	0.47
1.4	1.02	1.68	5.45	23.0	0.51
1.5	1.15	1.80	5.84	26.0	0.55
1.6	1.29	1.92	6.22	29.2	0.58
1.7	1.44	2.04	6.61	32.6	0.62
1.8	1.60	2.16	7.00	36.1	0.66
1.9	1.76	2.28	7.39	39.8	0.69
2.0	1.93	2.40	7.78	43.6	0.73

5/8" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.12	0.39	0.18	0.04
0.2	0.03	0.24	0.78	0.74	0.07
0.3	0.07	0.36	1.17	1.51	0.11
0.4	0.11	0.48	1.56	2.50	0.15
0.5	0.16	0.60	1.95	3.69	0.18
0.6	0.22	0.72	2.33	5.07	0.22
0.7	0.26	0.84	2.72	5.93	0.26
0.8	0.33	0.96	3.11	7.53	0.29
0.9	0.41	1.08	3.50	9.30	0.33
1.0	0.50	1.20	3.89	11.2	0.37
1.1	0.59	1.32	4.28	13.3	0.40
1.2	0.69	1.44	4.67	15.6	0.44
1.3	0.79	1.56	5.06	18.0	0.47
1.4	0.91	1.68	5.45	20.5	0.51
1.5	1.03	1.80	5.84	23.2	0.55
1.6	1.15	1.92	6.22	26.1	0.58
1.7	1.29	2.04	6.61	29.1	0.62
1.8	1.42	2.16	7.00	32.2	0.66
1.9	1.57	2.28	7.39	35.5	0.69
2.0	1.72	2.40	7.78	39.0	0.73

**APPENDIX B**

**HEAD LOSS - 3/4" PEX TUBING**

**100% Water**

**3/4" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.25	0.03
0.2	0.02	0.18	0.78	0.50	0.05
0.3	0.03	0.26	1.17	0.75	0.08
0.4	0.04	0.35	1.56	0.99	0.11
0.5	0.05	0.44	1.95	1.24	0.13
0.6	0.14	0.53	2.33	3.14	0.16
0.7	0.18	0.62	2.72	4.11	0.19
0.8	0.23	0.70	3.11	5.19	0.21
0.9	0.28	0.79	3.50	6.38	0.24
1.0	0.34	0.88	3.89	7.67	0.27
1.1	0.40	0.97	4.28	9.06	0.30
1.2	0.47	1.06	4.67	10.6	0.32
1.3	0.54	1.15	5.06	12.1	0.35
1.4	0.61	1.23	5.45	13.8	0.38
1.5	0.69	1.32	5.84	15.6	0.40
1.6	0.77	1.41	6.22	17.5	0.43
1.7	0.86	1.50	6.61	19.4	0.46
1.8	0.95	1.59	7.00	21.5	0.48
1.9	0.93	1.67	7.39	21.0	0.51
2.0	1.02	1.76	7.78	23.0	0.54

**3/4" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.14	0.03
0.2	0.01	0.18	0.78	0.28	0.05
0.3	0.02	0.26	1.17	0.42	0.08
0.4	0.06	0.35	1.56	1.32	0.11
0.5	0.09	0.44	1.95	1.96	0.13
0.6	0.12	0.53	2.33	2.69	0.16
0.7	0.16	0.62	2.72	3.52	0.19
0.8	0.20	0.70	3.11	4.45	0.21
0.9	0.24	0.79	3.50	5.47	0.24
1.0	0.29	0.88	3.89	6.58	0.27
1.1	0.31	0.97	4.28	6.92	0.30
1.2	0.36	1.06	4.67	8.09	0.32
1.3	0.41	1.15	5.06	9.34	0.35
1.4	0.47	1.23	5.45	10.7	0.38
1.5	0.53	1.32	5.84	12.1	0.40
1.6	0.60	1.41	6.22	13.5	0.43
1.7	0.67	1.50	6.61	15.1	0.46
1.8	0.74	1.59	7.00	16.7	0.48
1.9	0.81	1.67	7.39	18.4	0.51
2.0	0.89	1.76	7.78	20.2	0.54

**3/4" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.20	0.03
0.2	0.02	0.18	0.78	0.39	0.05
0.3	0.03	0.26	1.17	0.59	0.08
0.4	0.03	0.35	1.56	0.79	0.11
0.5	0.09	0.44	1.95	2.15	0.13
0.6	0.13	0.53	2.33	2.95	0.16
0.7	0.17	0.62	2.72	3.87	0.19
0.8	0.22	0.70	3.11	4.88	0.21
0.9	0.27	0.79	3.50	6.00	0.24
1.0	0.32	0.88	3.89	7.22	0.27
1.1	0.38	0.97	4.28	8.53	0.30
1.2	0.44	1.06	4.67	9.93	0.32
1.3	0.50	1.15	5.06	11.4	0.35
1.4	0.57	1.23	5.45	13.0	0.38
1.5	0.58	1.32	5.84	13.1	0.40
1.6	0.65	1.41	6.22	14.7	0.43
1.7	0.72	1.50	6.61	16.3	0.46
1.8	0.80	1.59	7.00	18.1	0.48
1.9	0.88	1.67	7.39	19.9	0.51
2.0	0.97	1.76	7.78	21.9	0.54

**3/4" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.11	0.03
0.2	0.01	0.18	0.78	0.23	0.05
0.3	0.03	0.26	1.17	0.76	0.08
0.4	0.06	0.35	1.56	1.25	0.11
0.5	0.08	0.44	1.95	1.85	0.13
0.6	0.11	0.53	2.33	2.55	0.16
0.7	0.15	0.62	2.72	3.34	0.19
0.8	0.19	0.70	3.11	4.22	0.21
0.9	0.20	0.79	3.50	4.62	0.24
1.0	0.25	0.88	3.89	5.57	0.27
1.1	0.29	0.97	4.28	6.61	0.30
1.2	0.34	1.06	4.67	7.73	0.32
1.3	0.39	1.15	5.06	8.92	0.35
1.4	0.45	1.23	5.45	10.2	0.38
1.5	0.51	1.32	5.84	11.5	0.40
1.6	0.57	1.41	6.22	12.9	0.43
1.7	0.64	1.50	6.61	14.4	0.46
1.8	0.71	1.59	7.00	16.0	0.48
1.9	0.78	1.67	7.39	17.6	0.51
2.0	0.85	1.76	7.78	19.3	0.54

**3/4" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.16	0.03
0.2	0.01	0.18	0.78	0.32	0.05
0.3	0.02	0.26	1.17	0.48	0.08
0.4	0.06	0.35	1.56	1.38	0.11
0.5	0.09	0.44	1.95	2.03	0.13
0.6	0.12	0.53	2.33	2.80	0.16
0.7	0.16	0.62	2.72	3.66	0.19
0.8	0.20	0.70	3.11	4.63	0.21
0.9	0.25	0.79	3.50	5.69	0.24
1.0	0.30	0.88	3.89	6.84	0.27
1.1	0.36	0.97	4.28	8.08	0.30
1.2	0.42	1.06	4.67	9.41	0.32
1.3	0.43	1.15	5.06	9.65	0.35
1.4	0.49	1.23	5.45	11.0	0.38
1.5	0.55	1.32	5.84	12.5	0.40
1.6	0.62	1.41	6.22	14.0	0.43
1.7	0.69	1.50	6.61	15.6	0.46
1.8	0.76	1.59	7.00	17.3	0.48
1.9	0.84	1.67	7.39	19.0	0.51
2.0	0.92	1.76	7.78	20.9	0.54

**3/4" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.09	0.39	0.10	0.03
0.2	0.01	0.18	0.78	0.20	0.05
0.3	0.03	0.26	1.17	0.73	0.08
0.4	0.05	0.35	1.56	1.20	0.11
0.5	0.08	0.44	1.95	1.78	0.13
0.6	0.11	0.53	2.33	2.45	0.16
0.7	0.14	0.62	2.72	3.20	0.19
0.8	0.16	0.70	3.11	3.61	0.21
0.9	0.20	0.79	3.50	4.45	0.24
1.0	0.24	0.88	3.89	5.38	0.27
1.1	0.28	0.97	4.28	6.38	0.30
1.2	0.33	1.06	4.67	7.45	0.32
1.3	0.38	1.15	5.06	8.60	0.35
1.4	0.43	1.23	5.45	9.83	0.38
1.5	0.49	1.32	5.84	11.1	0.40
1.6	0.55	1.41	6.22	12.5	0.43
1.7	0.62	1.50	6.61	13.9	0.46
1.8	0.68	1.59	7.00	15.4	0.48
1.9	0.75	1.67	7.39	17.0	0.51
2.0	0.82	1.76	7.78	18.6	0.54

**APPENDIX B**

**HEAD LOSS - 1" PEX TUBING**

**100% Water**

**1" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.09	0.02
0.2	0.01	0.11	0.78	0.18	0.03
0.3	0.01	0.16	1.17	0.27	0.05
0.4	0.02	0.21	1.56	0.36	0.07
0.5	0.02	0.27	1.95	0.46	0.08
0.6	0.02	0.32	2.33	0.55	0.10
0.7	0.03	0.37	2.72	0.64	0.11
0.8	0.07	0.43	3.11	1.58	0.13
0.9	0.09	0.48	3.50	1.94	0.15
1.0	0.10	0.53	3.89	2.33	0.16
1.1	0.12	0.59	4.28	2.76	0.18
1.2	0.14	0.64	4.67	3.21	0.20
1.3	0.16	0.69	5.06	3.69	0.21
1.4	0.19	0.75	5.45	4.20	0.23
1.5	0.21	0.80	5.84	4.74	0.24
1.6	0.23	0.85	6.22	5.31	0.26
1.7	0.26	0.91	6.61	5.90	0.28
1.8	0.29	0.96	7.00	6.52	0.29
1.9	0.32	1.01	7.39	7.17	0.31
2.0	0.35	1.07	7.78	7.85	0.33

**1" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.05	0.02
0.2	0.00	0.11	0.78	0.10	0.03
0.3	0.01	0.16	1.17	0.15	0.05
0.4	0.01	0.21	1.56	0.21	0.07
0.5	0.03	0.27	1.95	0.59	0.08
0.6	0.04	0.32	2.33	0.82	0.10
0.7	0.05	0.37	2.72	1.07	0.11
0.8	0.06	0.43	3.11	1.35	0.13
0.9	0.07	0.48	3.50	1.66	0.15
1.0	0.09	0.53	3.89	2.00	0.16
1.1	0.10	0.59	4.28	2.36	0.18
1.2	0.12	0.64	4.67	2.75	0.20
1.3	0.14	0.69	5.06	3.17	0.21
1.4	0.14	0.75	5.45	3.21	0.23
1.5	0.16	0.80	5.84	3.63	0.24
1.6	0.18	0.85	6.22	4.08	0.26
1.7	0.20	0.91	6.61	4.54	0.28
1.8	0.22	0.96	7.00	5.03	0.29
1.9	0.25	1.01	7.39	5.54	0.31
2.0	0.27	1.07	7.78	6.08	0.33

**1" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.07	0.02
0.2	0.01	0.11	0.78	0.14	0.03
0.3	0.01	0.16	1.17	0.22	0.05
0.4	0.01	0.21	1.56	0.29	0.07
0.5	0.02	0.27	1.95	0.36	0.08
0.6	0.04	0.32	2.33	0.90	0.10
0.7	0.05	0.37	2.72	1.18	0.11
0.8	0.07	0.43	3.11	1.48	0.13
0.9	0.08	0.48	3.50	1.82	0.15
1.0	0.10	0.53	3.89	2.19	0.16
1.1	0.11	0.59	4.28	2.59	0.18
1.2	0.13	0.64	4.67	3.02	0.20
1.3	0.15	0.69	5.06	3.47	0.21
1.4	0.17	0.75	5.45	3.95	0.23
1.5	0.20	0.80	5.84	4.46	0.24
1.6	0.22	0.85	6.22	4.99	0.26
1.7	0.25	0.91	6.61	5.55	0.28
1.8	0.27	0.96	7.00	6.14	0.29
1.9	0.30	1.01	7.39	6.75	0.31
2.0	0.29	1.07	7.78	6.58	0.33

**1" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.04	0.02
0.2	0.00	0.11	0.78	0.08	0.03
0.3	0.01	0.16	1.17	0.13	0.05
0.4	0.02	0.21	1.56	0.38	0.07
0.5	0.02	0.27	1.95	0.56	0.08
0.6	0.03	0.32	2.33	0.78	0.10
0.7	0.04	0.37	2.72	1.02	0.11
0.8	0.06	0.43	3.11	1.28	0.13
0.9	0.07	0.48	3.50	1.58	0.15
1.0	0.08	0.53	3.89	1.90	0.16
1.1	0.10	0.59	4.28	2.24	0.18
1.2	0.10	0.64	4.67	2.33	0.20
1.3	0.12	0.69	5.06	2.68	0.21
1.4	0.14	0.75	5.45	3.06	0.23
1.5	0.15	0.80	5.84	3.47	0.24
1.6	0.17	0.85	6.22	3.89	0.26
1.7	0.19	0.91	6.61	4.34	0.28
1.8	0.21	0.96	7.00	4.81	0.29
1.9	0.23	1.01	7.39	5.30	0.31
2.0	0.26	1.07	7.78	5.81	0.33

**1" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.06	0.02
0.2	0.01	0.11	0.78	0.12	0.03
0.3	0.01	0.16	1.17	0.18	0.05
0.4	0.01	0.21	1.56	0.24	0.07
0.5	0.03	0.27	1.95	0.62	0.08
0.6	0.04	0.32	2.33	0.85	0.10
0.7	0.05	0.37	2.72	1.11	0.11
0.8	0.06	0.43	3.11	1.41	0.13
0.9	0.08	0.48	3.50	1.73	0.15
1.0	0.09	0.53	3.89	2.08	0.16
1.1	0.11	0.59	4.28	2.46	0.18
1.2	0.13	0.64	4.67	2.86	0.20
1.3	0.15	0.69	5.06	3.29	0.21
1.4	0.17	0.75	5.45	3.75	0.23
1.5	0.19	0.80	5.84	4.23	0.24
1.6	0.19	0.85	6.22	4.21	0.26
1.7	0.21	0.91	6.61	4.70	0.28
1.8	0.23	0.96	7.00	5.20	0.29
1.9	0.25	1.01	7.39	5.73	0.31
2.0	0.28	1.07	7.78	6.28	0.33

**1" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.05	0.39	0.04	0.02
0.2	0.00	0.11	0.78	0.07	0.03
0.3	0.01	0.16	1.17	0.22	0.05
0.4	0.02	0.21	1.56	0.37	0.07
0.5	0.02	0.27	1.95	0.54	0.08
0.6	0.03	0.32	2.33	0.74	0.10
0.7	0.04	0.37	2.72	0.97	0.11
0.8	0.05	0.43	3.11	1.23	0.13
0.9	0.07	0.48	3.50	1.51	0.15
1.0	0.07	0.53	3.89	1.62	0.16
1.1	0.08	0.59	4.28	1.92	0.18
1.2	0.10	0.64	4.67	2.24	0.20
1.3	0.11	0.69	5.06	2.59	0.21
1.4	0.13	0.75	5.45	2.96	0.23
1.5	0.15	0.80	5.84	3.34	0.24
1.6	0.17	0.85	6.22	3.76	0.26
1.7	0.19	0.91	6.61	4.19	0.28
1.8	0.21	0.96	7.00	4.64	0.29
1.9	0.23	1.01	7.39	5.11	0.31
2.0	0.25	1.07	7.78	5.60	0.33

**APPENDIX B**

**HEAD LOSS - 1" PEX SUPPLY TUBING**

**100% Water**

**1" PEX Tubing / 100% Water / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.10	0.53	3.89	2.33	0.16
2.0	0.35	1.07	7.78	7.85	0.33
3.0	0.63	1.60	11.7	14.3	0.49
4.0	1.06	2.13	15.6	24.0	0.65
5.0	1.58	2.67	19.5	35.8	0.81
6.0	2.19	3.20	23.3	49.6	0.98
7.0	2.89	3.73	27.2	65.5	1.14
8.0	3.68	4.27	31.1	83.2	1.30
9.0	4.55	4.80	35.0	103	1.46
10.0	5.50	5.34	38.9	124	1.63
11.0	6.52	5.87	42.8	148	1.79
12.0	7.63	6.40	46.7	173	1.95
13.0	8.81	6.94	50.6	199	2.11
14.0	10.1	7.47	54.5	228	2.28
15.0	11.4	8.00	58.4	258	2.44
16.0	12.8	8.54	62.2	290	2.60
17.0	14.3	9.07	66.1	323	2.77
18.0	15.8	9.60	70.0	358	2.93
19.0	17.5	10.1	73.9	395	3.09
20.0	19.2	10.7	77.8	433	3.25

**1" PEX Tubing / 100% Water / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.09	0.53	3.89	2.00	0.16
2.0	0.27	1.07	7.78	6.08	0.33
3.0	0.56	1.60	11.7	12.6	0.49
4.0	0.93	2.13	15.6	21.1	0.65
5.0	1.39	2.67	19.5	31.5	0.81
6.0	1.93	3.20	23.3	43.7	0.98
7.0	2.55	3.73	27.2	57.7	1.14
8.0	3.24	4.27	31.1	73.4	1.30
9.0	4.01	4.80	35.0	90.7	1.46
10.0	4.85	5.34	38.9	110	1.63
11.0	5.76	5.87	42.8	130	1.79
12.0	6.74	6.40	46.7	152	1.95
13.0	7.79	6.94	50.6	176	2.11
14.0	8.90	7.47	54.5	201	2.28
15.0	10.1	8.00	58.4	228	2.44
16.0	11.3	8.54	62.2	256	2.60
17.0	12.6	9.07	66.1	286	2.77
18.0	14.0	9.60	70.0	317	2.93
19.0	15.5	10.1	73.9	350	3.09
20.0	17.0	10.7	77.8	384	3.25

**1" PEX Tubing / 100% Water / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.10	0.53	3.89	2.19	0.16
2.0	0.29	1.07	7.78	6.58	0.33
3.0	0.60	1.60	11.67	13.6	0.49
4.0	1.01	2.13	15.56	22.8	0.65
5.0	1.50	2.67	19.45	34.0	0.81
6.0	2.09	3.20	23.34	47.2	0.98
7.0	2.75	3.73	27.23	62.3	1.14
8.0	3.50	4.27	31.12	79.2	1.30
9.0	4.33	4.80	35.01	97.8	1.46
10.0	5.23	5.34	38.90	118	1.63
11.0	6.21	5.87	42.79	140	1.79
12.0	7.26	6.40	46.68	164	1.95
13.0	8.39	6.94	50.57	190	2.11
14.0	9.59	7.47	54.46	217	2.28
15.0	10.9	8.00	58.35	246	2.44
16.0	12.2	8.54	62.24	276	2.60
17.0	13.6	9.07	66.13	308	2.77
18.0	15.1	9.60	70.02	341	2.93
19.0	16.6	10.1	73.91	376	3.09
20.0	18.3	10.7	77.80	413	3.25

**1" PEX Tubing / 100% Water / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.08	0.53	3.89	1.90	0.16
2.0	0.26	1.07	7.78	5.81	0.33
3.0	0.53	1.60	11.7	12.0	0.49
4.0	0.89	2.13	15.6	20.2	0.65
5.0	1.33	2.67	19.5	30.1	0.81
6.0	1.85	3.20	23.3	41.8	0.98
7.0	2.44	3.73	27.2	55.2	1.14
8.0	3.10	4.27	31.1	70.2	1.30
9.0	3.84	4.80	35.0	86.9	1.46
10.0	4.64	5.34	38.9	105	1.63
11.0	5.52	5.87	42.8	125	1.79
12.0	6.45	6.40	46.7	146	1.95
13.0	7.46	6.94	50.6	169	2.11
14.0	8.53	7.47	54.5	193	2.28
15.0	9.66	8.00	58.4	219	2.44
16.0	10.9	8.54	62.2	246	2.60
17.0	12.1	9.07	66.1	274	2.77
18.0	13.4	9.60	70.0	304	2.93
19.0	14.8	10.1	73.9	335	3.09
20.0	16.3	10.7	77.8	368	3.25

**1" PEX Tubing / 100% Water / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.09	0.53	3.89	2.08	0.16
2.0	0.28	1.07	7.78	6.28	0.33
3.0	0.57	1.60	11.7	13.0	0.49
4.0	0.96	2.13	15.6	21.8	0.65
5.0	1.44	2.67	19.5	32.5	0.81
6.0	2.00	3.20	23.3	45.1	0.98
7.0	2.63	3.73	27.2	59.6	1.14
8.0	3.35	4.27	31.1	75.7	1.30
9.0	4.14	4.80	35.0	93.6	1.46
10.0	5.00	5.34	38.9	113	1.63
11.0	5.94	5.87	42.8	134	1.79
12.0	6.95	6.40	46.7	157	1.95
13.0	8.03	6.94	50.6	182	2.11
14.0	9.18	7.47	54.5	208	2.28
15.0	10.4	8.00	58.4	235	2.44
16.0	11.7	8.54	62.2	264	2.60
17.0	13.0	9.07	66.1	295	2.77
18.0	14.5	9.60	70.0	327	2.93
19.0	15.9	10.1	73.9	361	3.09
20.0	17.5	10.7	77.8	396	3.25

**1" PEX Tubing / 100% Water / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
1.0	0.07	0.53	3.89	1.62	0.16
2.0	0.25	1.07	7.78	5.60	0.33
3.0	0.51	1.60	11.7	11.6	0.49
4.0	0.86	2.13	15.6	19.5	0.65
5.0	1.29	2.67	19.5	29.1	0.81
6.0	1.79	3.20	23.3	40.4	0.98
7.0	2.36	3.73	27.2	53.3	1.14
8.0	3.00	4.27	31.1	67.9	1.30
9.0	3.71	4.80	35.0	83.9	1.46
10.0	4.49	5.34	38.9	102	1.63
11.0	5.33	5.87	42.8	121	1.79
12.0	6.24	6.40	46.7	141	1.95
13.0	7.21	6.94	50.6	163	2.11
14.0	8.24	7.47	54.5	186	2.28
15.0	9.34	8.00	58.4	211	2.44
16.0	10.5	8.54	62.2	237	2.60
17.0	11.7	9.07	66.1	265	2.77
18.0	13.0	9.60	70.0	294	2.93
19.0	14.3	10.1	73.9	324	3.09
20.0	15.7	10.7	77.8	356	3.25

**APPENDIX B**

**HEAD LOSS - 1/2" XPA PIPE  
30% Glycol**

**1/2" XPA Pipe / 30% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.11	0.16	0.39	2.40	0.05
0.2	0.21	0.33	0.78	4.80	0.10
0.3	0.32	0.49	1.17	7.20	0.15
0.4	0.42	0.65	1.56	9.60	0.20
0.5	0.53	0.82	1.95	12.0	0.25
0.6	0.64	0.98	2.33	14.4	0.30
0.7	0.74	1.14	2.72	16.8	0.35
0.8	0.85	1.31	3.11	19.2	0.40
0.9	0.96	1.47	3.50	21.6	0.45
1.0	1.06	1.63	3.89	24.0	0.50
1.1	1.29	1.80	4.28	26.4	0.55
1.2	2.29	1.96	4.67	60.4	0.60
1.3	3.07	2.12	5.06	69.5	0.65
1.4	3.50	2.29	5.45	79.1	0.70
1.5	3.95	2.45	5.84	89.3	0.75
1.6	4.42	2.61	6.22	100	0.80
1.7	4.91	2.78	6.61	111	0.85
1.8	5.43	2.94	7.00	123	0.90
1.9	5.97	3.10	7.39	135	0.95
2.0	6.53	3.27	7.78	148	1.00

**1/2" XPA Pipe / 30% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.16	0.39	1.00	0.05
0.2	0.09	0.33	0.78	2.00	0.10
0.3	0.19	0.49	1.17	4.23	0.15
0.4	0.31	0.65	1.56	7.00	0.20
0.5	0.46	0.82	1.95	10.3	0.25
0.6	0.63	0.98	2.33	14.2	0.30
0.7	0.82	1.14	2.72	18.6	0.35
0.8	1.04	1.31	3.11	23.5	0.40
0.9	1.28	1.47	3.50	28.9	0.45
1.0	1.54	1.63	3.89	34.8	0.50
1.1	1.82	1.80	4.28	41.1	0.55
1.2	2.12	1.96	4.67	47.9	0.60
1.3	2.43	2.12	5.06	55.1	0.65
1.4	2.77	2.29	5.45	62.7	0.70
1.5	3.13	2.45	5.84	70.7	0.75
1.6	3.12	2.61	6.22	70.5	0.80
1.7	3.47	2.78	6.61	78.5	0.85
1.8	3.85	2.94	7.00	87.0	0.90
1.9	4.24	3.10	7.39	95.9	0.95
2.0	4.65	3.27	7.78	105	1.00

**1/2" XPA Pipe / 30% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.08	0.16	0.39	1.71	0.05
0.2	0.15	0.33	0.78	3.42	0.10
0.3	0.23	0.49	1.17	5.13	0.15
0.4	0.30	0.65	1.56	6.84	0.20
0.5	0.38	0.82	1.95	8.55	0.25
0.6	0.45	0.98	2.33	10.3	0.30
0.7	0.53	1.14	2.72	12.0	0.35
0.8	0.60	1.31	3.11	13.7	0.40
0.9	1.48	1.47	3.50	33.4	0.45
1.0	1.78	1.63	3.89	40.2	0.50
1.1	2.10	1.80	4.28	47.5	0.55
1.2	2.44	1.96	4.67	55.3	0.60
1.3	2.81	2.12	5.06	63.6	0.65
1.4	3.20	2.29	5.45	72.4	0.70
1.5	3.61	2.45	5.84	81.7	0.75
1.6	4.04	2.61	6.22	91.4	0.80
1.7	4.49	2.78	6.61	102	0.85
1.8	4.97	2.94	7.00	112	0.90
1.9	5.46	3.10	7.39	123	0.95
2.0	5.97	3.27	7.78	135	1.00

**1/2" XPA Pipe / 30% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.16	0.39	0.81	0.05
0.2	0.07	0.33	0.78	1.62	0.10
0.3	0.11	0.49	1.17	2.43	0.15
0.4	0.29	0.65	1.56	6.61	0.20
0.5	0.43	0.82	1.95	9.76	0.25
0.6	0.59	0.98	2.33	13.4	0.30
0.7	0.78	1.14	2.72	17.6	0.35
0.8	0.98	1.31	3.11	22.2	0.40
0.9	1.21	1.47	3.50	27.3	0.45
1.0	1.45	1.63	3.89	32.8	0.50
1.1	1.71	1.80	4.28	38.8	0.55
1.2	2.00	1.96	4.67	45.2	0.60
1.3	2.30	2.12	5.06	52.0	0.65
1.4	2.33	2.29	5.45	52.8	0.70
1.5	2.64	2.45	5.84	59.7	0.75
1.6	2.96	2.61	6.22	67.0	0.80
1.7	3.30	2.78	6.61	74.7	0.85
1.8	3.66	2.94	7.00	82.8	0.90
1.9	4.03	3.10	7.39	91.2	0.95
2.0	4.42	3.27	7.78	100	1.00

**1/2" XPA Pipe / 30% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.16	0.39	1.28	0.05
0.2	0.11	0.33	0.78	2.57	0.10
0.3	0.17	0.49	1.17	3.85	0.15
0.4	0.23	0.65	1.56	5.14	0.20
0.5	0.28	0.82	1.95	6.42	0.25
0.6	0.34	0.98	2.33	7.71	0.30
0.7	0.88	1.14	2.72	19.9	0.35
0.8	1.11	1.31	3.11	25.2	0.40
0.9	1.37	1.47	3.50	31.0	0.45
1.0	1.65	1.63	3.89	37.2	0.50
1.1	1.94	1.80	4.28	44.0	0.55
1.2	2.26	1.96	4.67	51.2	0.60
1.3	2.60	2.12	5.06	58.9	0.65
1.4	2.97	2.29	5.45	67.1	0.70
1.5	3.35	2.45	5.84	75.7	0.75
1.6	3.75	2.61	6.22	84.7	0.80
1.7	4.17	2.78	6.61	94.2	0.85
1.8	4.60	2.94	7.00	104	0.90
1.9	5.06	3.10	7.39	114	0.95
2.0	5.54	3.27	7.78	125	1.00

**1/2" XPA Pipe / 30% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.16	0.39	0.67	0.05
0.2	0.06	0.33	0.78	1.34	0.10
0.3	0.09	0.49	1.17	2.02	0.15
0.4	0.28	0.65	1.56	6.26	0.20
0.5	0.41	0.82	1.95	9.25	0.25
0.6	0.56	0.98	2.33	12.7	0.30
0.7	0.74	1.14	2.72	16.7	0.35
0.8	0.93	1.31	3.11	21.1	0.40
0.9	1.14	1.47	3.50	25.9	0.45
1.0	1.38	1.63	3.89	31.1	0.50
1.1	1.45	1.80	4.28	32.7	0.55
1.2	1.69	1.96	4.67	38.2	0.60
1.3	1.95	2.12	5.06	44.1	0.65
1.4	2.23	2.29	5.45	50.4	0.70
1.5	2.52	2.45	5.84	57.0	0.75
1.6	2.83	2.61	6.22	64.0	0.80
1.7	3.15	2.78	6.61	71.4	0.85
1.8	3.49	2.94	7.00	79.1	0.90
1.9	3.85	3.10	7.39	87.1	0.95
2.0	4.22	3.27	7.78	95.5	1.00

**APPENDIX B**

**HEAD LOSS - 1/2" XPA PIPE**

**50% Glycol**

**1/2" XPA Pipe / 50% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.22	0.16	0.39	4.98	0.05
0.2	0.44	0.33	0.78	10.0	0.10
0.3	0.66	0.49	1.17	14.9	0.15
0.4	0.88	0.65	1.56	19.9	0.20
0.5	1.10	0.82	1.95	24.9	0.25
0.6	1.32	0.98	2.33	29.9	0.30
0.7	1.54	1.14	2.72	34.9	0.35
0.8	1.76	1.31	3.11	39.8	0.40
0.9	1.98	1.47	3.50	44.8	0.45
1.0	2.20	1.63	3.89	49.8	0.50
1.1	2.42	1.80	4.28	54.8	0.55
1.2	2.64	1.96	4.67	59.8	0.60
1.3	2.86	2.12	5.06	64.7	0.65
1.4	3.08	2.29	5.45	69.7	0.70
1.5	3.30	2.45	5.84	74.7	0.75
1.6	3.52	2.61	6.22	79.7	0.80
1.7	3.74	2.78	6.61	84.7	0.85
1.8	3.96	2.94	7.00	89.6	0.90
1.9	4.18	3.10	7.39	94.6	0.95
2.0	4.40	3.27	7.78	100	1.00

**1/2" XPA Pipe / 50% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.08	0.16	0.39	1.73	0.05
0.2	0.15	0.33	0.78	3.46	0.10
0.3	0.23	0.49	1.17	5.19	0.15
0.4	0.31	0.65	1.56	6.92	0.20
0.5	0.38	0.82	1.95	8.65	0.25
0.6	0.46	0.98	2.33	10.4	0.30
0.7	0.54	1.14	2.72	12.1	0.35
0.8	0.61	1.31	3.11	13.8	0.40
0.9	1.48	1.47	3.50	33.4	0.45
1.0	1.78	1.63	3.89	40.2	0.50
1.1	2.10	1.80	4.28	47.4	0.55
1.2	2.44	1.96	4.67	55.3	0.60
1.3	2.81	2.12	5.06	63.6	0.65
1.4	3.20	2.29	5.45	72.4	0.70
1.5	3.61	2.45	5.84	81.6	0.75
1.6	4.04	2.61	6.22	91.4	0.80
1.7	4.49	2.78	6.61	102	0.85
1.8	4.97	2.94	7.00	112	0.90
1.9	5.46	3.10	7.39	123	0.95
2.0	5.97	3.27	7.78	135	1.00

**1/2" XPA Pipe / 50% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.15	0.16	0.39	3.31	0.05
0.2	0.29	0.33	0.78	6.62	0.10
0.3	0.44	0.49	1.17	9.93	0.15
0.4	0.59	0.65	1.56	13.2	0.20
0.5	0.73	0.82	1.95	16.6	0.25
0.6	0.88	0.98	2.33	19.9	0.30
0.7	1.02	1.14	2.72	23.2	0.35
0.8	1.17	1.31	3.11	26.5	0.40
0.9	1.32	1.47	3.50	29.8	0.45
1.0	1.46	1.63	3.89	33.1	0.50
1.1	1.61	1.80	4.28	36.4	0.55
1.2	1.76	1.96	4.67	39.7	0.60
1.3	1.90	2.12	5.06	43.0	0.65
1.4	2.05	2.29	5.45	46.3	0.70
1.5	2.20	2.45	5.84	49.7	0.75
1.6	4.81	2.61	6.22	109	0.80
1.7	5.34	2.78	6.61	121	0.85
1.8	5.91	2.94	7.00	134	0.90
1.9	6.49	3.10	7.39	147	0.95
2.0	7.10	3.27	7.78	161	1.00

**1/2" XPA Pipe / 50% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.16	0.39	1.33	0.05
0.2	0.12	0.33	0.78	2.67	0.10
0.3	0.18	0.49	1.17	4.00	0.15
0.4	0.24	0.65	1.56	5.34	0.20
0.5	0.29	0.82	1.95	6.67	0.25
0.6	0.35	0.98	2.33	8.00	0.30
0.7	0.89	1.14	2.72	20.0	0.35
0.8	1.12	1.31	3.11	25.3	0.40
0.9	1.37	1.47	3.50	31.1	0.45
1.0	1.65	1.63	3.89	37.4	0.50
1.1	1.95	1.80	4.28	44.2	0.55
1.2	2.27	1.96	4.67	51.4	0.60
1.3	2.62	2.12	5.06	59.2	0.65
1.4	2.98	2.29	5.45	67.4	0.70
1.5	3.36	2.45	5.84	76.0	0.75
1.6	3.76	2.61	6.22	85.1	0.80
1.7	4.18	2.78	6.61	94.6	0.85
1.8	4.62	2.94	7.00	105	0.90
1.9	5.08	3.10	7.39	115	0.95
2.0	5.56	3.27	7.78	126	1.00

**1/2" XPA Pipe / 50% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.10	0.16	0.39	2.33	0.05
0.2	0.21	0.33	0.78	4.66	0.10
0.3	0.31	0.49	1.17	7.00	0.15
0.4	0.41	0.65	1.56	9.33	0.20
0.5	0.52	0.82	1.95	11.7	0.25
0.6	0.62	0.98	2.33	14.0	0.30
0.7	0.72	1.14	2.72	16.3	0.35
0.8	0.82	1.31	3.11	18.7	0.40
0.9	0.93	1.47	3.50	21.0	0.45
1.0	1.03	1.63	3.89	23.3	0.50
1.1	2.27	1.80	4.28	51.4	0.55
1.2	2.65	1.96	4.67	59.9	0.60
1.3	3.05	2.12	5.06	68.9	0.65
1.4	3.47	2.29	5.45	78.4	0.70
1.5	3.91	2.45	5.84	88.5	0.75
1.6	4.38	2.61	6.22	99.1	0.80
1.7	4.87	2.78	6.61	110	0.85
1.8	5.38	2.94	7.00	122	0.90
1.9	5.92	3.10	7.39	134	0.95
2.0	6.47	3.27	7.78	146	1.00

**1/2" XPA Pipe / 50% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.05	0.16	0.39	1.07	0.05
0.2	0.09	0.33	0.78	2.13	0.10
0.3	0.14	0.49	1.17	3.20	0.15
0.4	0.19	0.65	1.56	4.27	0.20
0.5	0.24	0.82	1.95	5.34	0.25
0.6	0.63	0.98	2.33	14.4	0.30
0.7	0.83	1.14	2.72	18.8	0.35
0.8	1.05	1.31	3.11	23.8	0.40
0.9	1.29	1.47	3.50	29.2	0.45
1.0	1.55	1.63	3.89	35.1	0.50
1.1	1.83	1.80	4.28	41.5	0.55
1.2	2.14	1.96	4.67	48.3	0.60
1.3	2.46	2.12	5.06	55.6	0.65
1.4	2.80	2.29	5.45	63.3	0.70
1.5	3.16	2.45	5.84	71.4	0.75
1.6	3.53	2.61	6.22	79.9	0.80
1.7	3.93	2.78	6.61	88.9	0.85
1.8	3.87	2.94	7.00	87.5	0.90
1.9	4.26	3.10	7.39	96.4	0.95
2.0	4.67	3.27	7.78	106	1.00



**APPENDIX B**

**HEAD LOSS - 5/8" XPA PIPE  
30% Glycol**

**5/8" XPA Pipe / 30% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.10	0.39	0.93	0.03
0.2	0.08	0.20	0.78	1.87	0.06
0.3	0.12	0.31	1.17	2.80	0.09
0.4	0.17	0.41	1.56	3.74	0.12
0.5	0.21	0.51	1.95	4.67	0.16
0.6	0.25	0.61	2.33	5.61	0.19
0.7	0.29	0.71	2.72	6.54	0.22
0.8	0.33	0.82	3.11	7.48	0.25
0.9	0.37	0.92	3.50	8.41	0.28
1.0	0.41	1.02	3.89	9.35	0.31
1.1	0.45	1.12	4.28	10.3	0.34
1.2	0.50	1.22	4.67	11.2	0.37
1.3	0.54	1.33	5.06	12.2	0.40
1.4	0.58	1.43	5.45	13.1	0.44
1.5	1.29	1.53	5.84	29.1	0.47
1.6	1.44	1.63	6.22	32.6	0.50
1.7	1.60	1.73	6.61	36.3	0.53
1.8	1.77	1.84	7.00	40.1	0.56
1.9	1.95	1.94	7.39	44.0	0.59
2.0	2.13	2.04	7.78	48.2	0.62

**5/8" XPA Pipe / 30% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.10	0.39	0.39	0.03
0.2	0.03	0.20	0.78	0.78	0.06
0.3	0.06	0.31	1.17	1.38	0.09
0.4	0.10	0.41	1.56	2.28	0.12
0.5	0.15	0.51	1.95	3.37	0.16
0.6	0.21	0.61	2.33	4.64	0.19
0.7	0.27	0.71	2.72	6.08	0.22
0.8	0.34	0.82	3.11	7.68	0.25
0.9	0.42	0.92	3.50	9.44	0.28
1.0	0.50	1.02	3.89	11.3	0.31
1.1	0.59	1.12	4.28	13.4	0.34
1.2	0.69	1.22	4.67	15.6	0.37
1.3	0.79	1.33	5.06	18.0	0.40
1.4	0.90	1.43	5.45	20.4	0.44
1.5	1.02	1.53	5.84	23.1	0.47
1.6	1.14	1.63	6.22	25.8	0.50
1.7	1.27	1.73	6.61	28.7	0.53
1.8	1.40	1.84	7.00	31.7	0.56
1.9	1.54	1.94	7.39	34.9	0.59
2.0	1.69	2.04	7.78	38.2	0.62

**5/8" XPA Pipe / 30% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.10	0.39	0.67	0.03
0.2	0.06	0.20	0.78	1.33	0.06
0.3	0.09	0.31	1.17	2.00	0.09
0.4	0.12	0.41	1.56	2.66	0.12
0.5	0.15	0.51	1.95	3.33	0.16
0.6	0.18	0.61	2.33	3.99	0.19
0.7	0.21	0.71	2.72	4.66	0.22
0.8	0.24	0.82	3.11	5.32	0.25
0.9	0.26	0.92	3.50	5.99	0.28
1.0	0.29	1.02	3.89	6.65	0.31
1.1	0.68	1.12	4.28	15.5	0.34
1.2	0.80	1.22	4.67	18.0	0.37
1.3	0.92	1.33	5.06	20.7	0.40
1.4	1.04	1.43	5.45	23.6	0.44
1.5	1.18	1.53	5.84	26.6	0.47
1.6	1.32	1.63	6.22	29.8	0.50
1.7	1.47	1.73	6.61	33.2	0.53
1.8	1.62	1.84	7.00	36.6	0.56
1.9	1.78	1.94	7.39	40.3	0.59
2.0	1.95	2.04	7.78	44.1	0.62

**5/8" XPA Pipe / 30% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.32	0.03
0.2	0.03	0.20	0.78	0.63	0.06
0.3	0.04	0.31	1.17	0.95	0.09
0.4	0.06	0.41	1.56	1.26	0.12
0.5	0.14	0.51	1.95	3.18	0.16
0.6	0.19	0.61	2.33	4.38	0.19
0.7	0.25	0.71	2.72	5.74	0.22
0.8	0.32	0.82	3.11	7.25	0.25
0.9	0.39	0.92	3.50	8.91	0.28
1.0	0.47	1.02	3.89	10.7	0.31
1.1	0.56	1.12	4.28	12.7	0.34
1.2	0.65	1.22	4.67	14.7	0.37
1.3	0.75	1.33	5.06	16.9	0.40
1.4	0.85	1.43	5.45	19.3	0.44
1.5	0.96	1.53	5.84	21.8	0.47
1.6	1.08	1.63	6.22	24.4	0.50
1.7	1.07	1.73	6.61	24.1	0.53
1.8	1.18	1.84	7.00	26.7	0.56
1.9	1.30	1.94	7.39	29.5	0.59
2.0	1.43	2.04	7.78	32.3	0.62

**5/8" XPA Pipe / 30% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.10	0.39	0.50	0.03
0.2	0.04	0.20	0.78	1.00	0.06
0.3	0.07	0.31	1.17	1.50	0.09
0.4	0.09	0.41	1.56	2.00	0.12
0.5	0.11	0.51	1.95	2.50	0.16
0.6	0.13	0.61	2.33	3.00	0.19
0.7	0.15	0.71	2.72	3.50	0.22
0.8	0.36	0.82	3.11	8.22	0.25
0.9	0.45	0.92	3.50	10.1	0.28
1.0	0.54	1.02	3.89	12.1	0.31
1.1	0.63	1.12	4.28	14.3	0.34
1.2	0.74	1.22	4.67	16.7	0.37
1.3	0.85	1.33	5.06	19.2	0.40
1.4	0.97	1.43	5.45	21.9	0.44
1.5	1.09	1.53	5.84	24.7	0.47
1.6	1.22	1.63	6.22	27.6	0.50
1.7	1.36	1.73	6.61	30.7	0.53
1.8	1.50	1.84	7.00	34.0	0.56
1.9	1.65	1.94	7.39	37.3	0.59
2.0	1.81	2.04	7.78	40.8	0.62

**5/8" XPA Pipe / 30% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.10	0.39	0.26	0.03
0.2	0.02	0.20	0.78	0.52	0.06
0.3	0.03	0.31	1.17	0.78	0.09
0.4	0.05	0.41	1.56	1.05	0.12
0.5	0.13	0.51	1.95	3.02	0.16
0.6	0.18	0.61	2.33	4.15	0.19
0.7	0.24	0.71	2.72	5.44	0.22
0.8	0.30	0.82	3.11	6.87	0.25
0.9	0.37	0.92	3.50	8.44	0.28
1.0	0.45	1.02	3.89	10.1	0.31
1.1	0.53	1.12	4.28	12.0	0.34
1.2	0.62	1.22	4.67	14.0	0.37
1.3	0.71	1.33	5.06	16.1	0.40
1.4	0.72	1.43	5.45	16.3	0.44
1.5	0.81	1.53	5.84	18.4	0.47
1.6	0.91	1.63	6.22	20.7	0.50
1.7	1.02	1.73	6.61	23.0	0.53
1.8	1.13	1.84	7.00	25.5	0.56
1.9	1.24	1.94	7.39	28.1	0.59
2.0	1.36	2.04	7.78	30.8	0.62

**APPENDIX B**

**HEAD LOSS - 5/8" XPA PIPE**

**50% Glycol**

**5/8" XPA Pipe / 50% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.09	0.10	0.39	1.94	0.03
0.2	0.17	0.20	0.78	3.88	0.06
0.3	0.26	0.31	1.17	5.82	0.09
0.4	0.34	0.41	1.56	7.75	0.12
0.5	0.43	0.51	1.95	9.69	0.16
0.6	0.51	0.61	2.33	11.6	0.19
0.7	0.60	0.71	2.72	13.6	0.22
0.8	0.69	0.82	3.11	15.5	0.25
0.9	0.77	0.92	3.50	17.4	0.28
1.0	0.86	1.02	3.89	19.4	0.31
1.1	0.94	1.12	4.28	21.3	0.34
1.2	1.03	1.22	4.67	23.3	0.37
1.3	1.11	1.33	5.06	25.2	0.40
1.4	1.20	1.43	5.45	27.1	0.44
1.5	1.29	1.53	5.84	29.1	0.47
1.6	1.37	1.63	6.22	31.0	0.50
1.7	1.46	1.73	6.61	33.0	0.53
1.8	1.54	1.84	7.00	34.9	0.56
1.9	1.63	1.94	7.39	36.8	0.59
2.0	1.71	2.04	7.78	38.8	0.62

**5/8" XPA Pipe / 50% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.10	0.39	0.67	0.03
0.2	0.06	0.20	0.78	1.35	0.06
0.3	0.09	0.31	1.17	2.02	0.09
0.4	0.12	0.41	1.56	2.69	0.12
0.5	0.15	0.51	1.95	3.37	0.16
0.6	0.18	0.61	2.33	4.04	0.19
0.7	0.21	0.71	2.72	4.71	0.22
0.8	0.24	0.82	3.11	5.39	0.25
0.9	0.27	0.92	3.50	6.06	0.28
1.0	0.30	1.02	3.89	6.73	0.31
1.1	0.68	1.12	4.28	15.5	0.34
1.2	0.80	1.22	4.67	18.0	0.37
1.3	0.92	1.33	5.06	20.7	0.40
1.4	1.04	1.43	5.45	23.6	0.44
1.5	1.18	1.53	5.84	26.6	0.47
1.6	1.32	1.63	6.22	29.8	0.50
1.7	1.47	1.73	6.61	33.2	0.53
1.8	1.62	1.84	7.00	36.6	0.56
1.9	1.78	1.94	7.39	40.3	0.59
2.0	1.95	2.04	7.78	44.1	0.62

**5/8" XPA Pipe / 50% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.10	0.39	1.29	0.03
0.2	0.11	0.20	0.78	2.58	0.06
0.3	0.17	0.31	1.17	3.87	0.09
0.4	0.23	0.41	1.56	5.15	0.12
0.5	0.28	0.51	1.95	6.44	0.16
0.6	0.34	0.61	2.33	7.73	0.19
0.7	0.40	0.71	2.72	9.02	0.22
0.8	0.46	0.82	3.11	10.3	0.25
0.9	0.51	0.92	3.50	11.6	0.28
1.0	0.57	1.02	3.89	12.9	0.31
1.1	0.63	1.12	4.28	14.2	0.34
1.2	0.68	1.22	4.67	15.5	0.37
1.3	0.74	1.33	5.06	16.8	0.40
1.4	0.80	1.43	5.45	18.0	0.44
1.5	0.85	1.53	5.84	19.3	0.47
1.6	0.91	1.63	6.22	20.6	0.50
1.7	0.97	1.73	6.61	21.9	0.53
1.8	1.03	1.84	7.00	23.2	0.56
1.9	1.08	1.94	7.39	24.5	0.59
2.0	1.14	2.04	7.78	25.8	0.62

**5/8" XPA Pipe / 50% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.10	0.39	0.52	0.03
0.2	0.05	0.20	0.78	1.04	0.06
0.3	0.07	0.31	1.17	1.56	0.09
0.4	0.09	0.41	1.56	2.08	0.12
0.5	0.11	0.51	1.95	2.60	0.16
0.6	0.14	0.61	2.33	3.12	0.19
0.7	0.16	0.71	2.72	3.64	0.22
0.8	0.18	0.82	3.11	4.15	0.25
0.9	0.45	0.92	3.50	10.1	0.28
1.0	0.54	1.02	3.89	12.2	0.31
1.1	0.64	1.12	4.28	14.4	0.34
1.2	0.74	1.22	4.67	16.8	0.37
1.3	0.85	1.33	5.06	19.3	0.40
1.4	0.97	1.43	5.45	22.0	0.44
1.5	1.10	1.53	5.84	24.8	0.47
1.6	1.23	1.63	6.22	27.8	0.50
1.7	1.36	1.73	6.61	30.9	0.53
1.8	1.51	1.84	7.00	34.1	0.56
1.9	1.66	1.94	7.39	37.5	0.59
2.0	1.81	2.04	7.78	41.0	0.62

**5/8" XPA Pipe / 50% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.10	0.39	0.91	0.03
0.2	0.08	0.20	0.78	1.82	0.06
0.3	0.12	0.31	1.17	2.72	0.09
0.4	0.16	0.41	1.56	3.63	0.12
0.5	0.20	0.51	1.95	4.54	0.16
0.6	0.24	0.61	2.33	5.45	0.19
0.7	0.28	0.71	2.72	6.35	0.22
0.8	0.32	0.82	3.11	7.26	0.25
0.9	0.36	0.92	3.50	8.17	0.28
1.0	0.40	1.02	3.89	9.08	0.31
1.1	0.44	1.12	4.28	10.0	0.34
1.2	0.48	1.22	4.67	10.9	0.37
1.3	0.52	1.33	5.06	11.8	0.40
1.4	1.13	1.43	5.45	25.6	0.44
1.5	1.28	1.53	5.84	28.9	0.47
1.6	1.43	1.63	6.22	32.3	0.50
1.7	1.59	1.73	6.61	35.9	0.53
1.8	1.76	1.84	7.00	39.7	0.56
1.9	1.93	1.94	7.39	43.7	0.59
2.0	2.11	2.04	7.78	47.8	0.62

**5/8" XPA Pipe / 50% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.10	0.39	0.42	0.03
0.2	0.04	0.20	0.78	0.83	0.06
0.3	0.06	0.31	1.17	1.25	0.09
0.4	0.07	0.41	1.56	1.66	0.12
0.5	0.09	0.51	1.95	2.08	0.16
0.6	0.11	0.61	2.33	2.49	0.19
0.7	0.27	0.71	2.72	6.14	0.22
0.8	0.34	0.82	3.11	7.75	0.25
0.9	0.42	0.92	3.50	9.53	0.28
1.0	0.51	1.02	3.89	11.5	0.31
1.1	0.60	1.12	4.28	13.5	0.34
1.2	0.70	1.22	4.67	15.8	0.37
1.3	0.80	1.33	5.06	18.1	0.40
1.4	0.91	1.43	5.45	20.6	0.44
1.5	1.03	1.53	5.84	23.3	0.47
1.6	1.15	1.63	6.22	26.1	0.50
1.7	1.28	1.73	6.61	29.0	0.53
1.8	1.42	1.84	7.00	32.0	0.56
1.9	1.56	1.94	7.39	35.2	0.59
2.0	1.70	2.04	7.78	38.5	0.62

**APPENDIX B**

**HEAD LOSS - 3/4" XPA PIPE**

**30% Glycol**

**3/4" XPA Pipe / 30% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.06	0.39	0.36	0.02
0.2	0.03	0.13	0.78	0.71	0.04
0.3	0.05	0.19	1.17	1.07	0.06
0.4	0.06	0.25	1.56	1.42	0.08
0.5	0.08	0.31	1.95	1.78	0.10
0.6	0.09	0.38	2.33	2.13	0.12
0.7	0.11	0.44	2.72	2.49	0.13
0.8	0.13	0.50	3.11	2.84	0.15
0.9	0.14	0.57	3.50	3.20	0.17
1.0	0.16	0.63	3.89	3.56	0.19
1.1	0.17	0.69	4.28	3.91	0.21
1.2	0.19	0.75	4.67	4.27	0.23
1.3	0.20	0.82	5.06	4.62	0.25
1.4	0.22	0.88	5.45	4.98	0.27
1.5	0.24	0.94	5.84	5.33	0.29
1.6	0.25	1.01	6.22	5.69	0.31
1.7	0.27	1.07	6.61	6.05	0.33
1.8	0.28	1.13	7.00	6.40	0.35
1.9	0.62	1.19	7.39	14.0	0.36
2.0	0.68	1.26	7.78	15.3	0.38

**3/4" XPA Pipe / 30% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.15	0.02
0.2	0.01	0.13	0.78	0.30	0.04
0.3	0.02	0.19	1.17	0.44	0.06
0.4	0.03	0.25	1.56	0.59	0.08
0.5	0.03	0.31	1.95	0.74	0.10
0.6	0.04	0.38	2.33	0.89	0.12
0.7	0.05	0.44	2.72	1.03	0.13
0.8	0.11	0.50	3.11	2.44	0.15
0.9	0.13	0.57	3.50	3.00	0.17
1.0	0.16	0.63	3.89	3.60	0.19
1.1	0.19	0.69	4.28	4.26	0.21
1.2	0.22	0.75	4.67	4.96	0.23
1.3	0.25	0.82	5.06	5.70	0.25
1.4	0.29	0.88	5.45	6.49	0.27
1.5	0.32	0.94	5.84	7.32	0.29
1.6	0.36	1.01	6.22	8.20	0.31
1.7	0.40	1.07	6.61	9.12	0.33
1.8	0.45	1.13	7.00	10.1	0.35
1.9	0.49	1.19	7.39	11.1	0.36
2.0	0.54	1.26	7.78	12.1	0.38

**3/4" XPA Pipe / 30% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.25	0.02
0.2	0.02	0.13	0.78	0.51	0.04
0.3	0.03	0.19	1.17	0.76	0.06
0.4	0.04	0.25	1.56	1.01	0.08
0.5	0.06	0.31	1.95	1.27	0.10
0.6	0.07	0.38	2.33	1.52	0.12
0.7	0.08	0.44	2.72	1.77	0.13
0.8	0.09	0.50	3.11	2.03	0.15
0.9	0.10	0.57	3.50	2.28	0.17
1.0	0.11	0.63	3.89	2.53	0.19
1.1	0.12	0.69	4.28	2.78	0.21
1.2	0.13	0.75	4.67	3.04	0.23
1.3	0.15	0.82	5.06	3.29	0.25
1.4	0.33	0.88	5.45	7.49	0.27
1.5	0.37	0.94	5.84	8.45	0.29
1.6	0.42	1.01	6.22	9.46	0.31
1.7	0.47	1.07	6.61	10.5	0.33
1.8	0.51	1.13	7.00	11.6	0.35
1.9	0.57	1.19	7.39	12.8	0.36
2.0	0.62	1.26	7.78	14.0	0.38

**3/4" XPA Pipe / 30% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.12	0.02
0.2	0.01	0.13	0.78	0.24	0.04
0.3	0.02	0.19	1.17	0.36	0.06
0.4	0.02	0.25	1.56	0.48	0.08
0.5	0.03	0.31	1.95	0.60	0.10
0.6	0.03	0.38	2.33	0.72	0.12
0.7	0.08	0.44	2.72	1.82	0.13
0.8	0.10	0.50	3.11	2.30	0.15
0.9	0.12	0.57	3.50	2.83	0.17
1.0	0.15	0.63	3.89	3.40	0.19
1.1	0.18	0.69	4.28	4.02	0.21
1.2	0.21	0.75	4.67	4.68	0.23
1.3	0.24	0.82	5.06	5.38	0.25
1.4	0.27	0.88	5.45	6.12	0.27
1.5	0.31	0.94	5.84	6.91	0.29
1.6	0.34	1.01	6.22	7.74	0.31
1.7	0.38	1.07	6.61	8.60	0.33
1.8	0.42	1.13	7.00	9.51	0.35
1.9	0.46	1.19	7.39	10.4	0.36
2.0	0.51	1.26	7.78	11.4	0.38

**3/4" XPA Pipe / 30% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.19	0.02
0.2	0.02	0.13	0.78	0.38	0.04
0.3	0.03	0.19	1.17	0.57	0.06
0.4	0.03	0.25	1.56	0.76	0.08
0.5	0.04	0.31	1.95	0.95	0.10
0.6	0.05	0.38	2.33	1.14	0.12
0.7	0.06	0.44	2.72	1.33	0.13
0.8	0.07	0.50	3.11	1.52	0.15
0.9	0.08	0.57	3.50	1.71	0.17
1.0	0.17	0.63	3.89	3.85	0.19
1.1	0.20	0.69	4.28	4.55	0.21
1.2	0.23	0.75	4.67	5.30	0.23
1.3	0.27	0.82	5.06	6.10	0.25
1.4	0.31	0.88	5.45	6.94	0.27
1.5	0.35	0.94	5.84	7.83	0.29
1.6	0.39	1.01	6.22	8.77	0.31
1.7	0.43	1.07	6.61	9.75	0.33
1.8	0.48	1.13	7.00	10.8	0.35
1.9	0.52	1.19	7.39	11.8	0.36
2.0	0.57	1.26	7.78	13.0	0.38

**3/4" XPA Pipe / 30% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.00	0.06	0.39	0.10	0.02
0.2	0.01	0.13	0.78	0.20	0.04
0.3	0.01	0.19	1.17	0.30	0.06
0.4	0.02	0.25	1.56	0.40	0.08
0.5	0.02	0.31	1.95	0.50	0.10
0.6	0.06	0.38	2.33	1.32	0.12
0.7	0.08	0.44	2.72	1.73	0.13
0.8	0.10	0.50	3.11	2.18	0.15
0.9	0.12	0.57	3.50	2.68	0.17
1.0	0.14	0.63	3.89	3.22	0.19
1.1	0.17	0.69	4.28	3.81	0.21
1.2	0.20	0.75	4.67	4.43	0.23
1.3	0.23	0.82	5.06	5.10	0.25
1.4	0.26	0.88	5.45	5.80	0.27
1.5	0.29	0.94	5.84	6.55	0.29
1.6	0.32	1.01	6.22	7.33	0.31
1.7	0.36	1.07	6.61	8.15	0.33
1.8	0.35	1.13	7.00	8.02	0.35
1.9	0.39	1.19	7.39	8.84	0.36
2.0	0.43	1.26	7.78	9.69	0.38

**APPENDIX B**

**HEAD LOSS - 3/4" XPA PIPE  
50% Glycol**

**3/4" XPA Pipe / 50% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.06	0.39	0.74	0.02
0.2	0.07	0.13	0.78	1.48	0.04
0.3	0.10	0.19	1.17	2.21	0.06
0.4	0.13	0.25	1.56	2.95	0.08
0.5	0.16	0.31	1.95	3.69	0.10
0.6	0.20	0.38	2.33	4.43	0.12
0.7	0.23	0.44	2.72	5.16	0.13
0.8	0.26	0.50	3.11	5.90	0.15
0.9	0.29	0.57	3.50	6.64	0.17
1.0	0.33	0.63	3.89	7.38	0.19
1.1	0.36	0.69	4.28	8.11	0.21
1.2	0.39	0.75	4.67	8.85	0.23
1.3	0.42	0.82	5.06	9.59	0.25
1.4	0.46	0.88	5.45	10.3	0.27
1.5	0.49	0.94	5.84	11.1	0.29
1.6	0.52	1.01	6.22	11.8	0.31
1.7	0.55	1.07	6.61	12.5	0.33
1.8	0.59	1.13	7.00	13.3	0.35
1.9	0.62	1.19	7.39	14.0	0.36
2.0	0.65	1.26	7.78	14.8	0.38

**3/4" XPA Pipe / 50% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.26	0.02
0.2	0.02	0.13	0.78	0.51	0.04
0.3	0.03	0.19	1.17	0.77	0.06
0.4	0.05	0.25	1.56	1.02	0.08
0.5	0.06	0.31	1.95	1.28	0.10
0.6	0.07	0.38	2.33	1.54	0.12
0.7	0.08	0.44	2.72	1.79	0.13
0.8	0.09	0.50	3.11	2.05	0.15
0.9	0.10	0.57	3.50	2.30	0.17
1.0	0.11	0.63	3.89	2.56	0.19
1.1	0.12	0.69	4.28	2.82	0.21
1.2	0.14	0.75	4.67	3.07	0.23
1.3	0.15	0.82	5.06	3.33	0.25
1.4	0.33	0.88	5.45	7.49	0.27
1.5	0.37	0.94	5.84	8.45	0.29
1.6	0.42	1.01	6.22	9.46	0.31
1.7	0.47	1.07	6.61	10.5	0.33
1.8	0.51	1.13	7.00	11.6	0.35
1.9	0.57	1.19	7.39	12.8	0.36
2.0	0.62	1.26	7.78	14.0	0.38

**3/4" XPA Pipe / 50% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.06	0.39	0.49	0.02
0.2	0.04	0.13	0.78	0.98	0.04
0.3	0.07	0.19	1.17	1.47	0.06
0.4	0.09	0.25	1.56	1.96	0.08
0.5	0.11	0.31	1.95	2.45	0.10
0.6	0.13	0.38	2.33	2.94	0.12
0.7	0.15	0.44	2.72	3.43	0.13
0.8	0.17	0.50	3.11	3.92	0.15
0.9	0.20	0.57	3.50	4.41	0.17
1.0	0.22	0.63	3.89	4.90	0.19
1.1	0.24	0.69	4.28	5.39	0.21
1.2	0.26	0.75	4.67	5.88	0.23
1.3	0.28	0.82	5.06	6.37	0.25
1.4	0.30	0.88	5.45	6.86	0.27
1.5	0.33	0.94	5.84	7.35	0.29
1.6	0.35	1.01	6.22	7.84	0.31
1.7	0.37	1.07	6.61	8.33	0.33
1.8	0.39	1.13	7.00	8.82	0.35
1.9	0.41	1.19	7.39	9.31	0.36
2.0	0.43	1.26	7.78	9.80	0.38

**3/4" XPA Pipe / 50% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.20	0.02
0.2	0.02	0.13	0.78	0.40	0.04
0.3	0.03	0.19	1.17	0.59	0.06
0.4	0.03	0.25	1.56	0.79	0.08
0.5	0.04	0.31	1.95	0.99	0.10
0.6	0.05	0.38	2.33	1.19	0.12
0.7	0.06	0.44	2.72	1.38	0.13
0.8	0.07	0.50	3.11	1.58	0.15
0.9	0.08	0.57	3.50	1.78	0.17
1.0	0.09	0.63	3.89	1.98	0.19
1.1	0.20	0.69	4.28	4.57	0.21
1.2	0.24	0.75	4.67	5.32	0.23
1.3	0.27	0.82	5.06	6.12	0.25
1.4	0.31	0.88	5.45	6.97	0.27
1.5	0.35	0.94	5.84	7.87	0.29
1.6	0.39	1.01	6.22	8.81	0.31
1.7	0.43	1.07	6.61	9.79	0.33
1.8	0.48	1.13	7.00	10.8	0.35
1.9	0.53	1.19	7.39	11.9	0.36
2.0	0.58	1.26	7.78	13.0	0.38

**3/4" XPA Pipe / 50% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.06	0.39	0.35	0.02
0.2	0.03	0.13	0.78	0.69	0.04
0.3	0.05	0.19	1.17	1.04	0.06
0.4	0.06	0.25	1.56	1.38	0.08
0.5	0.08	0.31	1.95	1.73	0.10
0.6	0.09	0.38	2.33	2.07	0.12
0.7	0.11	0.44	2.72	2.42	0.13
0.8	0.12	0.50	3.11	2.76	0.15
0.9	0.14	0.57	3.50	3.11	0.17
1.0	0.15	0.63	3.89	3.45	0.19
1.1	0.17	0.69	4.28	3.80	0.21
1.2	0.18	0.75	4.67	4.14	0.23
1.3	0.20	0.82	5.06	4.49	0.25
1.4	0.21	0.88	5.45	4.83	0.27
1.5	0.23	0.94	5.84	5.18	0.29
1.6	0.24	1.01	6.22	5.53	0.31
1.7	0.26	1.07	6.61	5.87	0.33
1.8	0.56	1.13	7.00	12.6	0.35
1.9	0.61	1.19	7.39	13.9	0.36
2.0	0.67	1.26	7.78	15.2	0.38

**3/4" XPA Pipe / 50% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.06	0.39	0.16	0.02
0.2	0.01	0.13	0.78	0.32	0.04
0.3	0.02	0.19	1.17	0.47	0.06
0.4	0.03	0.25	1.56	0.63	0.08
0.5	0.03	0.31	1.95	0.79	0.10
0.6	0.04	0.38	2.33	0.95	0.12
0.7	0.05	0.44	2.72	1.11	0.13
0.8	0.06	0.50	3.11	1.26	0.15
0.9	0.13	0.57	3.50	3.02	0.17
1.0	0.16	0.63	3.89	3.64	0.19
1.1	0.19	0.69	4.28	4.30	0.21
1.2	0.22	0.75	4.67	5.00	0.23
1.3	0.25	0.82	5.06	5.75	0.25
1.4	0.29	0.88	5.45	6.55	0.27
1.5	0.33	0.94	5.84	7.39	0.29
1.6	0.37	1.01	6.22	8.27	0.31
1.7	0.41	1.07	6.61	9.20	0.33
1.8	0.45	1.13	7.00	10.2	0.35
1.9	0.49	1.19	7.39	11.2	0.36
2.0	0.54	1.26	7.78	12.2	0.38

APPENDIX B

HEAD LOSS - 1/2" PEX TUBING

30% Glycol

1/2" PEX Tubing / 30% Glycol / 80 Deg F (27 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.12	0.17	0.39	2.71	0.05
0.2	0.24	0.35	0.78	5.42	0.11
0.3	0.36	0.52	1.17	8.14	0.16
0.4	0.48	0.69	1.56	10.8	0.21
0.5	0.60	0.87	1.95	13.6	0.26
0.6	0.72	1.04	2.33	16.3	0.32
0.7	0.84	1.22	2.72	19.0	0.37
0.8	0.96	1.39	3.11	21.7	0.42
0.9	1.08	1.56	3.50	24.4	0.48
1.0	1.20	1.74	3.89	27.1	0.53
1.1	1.26	1.91	4.28	60.0	0.58
1.2	3.09	2.08	4.67	69.8	0.64
1.3	3.55	2.26	5.06	80.3	0.69
1.4	4.04	2.43	5.45	91.4	0.74
1.5	4.56	2.60	5.84	103	0.79
1.6	5.11	2.78	6.22	116	0.85
1.7	5.68	2.95	6.61	128	0.90
1.8	6.28	3.13	7.00	142	0.95
1.9	6.90	3.30	7.39	156	1.01
2.0	7.55	3.47	7.78	171	1.06

1/2" PEX Tubing / 30% Glycol / 140 Deg F (60 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.05	0.17	0.39	1.13	0.05
0.2	0.10	0.35	0.78	2.25	0.11
0.3	0.15	0.52	1.17	3.38	0.16
0.4	0.20	0.69	1.56	4.51	0.21
0.5	0.53	0.87	1.95	12.0	0.26
0.6	0.73	1.04	2.33	16.4	0.32
0.7	0.95	1.22	2.72	21.5	0.37
0.8	1.20	1.39	3.11	27.2	0.42
0.9	1.48	1.56	3.50	33.4	0.48
1.0	1.78	1.74	3.89	40.2	0.53
1.1	2.10	1.91	4.28	47.5	0.58
1.2	2.45	2.08	4.67	55.3	0.64
1.3	2.81	2.26	5.06	63.6	0.69
1.4	3.20	2.43	5.45	72.5	0.74
1.5	3.61	2.60	5.84	81.8	0.79
1.6	3.60	2.78	6.22	81.5	0.85
1.7	4.02	2.95	6.61	90.9	0.90
1.8	4.45	3.13	7.00	101	0.95
1.9	4.90	3.30	7.39	111	1.01
2.0	5.38	3.47	7.78	122	1.06

1/2" PEX Tubing / 30% Glycol / 100 Deg F (38 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.09	0.17	0.39	1.93	0.05
0.2	0.17	0.35	0.78	3.86	0.11
0.3	0.26	0.52	1.17	5.79	0.16
0.4	0.34	0.69	1.56	7.72	0.21
0.5	0.43	0.87	1.95	9.65	0.26
0.6	0.51	1.04	2.33	11.6	0.32
0.7	0.60	1.22	2.72	13.5	0.37
0.8	1.39	1.39	3.11	31.4	0.42
0.9	1.71	1.56	3.50	38.6	0.48
1.0	2.05	1.74	3.89	46.4	0.53
1.1	2.42	1.91	4.28	54.8	0.58
1.2	2.82	2.08	4.67	63.9	0.64
1.3	3.25	2.26	5.06	73.5	0.69
1.4	3.70	2.43	5.45	83.6	0.74
1.5	4.17	2.60	5.84	94.4	0.79
1.6	4.67	2.78	6.22	106	0.85
1.7	5.19	2.95	6.61	117	0.90
1.8	5.74	3.13	7.00	130	0.95
1.9	6.31	3.30	7.39	143	1.01
2.0	6.90	3.47	7.78	156	1.06

1/2" PEX Tubing / 30% Glycol / 160 Deg F (71 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.17	0.39	0.92	0.05
0.2	0.08	0.35	0.78	1.83	0.11
0.3	0.12	0.52	1.17	2.75	0.16
0.4	0.34	0.69	1.56	7.63	0.21
0.5	0.50	0.87	1.95	11.3	0.26
0.6	0.69	1.04	2.33	15.5	0.32
0.7	0.90	1.22	2.72	20.3	0.37
0.8	1.14	1.39	3.11	25.7	0.42
0.9	1.39	1.56	3.50	31.6	0.48
1.0	1.68	1.74	3.89	37.9	0.53
1.1	1.98	1.91	4.28	44.8	0.58
1.2	2.31	2.08	4.67	52.2	0.64
1.3	2.36	2.26	5.06	53.5	0.69
1.4	2.70	2.43	5.45	61.1	0.74
1.5	3.05	2.60	5.84	69.1	0.79
1.6	3.43	2.78	6.22	77.6	0.85
1.7	3.82	2.95	6.61	86.5	0.90
1.8	4.23	3.13	7.00	95.8	0.95
1.9	4.67	3.30	7.39	106	1.01
2.0	5.11	3.47	7.78	116	1.06

1/2" PEX Tubing / 30% Glycol / 120 Deg F (49 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.17	0.39	1.45	0.05
0.2	0.13	0.35	0.78	2.90	0.11
0.3	0.19	0.52	1.17	4.35	0.16
0.4	0.26	0.69	1.56	5.80	0.21
0.5	0.32	0.87	1.95	7.26	0.26
0.6	0.78	1.04	2.33	17.6	0.32
0.7	1.02	1.22	2.72	23.0	0.37
0.8	1.29	1.39	3.11	29.1	0.42
0.9	1.58	1.56	3.50	35.8	0.48
1.0	1.90	1.74	3.89	43.0	0.53
1.1	2.25	1.91	4.28	50.8	0.58
1.2	2.62	2.08	4.67	59.2	0.64
1.3	3.01	2.26	5.06	68.1	0.69
1.4	3.43	2.43	5.45	77.5	0.74
1.5	3.87	2.60	5.84	87.5	0.79
1.6	4.33	2.78	6.22	97.9	0.85
1.7	4.81	2.95	6.61	109	0.90
1.8	5.32	3.13	7.00	120	0.95
1.9	5.85	3.30	7.39	132	1.01
2.0	6.40	3.47	7.78	145	1.06

1/2" PEX Tubing / 30% Glycol / 180 Deg F (82 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.17	0.39	0.76	0.05
0.2	0.07	0.35	0.78	1.52	0.11
0.3	0.10	0.52	1.17	2.28	0.16
0.4	0.32	0.69	1.56	7.23	0.21
0.5	0.47	0.87	1.95	10.7	0.26
0.6	0.65	1.04	2.33	14.7	0.32
0.7	0.85	1.22	2.72	19.3	0.37
0.8	1.08	1.39	3.11	24.3	0.42
0.9	1.32	1.56	3.50	29.9	0.48
1.0	1.59	1.74	3.89	36.0	0.53
1.1	1.67	1.91	4.28	37.9	0.58
1.2	1.96	2.08	4.67	44.2	0.64
1.3	2.26	2.26	5.06	51.1	0.69
1.4	2.58	2.43	5.45	58.3	0.74
1.5	2.92	2.60	5.84	66.0	0.79
1.6	3.27	2.78	6.22	74.1	0.85
1.7	3.65	2.95	6.61	82.6	0.90
1.8	4.04	3.13	7.00	91.5	0.95
1.9	4.46	3.30	7.39	101	1.01
2.0	4.89	3.47	7.78	111	1.06

APPENDIX B

HEAD LOSS - 1/2" PEX TUBING

50% Glycol

1/2" PEX Tubing / 50% Glycol / 80 Deg F (27 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.25	0.17	0.39	5.63	0.05
0.2	0.50	0.35	0.78	11.3	0.11
0.3	0.75	0.52	1.17	16.9	0.16
0.4	0.99	0.69	1.56	22.5	0.21
0.5	1.24	0.87	1.95	28.1	0.26
0.6	1.49	1.04	2.33	33.8	0.32
0.7	1.74	1.22	2.72	39.4	0.37
0.8	1.99	1.39	3.11	45.0	0.42
0.9	2.24	1.56	3.50	50.6	0.48
1.0	2.49	1.74	3.89	56.3	0.53
1.1	2.74	1.91	4.28	61.9	0.58
1.2	2.98	2.08	4.67	67.5	0.64
1.3	3.23	2.26	5.06	73.1	0.69
1.4	3.48	2.43	5.45	78.8	0.74
1.5	3.73	2.60	5.84	84.4	0.79
1.6	3.98	2.78	6.22	90.0	0.85
1.7	4.23	2.95	6.61	95.6	0.90
1.8	4.48	3.13	7.00	101	0.95
1.9	4.72	3.30	7.39	107	1.01
2.0	4.97	3.47	7.78	113	1.06

1/2" PEX Tubing / 50% Glycol / 140 Deg F (60 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.09	0.17	0.39	1.95	0.05
0.2	0.17	0.35	0.78	3.91	0.11
0.3	0.26	0.52	1.17	5.86	0.16
0.4	0.35	0.69	1.56	7.81	0.21
0.5	0.43	0.87	1.95	9.77	0.26
0.6	0.52	1.04	2.33	11.7	0.32
0.7	0.60	1.22	2.72	13.7	0.37
0.8	1.39	1.39	3.11	31.4	0.42
0.9	1.71	1.56	3.50	38.6	0.48
1.0	2.05	1.74	3.89	46.4	0.53
1.1	2.42	1.91	4.28	54.8	0.58
1.2	2.82	2.08	4.67	63.9	0.64
1.3	3.25	2.26	5.06	73.5	0.69
1.4	3.70	2.43	5.45	83.6	0.74
1.5	4.17	2.60	5.84	94.4	0.79
1.6	4.67	2.78	6.22	106	0.85
1.7	5.19	2.95	6.61	117	0.90
1.8	5.74	3.13	7.00	130	0.95
1.9	6.31	3.30	7.39	143	1.01
2.0	6.90	3.47	7.78	156	1.06

1/2" PEX Tubing / 50% Glycol / 100 Deg F (38 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.17	0.17	0.39	3.74	0.05
0.2	0.33	0.35	0.78	7.48	0.11
0.3	0.50	0.52	1.17	11.2	0.16
0.4	0.66	0.69	1.56	15.0	0.21
0.5	0.83	0.87	1.95	18.7	0.26
0.6	0.99	1.04	2.33	22.4	0.32
0.7	1.16	1.22	2.72	26.2	0.37
0.8	1.32	1.39	3.11	29.9	0.42
0.9	1.49	1.56	3.50	33.7	0.48
1.0	1.65	1.74	3.89	37.4	0.53
1.1	1.82	1.91	4.28	41.1	0.58
1.2	1.98	2.08	4.67	44.9	0.64
1.3	2.15	2.26	5.06	48.6	0.69
1.4	2.31	2.43	5.45	52.3	0.74
1.5	4.96	2.60	5.84	112	0.79
1.6	5.55	2.78	6.22	126	0.85
1.7	6.18	2.95	6.61	140	0.90
1.8	6.83	3.13	7.00	154	0.95
1.9	7.50	3.30	7.39	170	1.01
2.0	8.21	3.47	7.78	186	1.06

1/2" PEX Tubing / 50% Glycol / 160 Deg F (71 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.07	0.17	0.39	1.51	0.05
0.2	0.13	0.35	0.78	3.01	0.11
0.3	0.20	0.52	1.17	4.52	0.16
0.4	0.27	0.69	1.56	6.03	0.21
0.5	0.33	0.87	1.95	7.53	0.26
0.6	0.40	1.04	2.33	9.04	0.32
0.7	1.02	1.22	2.72	23.1	0.37
0.8	1.29	1.39	3.11	29.2	0.42
0.9	1.59	1.56	3.50	35.9	0.48
1.0	1.91	1.74	3.89	43.2	0.53
1.1	2.26	1.91	4.28	51.0	0.58
1.2	2.63	2.08	4.67	59.4	0.64
1.3	3.02	2.26	5.06	68.4	0.69
1.4	3.44	2.43	5.45	77.8	0.74
1.5	3.88	2.60	5.84	87.8	0.79
1.6	4.35	2.78	6.22	98.3	0.85
1.7	4.83	2.95	6.61	109	0.90
1.8	5.34	3.13	7.00	121	0.95
1.9	5.87	3.30	7.39	133	1.01
2.0	6.42	3.47	7.78	145	1.06

1/2" PEX Tubing / 50% Glycol / 120 Deg F (49 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.12	0.17	0.39	2.63	0.05
0.2	0.23	0.35	0.78	5.27	0.11
0.3	0.35	0.52	1.17	7.90	0.16
0.4	0.47	0.69	1.56	10.5	0.21
0.5	0.58	0.87	1.95	13.2	0.26
0.6	0.70	1.04	2.33	15.8	0.32
0.7	0.82	1.22	2.72	18.4	0.37
0.8	0.93	1.39	3.11	21.1	0.42
0.9	1.05	1.56	3.50	23.7	0.48
1.0	1.16	1.74	3.89	26.3	0.53
1.1	2.63	1.91	4.28	59.4	0.58
1.2	3.06	2.08	4.67	69.2	0.64
1.3	3.52	2.26	5.06	79.6	0.69
1.4	4.01	2.43	5.45	90.6	0.74
1.5	4.52	2.60	5.84	102	0.79
1.6	5.06	2.78	6.22	115	0.85
1.7	5.63	2.95	6.61	127	0.90
1.8	6.22	3.13	7.00	141	0.95
1.9	6.84	3.30	7.39	155	1.01
2.0	7.48	3.47	7.78	169	1.06

1/2" PEX Tubing / 50% Glycol / 180 Deg F (82 Deg C)

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.05	0.17	0.39	1.21	0.05
0.2	0.11	0.35	0.78	2.41	0.11
0.3	0.16	0.52	1.17	3.62	0.16
0.4	0.21	0.69	1.56	4.82	0.21
0.5	0.53	0.87	1.95	12.1	0.26
0.6	0.73	1.04	2.33	16.6	0.32
0.7	0.96	1.22	2.72	21.7	0.37
0.8	1.21	1.39	3.11	27.5	0.42
0.9	1.49	1.56	3.50	33.8	0.48
1.0	1.79	1.74	3.89	40.6	0.53
1.1	2.12	1.91	4.28	48.0	0.58
1.2	2.47	2.08	4.67	55.8	0.64
1.3	2.84	2.26	5.06	64.2	0.69
1.4	3.23	2.43	5.45	73.1	0.74
1.5	3.65	2.60	5.84	82.5	0.79
1.6	4.08	2.78	6.22	92.4	0.85
1.7	4.04	2.95	6.61	91.4	0.90
1.8	4.48	3.13	7.00	101	0.95
1.9	4.93	3.30	7.39	112	1.01
2.0	5.41	3.47	7.78	122	1.06

**APPENDIX B**

**HEAD LOSS - 5/8" PEX TUBING**

**30% Glycol**

**5/8" PEX Tubing / 30% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.12	0.39	1.29	0.04
0.2	0.11	0.24	0.78	2.58	0.07
0.3	0.17	0.36	1.17	3.87	0.11
0.4	0.23	0.48	1.56	5.16	0.15
0.5	0.29	0.60	1.95	6.45	0.18
0.6	0.34	0.72	2.33	7.74	0.22
0.7	0.40	0.84	2.72	9.03	0.26
0.8	0.46	0.96	3.11	10.3	0.29
0.9	0.51	1.08	3.50	11.6	0.33
1.0	0.57	1.20	3.89	12.9	0.37
1.1	0.63	1.32	4.28	14.2	0.40
1.2	0.68	1.44	4.67	15.5	0.44
1.3	0.74	1.56	5.06	16.8	0.47
1.4	1.67	1.68	5.45	37.8	0.51
1.5	1.89	1.80	5.84	42.7	0.55
1.6	2.11	1.92	6.22	47.8	0.58
1.7	2.35	2.04	6.61	53.2	0.62
1.8	2.60	2.16	7.00	58.7	0.66
1.9	2.85	2.28	7.39	64.6	0.69
2.0	3.12	2.40	7.78	70.6	0.73

**5/8" PEX Tubing / 30% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.12	0.39	0.54	0.04
0.2	0.05	0.24	0.78	1.07	0.07
0.3	0.07	0.36	1.17	1.61	0.11
0.4	0.09	0.48	1.56	2.14	0.15
0.5	0.12	0.60	1.95	2.68	0.18
0.6	0.30	0.72	2.33	6.81	0.22
0.7	0.39	0.84	2.72	8.91	0.26
0.8	0.50	0.96	3.11	11.3	0.29
0.9	0.61	1.08	3.50	13.8	0.33
1.0	0.74	1.20	3.89	16.6	0.37
1.1	0.87	1.32	4.28	19.7	0.40
1.2	1.01	1.44	4.67	22.9	0.44
1.3	1.16	1.56	5.06	26.3	0.47
1.4	1.33	1.68	5.45	30.0	0.51
1.5	1.50	1.80	5.84	33.8	0.55
1.6	1.67	1.92	6.22	37.9	0.58
1.7	1.86	2.04	6.61	42.1	0.62
1.8	2.06	2.16	7.00	46.5	0.66
1.9	2.01	2.28	7.39	45.6	0.69
2.0	2.21	2.40	7.78	49.9	0.73

**5/8" PEX Tubing / 30% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.12	0.39	0.92	0.04
0.2	0.08	0.24	0.78	1.84	0.07
0.3	0.12	0.36	1.17	2.76	0.11
0.4	0.16	0.48	1.56	3.67	0.15
0.5	0.20	0.60	1.95	4.59	0.18
0.6	0.24	0.72	2.33	5.51	0.22
0.7	0.28	0.84	2.72	6.43	0.26
0.8	0.32	0.96	3.11	7.35	0.29
0.9	0.37	1.08	3.50	8.27	0.33
1.0	0.85	1.20	3.89	19.2	0.37
1.1	1.00	1.32	4.28	22.7	0.40
1.2	1.17	1.44	4.67	26.4	0.44
1.3	1.34	1.56	5.06	30.4	0.47
1.4	1.53	1.68	5.45	34.6	0.51
1.5	1.73	1.80	5.84	39.0	0.55
1.6	1.93	1.92	6.22	43.7	0.58
1.7	2.15	2.04	6.61	48.6	0.62
1.8	2.38	2.16	7.00	53.7	0.66
1.9	2.61	2.28	7.39	59.1	0.69
2.0	2.86	2.40	7.78	64.6	0.73

**5/8" PEX Tubing / 30% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.12	0.39	0.44	0.04
0.2	0.04	0.24	0.78	0.87	0.07
0.3	0.06	0.36	1.17	1.31	0.11
0.4	0.08	0.48	1.56	1.74	0.15
0.5	0.21	0.60	1.95	4.67	0.18
0.6	0.28	0.72	2.33	6.42	0.22
0.7	0.37	0.84	2.72	8.41	0.26
0.8	0.47	0.96	3.11	10.6	0.29
0.9	0.58	1.08	3.50	13.1	0.33
1.0	0.69	1.20	3.89	15.7	0.37
1.1	0.82	1.32	4.28	18.6	0.40
1.2	0.95	1.44	4.67	21.6	0.44
1.3	1.10	1.56	5.06	24.8	0.47
1.4	1.25	1.68	5.45	28.3	0.51
1.5	1.41	1.80	5.84	31.9	0.55
1.6	1.41	1.92	6.22	31.9	0.58
1.7	1.57	2.04	6.61	35.5	0.62
1.8	1.74	2.16	7.00	39.3	0.66
1.9	1.92	2.28	7.39	43.3	0.69
2.0	2.10	2.40	7.78	47.5	0.73

**5/8" PEX Tubing / 30% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.12	0.39	0.69	0.04
0.2	0.06	0.24	0.78	1.38	0.07
0.3	0.09	0.36	1.17	2.07	0.11
0.4	0.12	0.48	1.56	2.76	0.15
0.5	0.15	0.60	1.95	3.45	0.18
0.6	0.18	0.72	2.33	4.14	0.22
0.7	0.21	0.84	2.72	4.83	0.26
0.8	0.53	0.96	3.11	12.0	0.29
0.9	0.65	1.08	3.50	14.8	0.33
1.0	0.79	1.20	3.89	17.8	0.37
1.1	0.93	1.32	4.28	21.0	0.40
1.2	1.08	1.44	4.67	24.5	0.44
1.3	1.25	1.56	5.06	28.2	0.47
1.4	1.42	1.68	5.45	32.1	0.51
1.5	1.60	1.80	5.84	36.2	0.55
1.6	1.79	1.92	6.22	40.5	0.58
1.7	1.99	2.04	6.61	45.1	0.62
1.8	2.20	2.16	7.00	49.8	0.66
1.9	2.42	2.28	7.39	54.7	0.69
2.0	2.65	2.40	7.78	59.9	0.73

**5/8" PEX Tubing / 30% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.12	0.39	0.36	0.04
0.2	0.03	0.24	0.78	0.72	0.07
0.3	0.05	0.36	1.17	1.08	0.11
0.4	0.13	0.48	1.56	2.99	0.15
0.5	0.20	0.60	1.95	4.42	0.18
0.6	0.27	0.72	2.33	6.09	0.22
0.7	0.35	0.84	2.72	7.97	0.26
0.8	0.45	0.96	3.11	10.1	0.29
0.9	0.55	1.08	3.50	12.4	0.33
1.0	0.66	1.20	3.89	14.9	0.37
1.1	0.78	1.32	4.28	17.6	0.40
1.2	0.91	1.44	4.67	20.5	0.44
1.3	0.93	1.56	5.06	21.0	0.47
1.4	1.06	1.68	5.45	23.9	0.51
1.5	1.20	1.80	5.84	27.1	0.55
1.6	1.34	1.92	6.22	30.4	0.58
1.7	1.50	2.04	6.61	33.9	0.62
1.8	1.66	2.16	7.00	37.6	0.66
1.9	1.83	2.28	7.39	41.4	0.69
2.0	2.01	2.40	7.78	45.4	0.73

**APPENDIX B**

**HEAD LOSS - 5/8" PEX TUBING**

**50% Glycol**

**5/8" PEX Tubing / 50% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.12	0.12	0.39	2.68	0.04
0.2	0.24	0.24	0.78	5.35	0.07
0.3	0.35	0.36	1.17	8.03	0.11
0.4	0.47	0.48	1.56	10.7	0.15
0.5	0.59	0.60	1.95	13.4	0.18
0.6	0.71	0.72	2.33	16.1	0.22
0.7	0.83	0.84	2.72	18.7	0.26
0.8	0.95	0.96	3.11	21.4	0.29
0.9	1.06	1.08	3.50	24.1	0.33
1.0	1.18	1.20	3.89	26.8	0.37
1.1	1.30	1.32	4.28	29.4	0.40
1.2	1.42	1.44	4.67	32.1	0.44
1.3	1.54	1.56	5.06	34.8	0.47
1.4	1.66	1.68	5.45	37.5	0.51
1.5	1.77	1.80	5.84	40.1	0.55
1.6	1.89	1.92	6.22	42.8	0.58
1.7	2.01	2.04	6.61	45.5	0.62
1.8	2.13	2.16	7.00	48.2	0.66
1.9	2.25	2.28	7.39	50.8	0.69
2.0	2.37	2.40	7.78	53.5	0.73

**5/8" PEX Tubing / 50% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.12	0.39	0.93	0.04
0.2	0.08	0.24	0.78	1.86	0.07
0.3	0.12	0.36	1.17	2.79	0.11
0.4	0.16	0.48	1.56	3.72	0.15
0.5	0.21	0.60	1.95	4.65	0.18
0.6	0.25	0.72	2.33	5.57	0.22
0.7	0.29	0.84	2.72	6.50	0.26
0.8	0.33	0.96	3.11	7.43	0.29
0.9	0.37	1.08	3.50	8.36	0.33
1.0	0.85	1.20	3.89	19.2	0.37
1.1	1.00	1.32	4.28	22.7	0.40
1.2	1.17	1.44	4.67	26.4	0.44
1.3	1.34	1.56	5.06	30.4	0.47
1.4	1.53	1.68	5.45	34.6	0.51
1.5	1.73	1.80	5.84	39.0	0.55
1.6	1.93	1.92	6.22	43.7	0.58
1.7	2.15	2.04	6.61	48.6	0.62
1.8	2.37	2.16	7.00	53.7	0.66
1.9	2.61	2.28	7.39	59.1	0.69
2.0	2.86	2.40	7.78	64.6	0.73

**5/8" PEX Tubing / 50% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.08	0.12	0.39	1.78	0.04
0.2	0.16	0.24	0.78	3.56	0.07
0.3	0.24	0.36	1.17	5.34	0.11
0.4	0.31	0.48	1.56	7.11	0.15
0.5	0.39	0.60	1.95	8.89	0.18
0.6	0.47	0.72	2.33	10.67	0.22
0.7	0.55	0.84	2.72	12.5	0.26
0.8	0.63	0.96	3.11	14.2	0.29
0.9	0.71	1.08	3.50	16.0	0.33
1.0	0.79	1.20	3.89	17.8	0.37
1.1	0.86	1.32	4.28	19.6	0.40
1.2	0.94	1.44	4.67	21.3	0.44
1.3	1.02	1.56	5.06	23.1	0.47
1.4	1.10	1.68	5.45	24.9	0.51
1.5	1.18	1.80	5.84	26.7	0.55
1.6	1.26	1.92	6.22	28.5	0.58
1.7	1.34	2.04	6.61	30.2	0.62
1.8	2.82	2.16	7.00	63.9	0.66
1.9	3.10	2.28	7.39	70.2	0.69
2.0	3.40	2.40	7.78	76.8	0.73

**5/8" PEX Tubing / 50% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.12	0.39	0.72	0.04
0.2	0.06	0.24	0.78	1.43	0.07
0.3	0.10	0.36	1.17	2.15	0.11
0.4	0.13	0.48	1.56	2.87	0.15
0.5	0.16	0.60	1.95	3.58	0.18
0.6	0.19	0.72	2.33	4.30	0.22
0.7	0.22	0.84	2.72	5.02	0.26
0.8	0.53	0.96	3.11	12.1	0.29
0.9	0.66	1.08	3.50	14.9	0.33
1.0	0.79	1.20	3.89	17.9	0.37
1.1	0.93	1.32	4.28	21.1	0.40
1.2	1.09	1.44	4.67	24.6	0.44
1.3	1.25	1.56	5.06	28.3	0.47
1.4	1.42	1.68	5.45	32.2	0.51
1.5	1.61	1.80	5.84	36.3	0.55
1.6	1.80	1.92	6.22	40.7	0.58
1.7	2.00	2.04	6.61	45.2	0.62
1.8	2.21	2.16	7.00	50.0	0.66
1.9	2.43	2.28	7.39	55.0	0.69
2.0	2.66	2.40	7.78	60.1	0.73

**5/8" PEX Tubing / 50% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.12	0.39	1.25	0.04
0.2	0.11	0.24	0.78	2.51	0.07
0.3	0.17	0.36	1.17	3.76	0.11
0.4	0.22	0.48	1.56	5.01	0.15
0.5	0.28	0.60	1.95	6.27	0.18
0.6	0.33	0.72	2.33	7.52	0.22
0.7	0.39	0.84	2.72	8.77	0.26
0.8	0.44	0.96	3.11	10.0	0.29
0.9	0.50	1.08	3.50	11.3	0.33
1.0	0.55	1.20	3.89	12.5	0.37
1.1	0.61	1.32	4.28	13.8	0.40
1.2	0.66	1.44	4.67	15.0	0.44
1.3	1.46	1.56	5.06	32.9	0.47
1.4	1.66	1.68	5.45	37.5	0.51
1.5	1.87	1.80	5.84	42.3	0.55
1.6	2.09	1.92	6.22	47.4	0.58
1.7	2.33	2.04	6.61	52.7	0.62
1.8	2.57	2.16	7.00	58.2	0.66
1.9	2.83	2.28	7.39	64.0	0.69
2.0	3.10	2.40	7.78	70.0	0.73

**5/8" PEX Tubing / 50% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.12	0.39	0.57	0.04
0.2	0.05	0.24	0.78	1.15	0.07
0.3	0.08	0.36	1.17	1.72	0.11
0.4	0.10	0.48	1.56	2.29	0.15
0.5	0.13	0.60	1.95	2.87	0.18
0.6	0.15	0.72	2.33	3.44	0.22
0.7	0.40	0.84	2.72	9.00	0.26
0.8	0.50	0.96	3.11	11.4	0.29
0.9	0.62	1.08	3.50	14.0	0.33
1.0	0.74	1.20	3.89	16.8	0.37
1.1	0.88	1.32	4.28	19.8	0.40
1.2	1.02	1.44	4.67	23.1	0.44
1.3	1.18	1.56	5.06	26.6	0.47
1.4	1.34	1.68	5.45	30.3	0.51
1.5	1.51	1.80	5.84	34.1	0.55
1.6	1.69	1.92	6.22	38.2	0.58
1.7	1.88	2.04	6.61	42.5	0.62
1.8	2.08	2.16	7.00	47.0	0.66
1.9	2.28	2.28	7.39	51.6	0.69
2.0	2.50	2.40	7.78	56.5	0.73



**APPENDIX B**

**HEAD LOSS - 3/4" PEX TUBING**

**30% Glycol**

**3/4" PEX Tubing / 30% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.09	0.39	0.70	0.03
0.2	0.06	0.18	0.78	1.40	0.05
0.3	0.09	0.26	1.17	2.09	0.08
0.4	0.12	0.35	1.56	2.79	0.11
0.5	0.15	0.44	1.95	3.49	0.13
0.6	0.19	0.53	2.33	4.19	0.16
0.7	0.22	0.62	2.72	4.88	0.19
0.8	0.25	0.70	3.11	5.58	0.21
0.9	0.28	0.79	3.50	6.28	0.24
1.0	0.31	0.88	3.89	6.98	0.27
1.1	0.34	0.97	4.28	7.68	0.30
1.2	0.37	1.06	4.67	8.37	0.32
1.3	0.40	1.15	5.06	9.07	0.35
1.4	0.43	1.23	5.45	9.77	0.38
1.5	0.46	1.32	5.84	10.5	0.40
1.6	1.02	1.41	6.22	23.0	0.43
1.7	1.13	1.50	6.61	25.6	0.46
1.8	1.25	1.59	7.00	28.3	0.48
1.9	1.38	1.67	7.39	31.1	0.51
2.0	1.51	1.76	7.78	34.0	0.54

**3/4" PEX Tubing / 30% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.29	0.03
0.2	0.03	0.18	0.78	0.58	0.05
0.3	0.04	0.26	1.17	0.87	0.08
0.4	0.05	0.35	1.56	1.16	0.11
0.5	0.06	0.44	1.95	1.45	0.13
0.6	0.08	0.53	2.33	1.74	0.16
0.7	0.19	0.62	2.72	4.30	0.19
0.8	0.24	0.70	3.11	5.43	0.21
0.9	0.29	0.79	3.50	6.67	0.24
1.0	0.35	0.88	3.89	8.02	0.27
1.1	0.42	0.97	4.28	9.48	0.30
1.2	0.49	1.06	4.67	11.0	0.32
1.3	0.56	1.15	5.06	12.7	0.35
1.4	0.64	1.23	5.45	14.5	0.38
1.5	0.72	1.32	5.84	16.3	0.40
1.6	0.81	1.41	6.22	18.3	0.43
1.7	0.90	1.50	6.61	20.3	0.46
1.8	0.99	1.59	7.00	22.4	0.48
1.9	1.09	1.67	7.39	24.7	0.51
2.0	1.19	1.76	7.78	27.0	0.54

**3/4" PEX Tubing / 30% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.09	0.39	0.50	0.03
0.2	0.04	0.18	0.78	0.99	0.05
0.3	0.07	0.26	1.17	1.49	0.08
0.4	0.09	0.35	1.56	1.99	0.11
0.5	0.11	0.44	1.95	2.48	0.13
0.6	0.13	0.53	2.33	2.98	0.16
0.7	0.15	0.62	2.72	3.48	0.19
0.8	0.18	0.70	3.11	3.97	0.21
0.9	0.20	0.79	3.50	4.47	0.24
1.0	0.22	0.88	3.89	4.97	0.27
1.1	0.48	0.97	4.28	10.9	0.30
1.2	0.56	1.06	4.67	12.7	0.32
1.3	0.65	1.15	5.06	14.7	0.35
1.4	0.74	1.23	5.45	16.7	0.38
1.5	0.83	1.32	5.84	18.8	0.40
1.6	0.93	1.41	6.22	21.1	0.43
1.7	1.04	1.50	6.61	23.4	0.46
1.8	1.14	1.59	7.00	25.9	0.48
1.9	1.26	1.67	7.39	28.5	0.51
2.0	1.38	1.76	7.78	31.1	0.54

**3/4" PEX Tubing / 30% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.24	0.03
0.2	0.02	0.18	0.78	0.47	0.05
0.3	0.03	0.26	1.17	0.71	0.08
0.4	0.04	0.35	1.56	0.94	0.11
0.5	0.05	0.44	1.95	1.18	0.13
0.6	0.14	0.53	2.33	3.10	0.16
0.7	0.18	0.62	2.72	4.05	0.19
0.8	0.23	0.70	3.11	5.12	0.21
0.9	0.28	0.79	3.50	6.29	0.24
1.0	0.33	0.88	3.89	7.57	0.27
1.1	0.40	0.97	4.28	8.94	0.30
1.2	0.46	1.06	4.67	10.4	0.32
1.3	0.53	1.15	5.06	12.0	0.35
1.4	0.60	1.23	5.45	13.6	0.38
1.5	0.68	1.32	5.84	15.4	0.40
1.6	0.76	1.41	6.22	17.2	0.43
1.7	0.85	1.50	6.61	19.2	0.46
1.8	0.85	1.59	7.00	19.3	0.48
1.9	0.94	1.67	7.39	21.3	0.51
2.0	1.03	1.76	7.78	23.3	0.54

**3/4" PEX Tubing / 30% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.09	0.39	0.37	0.03
0.2	0.03	0.18	0.78	0.75	0.05
0.3	0.05	0.26	1.17	1.12	0.08
0.4	0.07	0.35	1.56	1.49	0.11
0.5	0.08	0.44	1.95	1.87	0.13
0.6	0.10	0.53	2.33	2.24	0.16
0.7	0.12	0.62	2.72	2.61	0.19
0.8	0.13	0.70	3.11	2.99	0.21
0.9	0.32	0.79	3.50	7.14	0.24
1.0	0.38	0.88	3.89	8.58	0.27
1.1	0.45	0.97	4.28	10.1	0.30
1.2	0.52	1.06	4.67	11.8	0.32
1.3	0.60	1.15	5.06	13.6	0.35
1.4	0.68	1.23	5.45	15.5	0.38
1.5	0.77	1.32	5.84	17.4	0.40
1.6	0.86	1.41	6.22	19.5	0.43
1.7	0.96	1.50	6.61	21.7	0.46
1.8	1.06	1.59	7.00	24.0	0.48
1.9	1.17	1.67	7.39	26.4	0.51
2.0	1.28	1.76	7.78	28.9	0.54

**3/4" PEX Tubing / 30% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.20	0.03
0.2	0.02	0.18	0.78	0.39	0.05
0.3	0.03	0.26	1.17	0.59	0.08
0.4	0.03	0.35	1.56	0.78	0.11
0.5	0.09	0.44	1.95	2.13	0.13
0.6	0.13	0.53	2.33	2.93	0.16
0.7	0.17	0.62	2.72	3.84	0.19
0.8	0.21	0.70	3.11	4.85	0.21
0.9	0.26	0.79	3.50	5.96	0.24
1.0	0.32	0.88	3.89	7.17	0.27
1.1	0.37	0.97	4.28	8.47	0.30
1.2	0.44	1.06	4.67	9.87	0.32
1.3	0.50	1.15	5.06	11.4	0.35
1.4	0.57	1.23	5.45	12.9	0.38
1.5	0.59	1.32	5.84	13.3	0.40
1.6	0.66	1.41	6.22	14.9	0.43
1.7	0.73	1.50	6.61	16.6	0.46
1.8	0.81	1.59	7.00	18.4	0.48
1.9	0.90	1.67	7.39	20.3	0.51
2.0	0.98	1.76	7.78	22.2	0.54

**APPENDIX B**

**HEAD LOSS - 3/4" PEX TUBING**

**50% Glycol**

**3/4" PEX Tubing / 50% Glycol / 80 Deg F (27 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.06	0.09	0.39	1.45	0.03
0.2	0.13	0.18	0.78	2.89	0.05
0.3	0.19	0.26	1.17	4.34	0.08
0.4	0.26	0.35	1.56	5.79	0.11
0.5	0.32	0.44	1.95	7.24	0.13
0.6	0.38	0.53	2.33	8.68	0.16
0.7	0.45	0.62	2.72	10.1	0.19
0.8	0.51	0.70	3.11	11.6	0.21
0.9	0.58	0.79	3.50	13.0	0.24
1.0	0.64	0.88	3.89	14.5	0.27
1.1	0.70	0.97	4.28	15.9	0.30
1.2	0.77	1.06	4.67	17.4	0.32
1.3	0.83	1.15	5.06	18.8	0.35
1.4	0.90	1.23	5.45	20.3	0.38
1.5	0.96	1.32	5.84	21.7	0.40
1.6	1.02	1.41	6.22	23.2	0.43
1.7	1.09	1.50	6.61	24.6	0.46
1.8	1.15	1.59	7.00	26.1	0.48
1.9	1.22	1.67	7.39	27.5	0.51
2.0	1.28	1.76	7.78	28.9	0.54

**3/4" PEX Tubing / 50% Glycol / 140 Deg F (60 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.09	0.39	0.50	0.03
0.2	0.04	0.18	0.78	1.01	0.05
0.3	0.07	0.26	1.17	1.51	0.08
0.4	0.09	0.35	1.56	2.01	0.11
0.5	0.11	0.44	1.95	2.51	0.13
0.6	0.13	0.53	2.33	3.02	0.16
0.7	0.16	0.62	2.72	3.52	0.19
0.8	0.18	0.70	3.11	4.02	0.21
0.9	0.20	0.79	3.50	4.52	0.24
1.0	0.22	0.88	3.89	5.03	0.27
1.1	0.24	0.97	4.28	5.53	0.30
1.2	0.26	1.06	4.67	6.03	0.32
1.3	0.28	1.15	5.06	6.53	0.35
1.4	0.30	1.23	5.45	7.03	0.38
1.5	0.32	1.32	5.84	7.53	0.40
1.6	0.34	1.41	6.22	8.03	0.43
1.7	0.36	1.50	6.61	8.53	0.46
1.8	0.38	1.59	7.00	9.03	0.48
1.9	0.40	1.67	7.39	9.53	0.51
2.0	0.42	1.76	7.78	10.03	0.54

**3/4" PEX Tubing / 50% Glycol / 100 Deg F (38 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.04	0.09	0.39	0.96	0.03
0.2	0.09	0.18	0.78	1.92	0.05
0.3	0.13	0.26	1.17	2.89	0.08
0.4	0.17	0.35	1.56	3.85	0.11
0.5	0.21	0.44	1.95	4.81	0.13
0.6	0.26	0.53	2.33	5.77	0.16
0.7	0.30	0.62	2.72	6.73	0.19
0.8	0.34	0.70	3.11	7.70	0.21
0.9	0.38	0.79	3.50	8.66	0.24
1.0	0.43	0.88	3.89	9.62	0.27
1.1	0.47	0.97	4.28	10.6	0.30
1.2	0.51	1.06	4.67	11.5	0.32
1.3	0.55	1.15	5.06	12.5	0.35
1.4	0.60	1.23	5.45	13.5	0.38
1.5	0.64	1.32	5.84	14.4	0.40
1.6	0.68	1.41	6.22	15.4	0.43
1.7	0.72	1.50	6.61	16.4	0.46
1.8	0.77	1.59	7.00	17.3	0.48
1.9	0.81	1.67	7.39	18.3	0.51
2.0	0.85	1.76	7.78	19.2	0.54

**3/4" PEX Tubing / 50% Glycol / 160 Deg F (71 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.02	0.09	0.39	0.39	0.03
0.2	0.03	0.18	0.78	0.78	0.05
0.3	0.05	0.26	1.17	1.16	0.08
0.4	0.07	0.35	1.56	1.55	0.11
0.5	0.09	0.44	1.95	1.94	0.13
0.6	0.10	0.53	2.33	2.33	0.16
0.7	0.12	0.62	2.72	2.71	0.19
0.8	0.14	0.70	3.11	3.10	0.21
0.9	0.16	0.79	3.50	3.49	0.24
1.0	0.18	0.88	3.89	3.88	0.27
1.1	0.20	0.97	4.28	4.27	0.30
1.2	0.22	1.06	4.67	4.66	0.32
1.3	0.24	1.15	5.06	5.05	0.35
1.4	0.26	1.23	5.45	5.44	0.38
1.5	0.28	1.32	5.84	5.83	0.40
1.6	0.30	1.41	6.22	6.22	0.43
1.7	0.32	1.50	6.61	6.61	0.46
1.8	0.34	1.59	7.00	7.00	0.48
1.9	0.36	1.67	7.39	7.39	0.51
2.0	0.38	1.76	7.78	7.78	0.54

**3/4" PEX Tubing / 50% Glycol / 120 Deg F (49 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.03	0.09	0.39	0.68	0.03
0.2	0.06	0.18	0.78	1.36	0.05
0.3	0.09	0.26	1.17	2.03	0.08
0.4	0.12	0.35	1.56	2.71	0.11
0.5	0.15	0.44	1.95	3.39	0.13
0.6	0.18	0.53	2.33	4.07	0.16
0.7	0.21	0.62	2.72	4.74	0.19
0.8	0.24	0.70	3.11	5.42	0.21
0.9	0.27	0.79	3.50	6.10	0.24
1.0	0.30	0.88	3.89	6.78	0.27
1.1	0.33	0.97	4.28	7.45	0.30
1.2	0.36	1.06	4.67	8.13	0.32
1.3	0.39	1.15	5.06	8.81	0.35
1.4	0.42	1.23	5.45	9.49	0.38
1.5	0.45	1.32	5.84	10.17	0.40
1.6	0.48	1.41	6.22	10.85	0.43
1.7	0.51	1.50	6.61	11.53	0.46
1.8	0.54	1.59	7.00	12.21	0.48
1.9	0.57	1.67	7.39	12.89	0.51
2.0	0.60	1.76	7.78	13.57	0.54

**3/4" PEX Tubing / 50% Glycol / 180 Deg F (82 Deg C)**

Flowrate GPM	Loss per 100ft PSI	Velocity ft/s	Flowrate L / min	Loss per 100m kPa	Velocity m / s
0.1	0.01	0.09	0.39	0.31	0.03
0.2	0.03	0.18	0.78	0.62	0.05
0.3	0.04	0.26	1.17	0.93	0.08
0.4	0.05	0.35	1.56	1.24	0.11
0.5	0.07	0.44	1.95	1.55	0.13
0.6	0.08	0.53	2.33	1.86	0.16
0.7	0.10	0.62	2.72	2.17	0.19
0.8	0.12	0.70	3.11	2.48	0.21
0.9	0.14	0.79	3.50	2.79	0.24
1.0	0.16	0.88	3.89	3.10	0.27
1.1	0.18	0.97	4.28	3.41	0.30
1.2	0.20	1.06	4.67	3.72	0.32
1.3	0.22	1.15	5.06	4.03	0.35
1.4	0.24	1.23	5.45	4.34	0.38
1.5	0.26	1.32	5.84	4.65	0.40
1.6	0.28	1.41	6.22	4.96	0.43
1.7	0.30	1.50	6.61	5.27	0.46
1.8	0.32	1.59	7.00	5.58	0.48
1.9	0.34	1.67	7.39	5.89	0.51
2.0	0.36	1.76	7.78	6.20	0.54

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