

PVC CLASS 160 IPS PLASTIC PIPE (SDR-26)

Size Flow GPM	1¼"		1½"		2"		2½"		3"		4"		6"		
	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	
1	0.17	0.01	0.13	0.00											
2	0.34	0.02	0.26	0.01	0.16	0.00									
3	0.52	0.04	0.39	0.02	0.25	0.01									
4	0.69	0.07	0.53	0.04	0.33	0.01	0.23	0.00							
5	0.86	0.11	0.66	0.05	0.42	0.02	0.28	0.01							
6	1.04	0.15	0.79	0.08	0.50	0.03	0.34	0.01	0.20	0.00					
7	1.21	0.20	0.92	0.10	0.59	0.03	0.40	0.01	0.27	0.01					
8	1.39	0.25	1.06	0.13	0.67	0.04	0.46	0.02	0.31	0.01					
9	1.56	0.31	1.19	0.16	0.76	0.05	0.52	0.02	0.35	0.01					
10	1.73	0.38	1.32	0.20	0.84	0.07	0.57	0.03	0.39	0.01					
11	1.91	0.45	1.45	0.23	0.93	0.08	0.63	0.03	0.43	0.01					
12	2.08	0.53	1.59	0.28	1.01	0.09	0.69	0.04	0.46	0.01	0.28	0.00			
14	2.43	0.71	1.85	0.37	1.18	0.12	0.81	0.05	0.54	0.02	0.33	0.01			
16	2.78	0.91	2.12	0.47	1.35	0.16	0.92	0.06	0.62	0.02	0.37	0.01			
18	3.12	1.13	2.38	0.58	1.52	0.20	1.04	0.08	0.70	0.03	0.42	0.01			
20	3.47	1.37	2.65	0.71	1.69	0.24	1.15	0.09	0.78	0.04	0.47	0.01			
22	3.82	1.64	2.91	0.85	1.86	0.29	1.27	0.11	0.86	0.04	0.52	0.01			
24	4.17	1.92	3.18	1.00	2.03	0.34	1.38	0.13	0.93	0.05	0.56	0.02			
26	4.51	2.23	3.44	1.15	2.20	0.39	1.50	0.15	1.01	0.06	0.61	0.02			
28	4.86	2.56	3.71	1.32	2.37	0.45	1.62	0.18	1.09	0.07	0.66	0.02			
30	5.21	2.91	3.97	1.50	2.54	0.51	1.73	0.20	1.17	0.08	0.70	0.02			
35	6.08	3.87	4.64	2.00	2.96	0.68	2.02	0.27	1.36	0.10	0.82	0.03	0.38	0.00	
40	6.95	4.95	5.30	2.56	3.39	0.86	2.31	0.34	1.56	0.13	0.94	0.04	0.43	0.01	
45	7.82	6.16	5.96	3.19	3.81	1.08	2.60	0.42	1.75	0.16	1.06	0.05	0.49	0.01	
50	8.69	7.49	6.63	3.88	4.24	1.31	2.89	0.52	1.95	0.20	1.18	0.06	0.54	0.01	
55	9.56	8.93	7.29	4.62	4.66	1.56	3.18	0.62	2.15	0.24	1.30	0.07	0.60	0.01	
60			7.95	5.43	5.09	1.83	3.47	0.72	2.34	0.28	1.41	0.08	0.65	0.01	
65			8.62	6.30	5.51	2.12	3.76	0.84	2.54	0.32	1.53	0.09	0.70	0.01	
70			9.28	7.23	5.93	2.44	4.05	0.96	2.73	0.37	1.65	0.11	0.76	0.02	
75			9.94	8.21	6.36	2.77	4.34	1.09	2.93	0.42	1.77	0.12	0.81	0.02	
80					6.78	3.12	4.63	1.23	3.12	0.47	1.89	0.14	0.87	0.02	
85					7.21	3.49	4.91	1.38	3.32	0.53	2.00	0.16	0.92	0.02	
90					7.63	3.88	5.20	1.53	3.51	0.59	2.12	0.17	0.98	0.03	
95					8.05	4.29	5.49	1.69	3.71	0.65	2.24	0.19	1.03	0.03	
100					8.48	4.72	5.78	1.86	3.91	0.72	2.36	0.21	1.09	0.03	
110					9.33	5.63	6.36	2.22	4.30	0.86	2.60	0.25	1.20	0.04	
120							6.94	2.61	4.69	1.01	2.83	0.30	1.30	0.05	
130							7.52	3.03	5.08	1.17	3.07	0.34	1.41	0.05	
140							8.10	3.47	5.47	1.34	3.31	0.39	1.52	0.06	
150							8.68	3.94	5.86	1.52	3.54	0.45	1.63	0.07	
160							9.26	4.45	6.25	1.71	3.78	0.50	1.74	0.08	
170								9.83	4.97	6.64	1.92	4.01	0.56	1.85	0.09
180									7.03	2.13	4.25	0.63	1.96	0.10	
190									7.43	2.35	4.49	0.69	2.07	0.11	
200									7.82	2.59	4.72	0.76	2.18	0.12	
225									8.79	3.22	5.31	0.95	2.45	0.14	
250									9.77	3.91	5.91	1.15	2.72	0.18	
275											6.50	1.37	3.00	0.21	
300											7.09	1.61	3.27	0.25	
325											7.68	1.87	3.54	0.29	
350											8.27	2.15	3.81	0.33	
375											8.86	2.44	4.09	0.37	
400											9.45	2.75	4.36	0.42	
425													4.63	0.47	
450													4.90	0.52	
475													5.18	0.58	
500													5.45	0.63	
550													6.00	0.76	
600													6.54	0.89	



We strongly suggest that you do not exceed velocities of 5 fps!

PVC CLASS 200 IPS PLASTIC PIPE (SDR-21)										
Size	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"	
Flow	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI	Vel PSI
GPM	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss	FPS Loss
1	0.47 0.06	0.28 0.02	0.18 0.01	0.13 0.00						
2	0.94 0.22	0.57 0.07	0.36 0.02	0.27 0.01	0.17 0.00					
3	1.42 0.46	0.86 0.14	0.54 0.04	0.41 0.02	0.26 0.01	0.18 0.00				
4	1.89 0.79	1.15 0.24	0.72 0.08	0.55 0.04	0.35 0.01	0.24 0.01				
5	2.36 1.20	1.44 0.36	0.90 0.12	0.68 0.06	0.44 0.02	0.30 0.01				
6	2.83 1.68	1.73 0.51	1.08 0.16	0.82 0.08	0.53 0.03	0.36 0.01	0.24 0.00			
7	3.30 2.23	2.02 0.67	1.26 0.22	0.96 0.11	0.61 0.04	0.42 0.01	0.28 0.01			
8	3.77 2.85	2.30 0.86	1.44 0.28	1.10 0.14	0.70 0.05	0.48 0.02	0.32 0.01			
9	4.25 3.55	2.59 1.07	1.62 0.34	1.24 0.18	0.79 0.06	0.54 0.02	0.36 0.01			
10	4.72 4.31	2.88 1.30	1.80 0.42	1.37 0.22	0.88 0.07	0.60 0.03	0.40 0.01			
11	5.19 5.15	3.17 1.56	1.98 0.50	1.51 0.26	0.97 0.09	0.66 0.03	0.44 0.01			
12	5.66 6.05	3.46 1.83	2.17 0.59	1.65 0.30	1.06 0.10	0.72 0.04	0.48 0.02	0.29 0.00		
14	6.60 8.05	4.04 2.43	2.53 0.78	1.93 0.40	1.23 0.14	0.84 0.05	0.56 0.02	0.34 0.01		
16	7.55 10.30	4.61 3.11	2.89 1.00	2.20 0.52	1.41 0.17	0.96 0.07	0.65 0.03	0.39 0.01		
18	8.49 12.81	5.19 3.87	3.25 1.24	2.48 0.64	1.59 0.22	1.08 0.09	0.73 0.03	0.44 0.01		
20	9.43 15.58	5.77 4.71	3.61 1.51	2.75 0.78	1.76 0.26	1.20 0.10	0.81 0.04	0.49 0.01		
22		6.34 5.62	3.97 1.80	3.03 0.93	1.94 0.32	1.32 0.12	0.89 0.05	0.54 0.01		
24		6.92 6.60	4.34 2.12	3.30 1.09	2.12 0.37	1.44 0.15	0.97 0.06	0.59 0.02		
26		7.50 7.65	4.70 2.46	3.58 1.27	2.29 0.43	1.56 0.17	1.05 0.07	0.63 0.02		
28		8.08 8.87	5.06 2.82	3.86 1.46	2.47 0.49	1.68 0.19	1.13 0.07	0.68 0.02		
30		8.65 9.98	5.42 3.20	4.13 1.66	2.65 0.56	1.80 0.22	1.22 0.09	0.73 0.02	0.34 0.00	
35			6.32 4.26	4.82 2.20	3.09 0.75	2.11 0.29	1.42 0.11	0.86 0.03	0.39 0.01	
40			7.23 5.45	5.51 2.82	3.53 0.95	2.41 0.38	1.62 0.14	0.98 0.04	0.45 0.01	
45			8.13 6.78	6.20 3.51	3.97 1.19	2.71 0.47	1.83 0.18	1.10 0.05	0.51 0.01	
50			9.04 8.24	6.89 4.26	4.41 1.44	3.01 0.57	2.03 0.22	1.23 0.06	0.56 0.01	
55			9.94 9.83	7.58 5.09	4.85 1.72	3.31 0.68	2.23 0.26	1.35 0.08	0.62 0.01	
60				8.27 5.97	5.30 2.02	3.61 0.80	2.44 0.31	1.47 0.09	0.68 0.01	
65				8.96 6.93	5.74 2.35	3.92 0.93	2.64 0.36	1.59 0.10	0.73 0.02	
70				9.65 7.95	6.18 2.69	4.22 1.06	2.84 0.41	1.72 0.12	0.79 0.02	
75					6.62 3.06	4.52 1.21	3.05 0.46	1.84 0.14	0.85 0.02	
80					7.06 3.44	4.82 1.36	3.25 0.52	1.96 0.15	0.90 0.02	
85					7.50 3.85	5.12 1.52	3.45 0.59	2.09 0.17	0.96 0.03	
90					7.95 4.82	5.42 1.69	3.66 0.65	2.21 0.19	1.02 0.03	
95					8.39 4.74	5.72 1.87	3.86 0.72	2.33 0.21	1.07 0.03	
100					8.83 5.21	6.03 2.06	4.07 0.79	2.46 0.23	1.13 0.04	
110					9.71 6.21	6.63 2.45	4.47 0.94	2.70 0.28	1.24 0.04	
120						7.23 2.88	4.88 1.11	2.95 0.33	1.36 0.05	
130						7.84 3.34	5.29 1.29	3.19 0.38	1.47 0.06	
140						8.44 3.84	5.69 1.47	3.44 0.43	1.59 0.07	
150						9.04 4.36	6.10 1.68	3.69 0.49	1.70 0.08	
160						9.64 4.91	6.51 1.89	3.93 0.55	1.81 0.08	
170							6.91 2.11	4.18 0.62	1.93 0.09	
180							7.32 2.35	4.42 0.69	2.04 0.11	
190							7.73 2.60	4.67 0.76	2.15 0.12	
200							8.14 2.85	4.92 0.84	2.27 0.13	
225							9.15 3.55	5.53 1.04	2.55 0.16	
250								6.15 1.27	2.83 0.19	
275								6.76 1.51	3.12 0.23	
300								7.38 1.78	3.40 0.27	
325								7.99 2.06	3.69 0.31	
350								8.61 2.36	3.97 0.36	
375								9.22 2.69	4.25 0.41	
400								9.84 3.03	4.54 0.46	
425									4.82 0.52	
450									5.11 0.57	
475									5.39 0.63	
500									5.67 0.70	
550									6.24 0.83	
600									6.81 0.98	



Note:
Vel FPS = Velocity in Feet per Second
PSI Loss = Pounds per Square Inch lost per 100 feet.

We strongly suggest that you do not exceed velocities of 5 fps!

Friction Loss Chart for ID Controlled Hose (Oval Hose & Layflat Hose)															
Size	Flow	1"		1½"		2"		3"		4"		6"			
		Flow	Vel	PSI	Vel	PSI	Vel	PSI	Vel	PSI	Vel	PSI	Vel	PSI	
GPM	GPH	FPS	Loss	FPS	Loss	FPS	Loss	FPS	Loss	FPS	Loss	FPS	Loss		
1	60	0.38	0.04	0.16	0.01	0.10	0.00								
2	120	0.76	0.14	0.32	0.02	0.19	0.01								
3	180	1.13	0.30	0.48	0.04	0.29	0.01								
4	240	1.51	0.52	0.65	0.07	0.39	0.02								
5	300	1.89	0.79	0.81	0.10	0.49	0.03								
6	360	2.27	1.10	0.97	0.14	0.58	0.04								
7	420	2.64	1.46	1.13	0.19	0.68	0.05								
8	480	3.02	1.87	1.29	0.24	0.78	0.07								
9	540	3.40	2.33	1.45	0.30	0.88	0.09								
10	600	3.78	2.83	1.62	0.36	0.97	0.10	0.26	0.00	0.26	0.00				
12	720	4.53	3.97	1.94	0.50	1.17	0.15	0.31	0.01	0.31	0.01				
14	840	5.29	5.29	2.26	0.67	1.36	0.20	0.36	0.01	0.36	0.01				
16	960	6.04	6.77	2.59	0.86	1.56	0.25	0.41	0.01	0.41	0.01				
18	1080	6.80	8.42	2.91	1.06	1.75	0.31	0.46	0.01	0.46	0.01				
20	1200	7.55	10.23	3.23	1.29	1.95	0.38	0.51	0.01	0.51	0.01				
25	1500	9.44	15.47	4.04	1.96	2.44	0.57	0.64	0.02	0.64	0.02				
30	1800	11.33	21.68	4.85	2.74	2.92	0.80	0.77	0.03	0.77	0.03	0.35	0.00		
35	2100	13.22	28.84	5.66	3.65	3.41	1.07	0.90	0.04	0.90	0.04	0.40	0.01		
40	2400	15.11	36.94	6.46	4.67	3.90	1.37	1.03	0.05	1.03	0.05	0.46	0.01		
45	2700	17.00	45.94	7.27	5.81	4.39	1.70	1.19	0.25	1.15	0.07	0.52	0.01		
50	3000			8.08	7.06	4.87	2.06	2.21	0.30	1.28	0.08	0.58	0.01		
55	3300			8.89	8.43	5.36	2.46	2.43	0.36	1.41	0.10	0.63	0.01		
60	3600			9.70	9.90	5.85	2.89	2.66	0.42	1.54	0.11	0.69	0.02		
65	3900			10.50	11.48	6.34	3.36	2.88	0.49	1.67	0.13	0.75	0.02		
70	4200			11.31	13.17	6.82	3.85	3.10	0.56	1.80	0.15	0.81	0.02		
75	4500			12.12	14.97	7.31	4.37	3.32	0.64	1.92	0.17	0.87	0.02		
80	4800			12.93	16.87	7.80	4.93	3.54	0.72	2.05	0.19	0.92	0.03		
85	5100			13.73	18.87	8.29	5.51	3.76	0.81	2.18	0.21	0.98	0.03		
90	5400			14.54	20.98	8.77	6.13	3.98	0.90	2.31	0.24	1.04	0.03		
100	6000					9.75	7.45	4.43	1.09	2.56	0.29	1.15	0.04		
110	6600							10.72	8.89	4.87	1.30	2.82	0.34	1.27	0.05
120	7200							11.70	10.44	5.31	1.53	3.08	0.40	1.38	0.06
130	7800							12.67	12.11	5.75	1.77	3.33	0.47	1.50	0.07
140	8400							13.65	13.90	6.20	2.03	3.59	0.54	1.62	0.08
150	9000							14.62	15.79	6.64	2.31	3.85	0.61	1.73	0.09
160	9600							15.60	17.79	7.08	2.60	4.10	0.69	1.85	0.10
170	10200							16.57	19.91	7.52	2.91	4.36	0.77	1.96	0.11
180	10800							7.97	3.24	4.62	0.86	4.62	0.86	2.08	0.12
190	11400							8.41	3.58	4.87	0.95	4.87	0.95	2.19	0.14
200	12000							8.85	3.93	5.13	1.04	5.13	1.04	2.31	0.15
250	15000							11.07	5.95	6.41	1.57	2.88	0.23		
300	18000							13.28	8.33	7.69	2.21	3.46	0.32		
350	21000							15.49	11.09	8.89	2.94	4.04	0.42		
400	24000							17.70	14.20	10.26	3.76	4.62	0.54		
450	27000							19.92	17.66	11.54	4.68	5.19	0.67		
500	30000							22.13	21.46	12.82	5.68	5.77	0.81		
600	36000									15.39	7.97	6.92	1.14		
700	42000									17.95	10.60	8.08	1.52		
800	48000									20.52	13.57	9.23	1.94		
900	54000									23.08	16.88	10.38	2.41		
1000	60000									25.65	20.52	11.54	2.93		
1200	72000											13.85	4.11		
1300	78000											15.00	4.77		
1400	84000											16.15	5.47		
1500	90000											17.31	6.22		
1600	96000											18.46	7.01		
1700	102000											19.62	7.84		
1800	108000											20.77	8.71		
1900	114000											21.92	9.63		
2000	120000											23.08	10.59		



Note:
Vel FPS = Velocity in Feet per Second
PSI Loss = Pounds per Square Inch lost per 100 feet.

We strongly suggest that you do not exceed velocities of 5 fps!

PRESSURE LOSS TABLES

POLYETHYLENE (PE) SDR-PRESSURE RATED TUBE											
Size Flow GPM	¾"		1"		1½"		1½"		2"		
	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	
1	0.60	0.12	0.37	0.04	0.21	0.01	0.15	0.00	0.09	0.00	
2	1.20	0.45	0.74	0.14	0.42	0.04	0.31	0.02	0.19	0.01	
3	1.80	0.95	1.11	0.29	0.64	0.08	0.47	0.04	0.28	0.01	
4	2.40	1.62	1.48	0.50	0.85	0.13	0.62	0.06	0.38	0.02	
5	3.00	2.44	1.85	0.76	1.07	0.20	0.78	0.09	0.47	0.03	
6	3.60	3.43	2.22	1.06	1.28	0.28	0.94	0.13	0.57	0.04	
7	4.20	4.56	2.59	1.41	1.49	0.37	1.10	0.18	0.66	0.05	
8	4.80	5.84	2.96	1.80	1.71	0.47	1.25	0.22	0.76	0.07	
9	5.40	7.26	3.33	2.24	1.92	0.59	1.41	0.28	0.85	0.08	
10	6.00	8.82	3.70	2.73	2.14	0.72	1.57	0.34	0.95	0.10	
11	6.60	10.53	4.07	3.25	2.35	0.86	1.73	0.40	1.05	0.12	
12	7.21	12.37	4.44	3.82	2.57	1.01	1.88	0.48	1.14	0.14	
14			5.19	5.08	2.99	1.34	2.20	0.63	1.33	0.19	
16			5.93	6.51	3.42	1.71	2.51	0.81	1.52	0.24	
18			6.67	8.10	3.85	2.13	2.83	1.01	1.71	0.30	
20			7.41	9.85	4.28	2.59	3.14	1.22	1.90	0.36	
22					4.71	3.09	3.46	1.46	2.10	0.43	
24					5.14	3.63	3.77	1.72	2.29	0.51	
26					5.57	4.21	4.09	1.99	2.48	0.59	
28					5.99	4.83	4.40	2.28	2.67	0.68	
30					6.42	5.49	4.72	2.59	2.86	0.77	
35					7.49	7.31	5.50	3.45	3.34	1.02	
40							6.29	4.42	3.81	1.31	
45							7.08	5.50	4.29	1.63	
50									4.77	1.98	
55									5.25	2.36	
60									5.72	2.78	
65									6.20	3.22	
70									6.68	3.69	
75									7.16	4.20	

Note:
Vel FPS = Velocity in Feet per Second
PSI Loss = Pounds per Square Inch lost per 100 feet.

TYPE K COPPER WATER TUBE															
Size Flow GPM	½"		5/8"		¾"		1"		1¼"		1½"		2"		
	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	Vel FPS	PSI Loss	
1	1.46	1.09	0.95	0.39	0.73	0.20	0.41	0.05	0.26	0.02	0.18	0.01	0.10	0.00	
2	2.93	3.94	1.91	1.40	1.47	0.73	0.82	0.18	0.52	0.06	0.37	0.03	0.21	0.01	
3	4.40	8.35	2.87	2.97	2.20	1.55	1.23	0.38	0.78	0.13	0.55	0.05	0.31	0.01	
4	5.87	14.23	3.83	5.05	2.94	2.64	1.64	0.65	1.05	0.22	0.74	0.09	0.42	0.02	
5	7.34	21.51	4.79	7.64	3.67	3.99	2.06	0.98	1.31	0.33	0.93	0.14	0.53	0.04	
6			5.75	10.70	4.41	5.60	2.47	1.37	1.57	0.46	1.11	0.20	0.63	0.05	
7			6.71	14.24	5.14	7.44	2.88	1.82	1.84	0.61	1.30	0.25	0.74	0.07	
8			7.67	18.24	5.88	9.53	3.29	2.33	2.10	0.78	1.48	0.34	0.85	0.09	
9					6.61	11.86	3.70	2.90	2.36	0.97	1.67	0.42	0.95	0.11	
10					7.35	14.41	4.12	3.53	2.63	1.18	1.86	0.51	1.06	0.13	
11							4.53	4.21	2.89	1.41	2.04	0.61	1.16	0.16	
12							4.94	4.94	3.15	1.66	2.23	0.71	1.27	0.18	
14							5.76	6.57	3.68	2.21	2.60	0.95	1.48	0.24	
16							6.59	8.42	4.21	2.83	2.97	1.22	1.70	0.31	
18							7.41	10.47	4.73	3.52	3.34	1.51	1.91	0.39	
20									5.26	4.28	3.72	1.84	1.12	0.47	
22									2.79	5.10	4.09	2.19	2.33	0.56	
24									6.31	5.99	4.46	2.58	2.55	0.66	
26									6.84	6.95	4.83	2.99	2.76	0.77	
28									7.37	7.98	5.20	3.43	2.97	0.88	
30											5.58	3.89	3.18	1.00	
35											6.51	5.18	3.72	1.33	
40											7.44	6.63	4.25	1.70	
45													4.78	2.12	
50													5.31	2.57	
55													5.84	3.07	
60													6.37	3.60	
65													6.91	4.18	
70													7.44	4.80	

Note:
Vel FPS = Velocity in Feet per Second
PSI Loss = Pounds per Square Inch lost per 100 feet.



We strongly suggest that you do not exceed velocities of 5 fps!

PRESSURE LOSS THROUGH WATER METERS (AWWA STANDARD)					
Size Flow GPM	5/8" PSI Loss	3/4" PSI Loss	1" PSI Loss	1½" PSI Loss	2" PSI Loss
1	0.2	0.1			
2	0.3	0.2			
3	0.4	0.3			
4	0.6	0.5	0.1		
5	0.9	0.6	0.2		
6	1.3	0.7	0.3		
7	1.8	0.8	0.4		
8	2.3	1.0	0.5		
9	3.0	1.3	0.6		
10	3.7	1.6	0.7		
11	4.4	1.9	0.8		
12	5.1	2.2	0.9		
13	6.1	2.6	1.0		
14	7.2	3.1	1.1		
15	8.3	3.6	1.2		
16	9.4	4.1	1.4	0.4	
17	10.7	4.6	1.6	0.5	
18	12.0	5.2	1.8	0.6	
19	13.4	5.8	2.0	0.7	
20	15.0	6.5	2.2	0.8	
22		7.9	2.8	1.0	
24		9.5	3.4	1.2	
26		11.2	4.0	1.4	
28		13.0	4.6	1.6	
30		15.0	5.3	1.8	0.7
32			6.0	2.1	0.8
34			6.9	2.4	0.9
36			7.8	2.7	1.0
38			8.7	3.0	1.2
40			9.6	3.3	1.3
42			10.6	3.6	1.4
44			11.7	3.9	1.5
46			12.8	4.2	1.6
48			13.9	4.5	1.7
50			15.0	4.9	1.9
52				5.3	2.1
54				5.7	2.2
56				6.2	2.3
58				6.7	2.5
60				7.2	2.7
65				8.3	3.2
70				9.8	3.7
75				11.2	4.3
80				12.8	4.9
90				16.1	6.2
100				20.0	7.8
110					9.5
120					11.3
130					13.0
140					15.1
150					17.3
160					20.0



HOW MUCH WATER IS NEEDED FOR TRICKLE IRRIGATION?

Rule of thumb: Be able to deliver at least one acre inch of water per week to the root system of the plants.

One Acre Inch of Water is approx. 27,000 Gallons

For orchards with one or two emitters per tree that have been grower installed into polyethylene trickle tubing , the formula for calculating the number of hours of irrigation per week that is necessary to apply an acre inch of water is as follows:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{27,000}{(\text{Number of trees per acre} \times \text{Number of emitter per tree} \times \text{GPH rate of emitters})}$$

Example: If an orchard is planted with trees on a 20 x 16 spacing, there would be 43,560 / (20 x 16) = 136 trees/ acre Let's assume that 2 emitters per tree were used with each emitter delivering 2 gal/ hour of water.

Now solving the formula would be:

$$\text{Irrigation Hours Needed to Apply Inch of Water per Week} = \frac{27,000}{(136 \times 2 \times 2)} = 49.63 \text{ or } 50 \text{ hours per week.}$$

For orchards where tubing with "built-in" emitters is used the formula for calculating the number of hours per week needed to deliver one acre inch of water is as follows:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{(\text{Distance in feet between rows} \times \text{distance in feet between emitters} \times 27,000)}{(43,560 \times \text{GPH Rate of Emitters})}$$

Example: If RAM tubing was used in an orchard planted with 15 feet between rows with emitters spaced every 3 feet with a .61 GPH emission rate, solving the formula would be:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{(15 \times 3 \times 27,000)}{(43,560 \times .61)} = 45.73 \text{ or } 46 \text{ hours per week.}$$



TRICKL-EEZ IRRIGATION INC

HOW MUCH WATER IS NEEDED FOR TRICKLE IRRIGATION?

Old rule of thumb: Be able to deliver at least one acre inch of water per week to the root system of the plants.

One Acre Inch of Water is approx 27,000 Gallons.

For vegetable fields or smaller fruits where a tape product is used, the formula for calculating the number of hours of irrigation per week that is necessary to apply an acre inch of water is as follows:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{27,000 \times \text{feet between rows} \times 100}{43,560 \times \text{flow rate of tape in gpm per 100 feet} \times 60}$$

Or use this simplified alternate formula:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{1.03 \times \text{feet between rows}}{\text{flow rate of tape in gpm per 100 feet}}$$

Example: If a field of vegetables was planted with a 5 foot row width and the flow rate of the tape was .38 gpm per 100 feet, solving the formula would be:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{27,000 \times 5 \times 100}{43,560 \times .38 \times 60} = 13.59 \text{ or } 14 \text{ hours per week}$$

Or use the simplified alternate formula:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{1.03 \times 5}{.38} = 13.55 \text{ or } 14 \text{ hours per week}$$

If the flow rate of each emitter is known and the spacing in inches between emitters, another simple formula can be used:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{.052 \times \text{feet between rows} \times \text{emitter spacing in inches}}{\text{flow rate of each emitter in gallons per hour}}$$

Example: If a field of vegetables was planted with a 5 foot row spacing and a tape was used that has an emitter every 12 inches with a flow rate per emitter of .23 GPH, solving the formula would be:

$$\text{Irrigation Hours Needed to Apply One Acre Inch of Water per Week} = \frac{.052 \times 5 \times 12}{.23} = 13.57 \text{ or } 14 \text{ hours per week}$$

PRECIPITATION RATE

Sprinkler Spacing Method...
Any Arc / Any Spacing
 inches/hr= $\frac{\text{GPM (Any Arc)} \times 34,650}{\text{Degree of Arc} \times \text{Head Spacing (ft)} \times \text{row spacing (ft)}}$

Equilateral Triangular Spacing:
 inches/hr= $\frac{\text{GPM of 360 Arc} \times 96.25}{(\text{Head Spacing})^2 \times .866}$

Total Area Method...
 inches/hr= $\frac{\text{Total GPM} \times 96.25}{\text{Total Area}}$

HEAD SPACING

Wind Velocity Of:	Maximum Spacing Of	
	Square Pattern	Triangular Pattern
0 to 3 mph	55% of diameter	60% of diameter
3 to 6 mph	50% of diameter	55% of diameter
6 to 12 mph	45% of diameter	50% of diameter



TRICKL-EEZ IRRIGATION INC

FILTRATION PERFORATION SIZES			
Mesh	Inches	mm	Micron
20	.0280	.711	711
40	.0165	.420	420
80	.0071	.180	180
100	.0060	.152	152
120	.0049	.125	125
140	.0042	.105	105
155	.0039	.100	100
180	.0035	.089	89
200	.0030	.074	74
270	.0021	.053	53
325	.0017	.044	44
600	.0010	.025	25

VALVE WIRE SIZING							
Maximum One-way Distance (ft.) Between Controller and Valve							
Ground Wire	Control Wire						
	18	16	14	12	10	8	6
18	1020	1260	1470	1640	1770	1860	1930
16	1260	1630	2000	2330	2610	2810	2960
14	1470	2000	2590	3180	3710	4150	4480
12	1640	2330	3180	4120	5050	5900	6590
10	1770	2610	3710	5050	6540	8030	9380
8	1860	2810	4150	5900	8030	10400	12770
6	1930	2960	4480	6590	9380	12770	16540

Solenoid Model: 24vac Pressure: 150psi Voltage Drop: 4V
 Min. Op. Voltage: 20V Amperage (peak): 0.3A

Conversion Factors		
To Convert	Into	Multiply by
FLOW		
Acre-Inch/Hr	Gallons/Min (gpm)	452.6
Acre-Inch	Gallons	27,154
Cubic Feet	Gallons (US)	7.481
Cubic Feet/Sec	Gallons/Min (gpm)	448.831
Cubic Meters	Gallons (US)	264.2
Cubic Meters/Hr	Gallons/Min (gpm)	4.403
Cubic Meters/Hr	Liters/Sec (L/s)	0.278
Gallons	Liters	3.785
Gallons/Min (gpm)	Cubic Meter/Hr (m³/hr)	0.227
Gallons/Min (gpm)	Liters/Sec (L/s)	0.063
Liters	Gallons (US)	0.264
Liters/Sec	Gallons/Min (gpm)	15.852
Liters/Sec	Cubic Meters/Hr (m³/hr)	3.598

AREA & LINEAR		
Acres	Hectares	0.405
Acres	Square Feet	43,560
Centimeters	Inches	0.394
Feet	Meters	0.305
Hectares	Acres	2.471
Inches	Millimeters	25.40
Meters	Feet	3.281
Miles	Kilometers	1.609
Miles	Feet	5,280
Millimeters	Inches	0.0394

PRESSURE		
Atmospheres	Kg/Sq Cm	1.033
Atmospheres	Pounds/Sq In (psi)	14.70
Bars	Pounds/Sq In (psi)	14.50
Feet of Water	Pounds/Sq In (psi)	0.434
Gallons of Water	Pounds	8.33
Kilograms/Sq Cm	Pounds/Sq In (psi)	14.22
KiloPascals (kPa)	Pounds/Sq In (psi)	0.145
Pounds/Sq In (psi)	Atmospheres	0.068
Pounds/Sq In (psi)	Bars	0.069
Pounds/Sq In (psi)	Feet of Water	2.307
Pounds/Sq In (psi)	KiloPascals (kPa)	6.895

POWER		
Horsepower	Kilowatts	0.746
Kilowatts	Horsepower	1.341

CONVERTING PARTS PER MILLION TO PERCENTS OR RATIOS					
PPM	Percent	Ratio	PPM	Percent	Ratio
100,000	10.00	10:1	10,000	1.000	100:1
75,000	7.500	13:1	5,000	0.500	200:1
56,000	5.600	18:1	4,000	0.400	250:1
50,000	5.000	20:1	2,500	0.250	400:1
25,000	2.500	40:1	2,000	0.200	500:1
23,000	2.300	44:1	1,000	0.100	1,000:1
22,000	2.200	45:1	500	0.050	2,000:1
20,000	2.000	50:1	250	0.025	4,000:1
11,000	1.100	91:1			

FORMULAS & TABLES FOR WIRE SIZE CALCULATIONS

Size of Wire (a) = $\frac{\text{AMPS (b)} \times 22 \times \text{wire length (c)}}{\text{Volts (d)} \times \% \text{ of allowable voltage loss (e)} \times .8 \text{ (f)}}$

a • Size of wire is in area circular mills; to determine proper wire size to use for the area of circular mills calculated, look in the second table and select the next large wire size (example: for an area circular mills calculation of 12400 - select a #8 wire size).

b • AMPS - select this information from the first table for the amperage draw of the motor being considered. Note the different figures for "single phase" and "three phase". For a TRICKL-EEZ control unit with a certain motor size, add 3 AMPS for the current draw of the the auxiliary timers and other equipment.

c • Wire Length - is the distance from power source to motor in linear feet.

d • Volts - is the incoming voltage of the power source.

e • Percentage (%) of allowable voltage loss - this figure should be between .025 and .05 for all calculations for 115 volt motors and larger. Our recommended allowable voltage drop is 2.5 - 3%. The maximum is 5%. The only exception is for 24 volt solenoid valve calculations where voltage drop may be as large as 20%

f • .8 factor - this factor is to be used only when calculations are being made for aluminum wire. For copper wire calculations use a factor of 1.

Normal Amperage Draw for Various Motors							Wire Size	Area Circular
Alternating Current Motors								
	Single Phase			Three Phase 60 cycle			AWG/MCM	Mills
	Ampere rating of Motor							
HP	115v	230v	200v	208V	230v	460v		
1/2	9.8	4.9					18	1620
3/4	13.8	6.9					16	2580
1	16.0	8.0	4.2	4.0	3.6	1.8	14	4110
1 1/2	20.0	10.0	6.0	5.7	5.2	2.6	12	6530
2	24.0	12.0	7.8	7.5	6.8	3.4	10	10380
3	34.0	17.0	11.0	10.6	9.6	4.8	8	16510
5	56.0	28.0	17.5	16.7	15.2	7.6	6	26240
7 1/2	80.0	40.0	25.3	24.2	22.0	11.0	4	41640
10	100.0	50.0	32.2	30.8	28.0	14.0	3	52620
15			48.3	46.2	42.0	21.0	2	66360
20			62.1	59.4	54.0	27.0	1	83690
25			78.2	74.8	68.0	34.0	0	105600
30			92.0	88.0	80.0	40.0	00	133100
40			119.6	114.4	104.0	52.0	000	167800
50			149.5	143.0	130.0	65.0	0000	211600
60			177.1	169.4	154.0	77.0	250	250000
75			220.8	211.2	192.0	96.0	300	300000
100			285.2	272.8	248.0	124.0	350	350000
							400	400000
							500	500000

For 90% & 80% power factor- the above figures shall be multiplied by 1.1 & 1.25 respectively.

HEAD & PRESSURE EQUIVALENTS																
Ft in Head	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70
PSI	.4	.9	1.3	1.7	2.2	2.6	3.0	3.5	3.9	4.3	8.7	13.0	17.3	21.7	26.0	30.3
Ft in Head	80	90	100	110	120	130	140	150	160	170	180	190	200	225	250	275
PSI	34.7	39.0	43.3	47.7	52.0	56.3	60.6	65.0	69.3	73.6	78.0	82.3	86.6	97.5	108.5	119.1

TRICKL-EEZ IRRIGATION INC

NEED A SYSTEM DESIGNED?

If you would like us to design a system for you, we will be happy to do so. **(Sorry, we do not design systems for lawns or landscaping or small home or hobby gardens!)** Please send us all relevant information and we will get a design to you as quickly as possible. The information we will need is:

What are you growing? _____

What is the row spacing? _____

How long are the rows? _____

How many rows? _____

What is the plant/ tree spacing? _____

What are the dimensions of the fields? _____

What is the terrain like (elevation changes)? _____

What is your water source (well, municipal, pond, river, lake, etc.)? _____

If using a pump, what is the make and model of the pump? _____

Where is the water source in relation to the fields? _____

How many gallons per minute of water is available? _____

What is the available pressure in psi? _____

Do you want an automatic system, or a manually operated system? _____

Do you want a fertilizer injector factored in? _____

Do you have specific preferences you'd like us to consider? _____

Please feel free to use the following page to make sketches that can aid us in designing your system, then you can simply mail this page to us for a design and materials list.

Please include:

Your Farm Name: _____

Your Name: _____

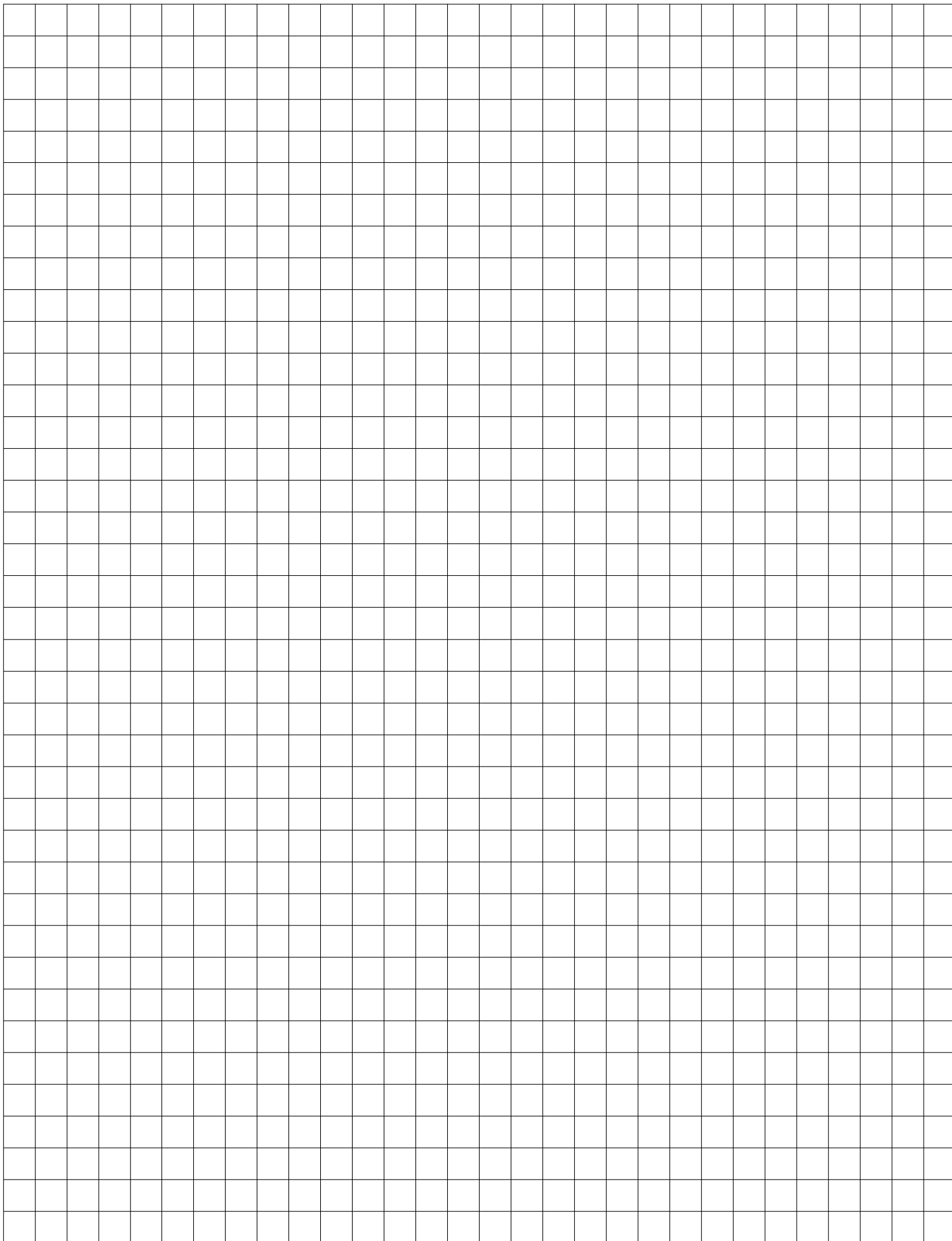
Address: _____

City, State, Zip: _____

Daytime Phone: _____

Fax Number: _____

Thank you for the opportunity to help you to irrigate you farm!



NOTES

TRICKL-EEZ IRRIGATION INC

Michigan Department of Treasury
3372 (Rev. 03-16)

Please fill out form and return to **TRICKL-EEZ IRRIGATION**

Michigan Sales and Use Tax Certificate of Exemption

FAX: 269-429-6669

or a-r@trickl-eez.com

INSTRUCTIONS: DO NOT send to the Department of Treasury. Certificate must be retained in the seller's records. This certificate is invalid unless all four sections are completed by the purchaser.

SECTION 1: TYPE OF PURCHASE

A. One-Time Purchase
Order or Invoice Number: _____

C. Blanket Certificate
Expiration Date (maximum of four years): _____

B. Blanket Certificate, Recurring Business Relationship

The purchaser hereby claims exemption on the purchase of tangible personal property and selected services made from the vendor listed below. This certifies that this claim is based upon the purchaser's proposed use of the items or services, OR the status of the purchaser.

Vendor's Name and Address

TRICKL-EEZ IRRIGATION, 4266 HOLLYWOOD ROAD, SAINT JOSEPH, MICHIGAN 49085

SECTION 2: ITEMS COVERED BY THIS CERTIFICATE

Check one of the following:

- All items purchased.
- Limited to the following items: _____

SECTION 3: BASIS FOR EXEMPTION CLAIM FEIN# _____

Check one of the following:

- For Lease. Enter Use Tax Registration Number: _____
- For Resale at Retail. Enter Sales Tax License Number: _____

The following exemptions DO NOT require the purchaser to provide a number:

- Agricultural Production. Enter percentage: _____ %
- Church, Government Entity, Nonprofit School, or Nonprofit Hospital (Circle type of organization).
- Contractor (must provide Michigan Sales and Use Tax Contractor Eligibility Statement (Form 3520)).
- For Resale at Wholesale.
- Industrial Processing. Enter percentage: _____ %
- Nonprofit Internal Revenue Code Section 501(c)(3) or 501(c)(4) Exempt Organization (must provide IRS authorized letter with this form).
- Nonprofit Organization with an authorized letter issued by the Michigan Department of Treasury prior to June 1994 (must provide copy of letter with this form).
- Rolling Stock purchased by an Interstate Motor Carrier.
- Qualified Data Center
- Other (explain): _____

SECTION 4: CERTIFICATION

I declare, under penalty of perjury, that the information on this certificate is true, that I have consulted the statutes, administrative rules and other sources of law applicable to my exemption, and that I have exercised reasonable care in assuring that my claim of exemption is valid under Michigan law. In the event this claim is disallowed, I accept full responsibility for the payment of tax, penalty and any accrued interest, including, if necessary, reimbursement to the vendor for tax and accrued interest.

Business Name		Type of Business (see codes on page 2)	
Business Address		City, State, ZIP Code	
Business Telephone Number (include area code)		Name (Print or Type)	
Signature and Title		Date Signed	

Application for a TRICKL-EEZ IRRIGATION Credit Agreement



4266 Hollywood Road
St. Joseph, MI 49085
(269)429-8200 • (269)429-6669 Fax

For Office Use Only:	
Approved By: _____	Date Approved: _____
Credit Limit: _____	Customer #: _____
Posted By: _____	Date Posted: _____

Date: _____

Name of Business _____

Number of years in business: _____

Business Address _____

Own _____ Rent _____ Lease _____

City _____ State _____ Zip _____

Business Phone _____

State Resale Tax Exempt # _____

Issuing State _____

(Certificate must be attached)

Fax Number _____

E-Mail _____

TYPE OF BUSINESS

Sole Proprietorship _____ Partnership _____ Corporation _____ Government _____

ESTIMATED MONTHLY PURCHASES

To \$499 \$500-\$999 \$1,000-\$2,499 \$2,500-\$4,999 \$5,000-\$9,999 \$10,000+

LIST NAME(S) AND ADDRESSES OF PARTNERS AND OFFICERS

Full Name _____

Telephone Number (____) _____

Address _____

Social Security Number _____

Date of Birth _____

Full Name _____

Telephone Number (____) _____

Address _____

Social Security Number _____

Date of Birth _____

BANK REFERENCE

Last 4 Digits of Acct Number: _____

Bank _____

Contact _____

Address _____

City _____ State _____ Zip _____

Telephone Number (____) _____

Fax Number (____) _____

BUSINESS CREDIT REFERENCES

List trade related references with whom you have established credit and do business with on a regular basis:

Name _____ Name _____

Address _____ Address _____

City _____ State _____ Zip _____ City _____ State _____ Zip _____

Telephone _____ Telephone _____

Fax # _____ Fax # _____

Name _____ Name _____

Address _____ Address _____

City _____ State _____ Zip _____ City _____ State _____ Zip _____

Telephone _____ Telephone _____

Fax # _____ Fax # _____

Terms and Conditions

This is a summary of **TRICKL-EEZ IRRIGATION's** Terms and Conditions statement which is printed in our catalog. These terms and conditions are very important and should be read and understood prior to release of shipments.

Complete this credit agreement and please allow time for written varification. Until your credit agreement is approved, all shipments are C.O.D.

All orders are shipped F.O.B. **TRICKL-EEZ IRRIGATION's** premises freight prepaid. Invoices are due thirty (30) days after invoice date and past due on the thirty-first (31st) day. All past due invoices will be charged a 1½% service charge per month. Postmark will determine payment date. **TRICKL-EEZ IRRIGATION** will not ship to any account with an invoice over thirty (30) days. Such an account may be reopened by paying **TRICKL-EEZ IRRIGATION** for all amounts past due.

Should **TRICKL-EEZ IRRIGATION** have to take any action to collect any monies due from customer, **TRICKL-EEZ IRRIGATION** shall be entitled to attorney's fees and costs, service charges, and interest at the maximum legal rate from the date the monies are first due. Should any dispute arise regarding this agreement or any transactions between the parties exclusive jurisdiction for resolution of such dispute shall be the courts of Michigan and exclusive law applicable shall be that of Michigan.

TRICKL-EEZ IRRIGATION reserves the right to refuse service to anyone.

I have read the above requirements for terms and conditions, and I authorize **TRICKL-EEZ IRRIGATION** to check our/my credit history with the banking institution listed above, or any credit reporting firm. In signing this agreement I agree to the above terms and will abide with them.

Signature _____ Title _____

Name _____ Date _____

In consideration of the extension of credit terms, the undersigned solely and/or collectively do personally guarantee the payment of all charges made by and/or on behalf of the applicants, plus attorney fees, court and all other costs of collection should collection proceedings become necessary.

Signature _____ Title _____

Name _____ Date _____

Please include a copy of most current year-to-date and year end financial statements.



Sales Order

3550 Chambersburg Road
Biglerville, PA 17307
(717)337-3030 • Fax (717)337-1785

Please mail, fax or e-mail this form to: 4266 Hollywood Road
St. Joseph, MI 49085
(269)429-8200 • Fax (269)429-6669
info@trickl-eez.com

Customer's Number: _____ Telephone: (____) _____

Name: _____ Ship To: _____

Address: _____ Address: _____

City: _____ State: _____ Zip Code: _____ City: _____ State: _____ Zip Code: _____

				PO #	
Terms	Ship Via	Todays Date	Ship Date		

Product Code	Description	U/M	Quantity Ordered	Price Each	Extension

I WISH TO PAY BY CREDIT CARD VISA MASTERCARD DISCOVER AMERICAN EXP

Name of Cardholder _____ Signature _____
- - - - - / /20

Card Number _____ Expiration Date _____ CVV2 Code _____

THIS FORM MAY BE PHOTOCOPIED - VOID UNLESS COMPLETE INFORMATION IS SUPPLIED
CHECK ONE: SALES TAX UNIT EXEMPTION CERTIFICATE
 SALES TAX BLANKET EXEMPTION CERTIFICATE

- Property and services purchased or leased using this certificate are exempt from sales tax because:
- Property or services will be directly used by purchaser in performing purchaser's operation as: _____
 - Property will be resold under license # _____
 - Other _____

I am authorized to execute this Certificate and claim this exemption. Misuse of this Certificate by seller, lessor buyer, lessee, or their representatives is punishable by fine and imprisonment. The provisions of this Certificate are a part of every transaction between the parties included.

Name of Purchaser or Lessee _____ Street Address _____ City _____ State _____ Zip Code _____

Signature _____ Signer's Title _____ Date _____ EIN _____

Total Materials
Sales Tax
Freight
Total



CVV2 Num

CVV2 Code is found on the back of your card, on the strip where you sign your name. It is the **LAST NUMBERS.**