

SPRINGFIELD PLASTICS, INC.

AUBURN, IL

PIPE FLOW CHART

PIPE		MANNINGS VALUE	SLOPE ft./100ft.	VELOCITY ft./sec.	FLOW cu. ft./sec.	FLOW GPM	ACRES DRAINED						
DIAMETER INCHES	n						DRAINAGE COEFFICIENT						
							0.25	0.375	0.5	0.75	1	1.5	2
4	SWP	0.015	0.15	0.73	0.064	29	6	4.1	3.0	2.0	1.5	1.0	0.8
4	SWP	0.015	0.2	0.85	0.074	33	7	4.7	3.5	2.3	1.8	1.2	0.9
4	SWP	0.015	0.3	1.04	0.090	41	9	5.7	4.3	2.9	2.1	1.4	1.1
4	SWP	0.015	0.4	1.20	0.104	47	10	6.6	5.0	3.3	2.5	1.7	1.2
4	SWP	0.015	0.5	1.34	0.117	52	11	7.4	5.5	3.7	2.8	1.8	1.4
4	SWP	0.015	1	1.89	0.165	74	16	10.5	7.8	5.2	3.9	2.6	2.0
4	SWP	0.015	2	2.67	0.233	105	22	14.8	11.1	7.4	5.5	3.7	2.8
4	SWP	0.015	3	3.27	0.286	129	27	18.1	13.6	9.1	6.8	4.5	3.4
4	DWP	0.012	0.1	0.75	0.07	29	6	4.1	3.1	2.1	1.6	1.0	0.8
4	DWP	0.012	0.2	1.06	0.09	41	9	5.8	4.4	2.9	2.2	1.5	1.1
4	DWP	0.012	0.3	1.29	0.11	51	11	7.2	5.4	3.6	2.7	1.8	1.3
4	DWP	0.012	0.4	1.49	0.13	59	12	8.3	6.2	4.1	3.1	2.1	1.6
4	DWP	0.012	0.5	1.67	0.15	66	14	9.2	6.9	4.6	3.5	2.3	1.7
4	DWP	0.012	1	2.36	0.21	93	20	13.1	9.8	6.5	4.9	3.3	2.5
4	DWP	0.012	2	3.34	0.29	131	28	18.5	13.9	9.2	6.9	4.6	3.5
4	DWP	0.012	3	4.09	0.36	161	34	22.6	17.0	11.3	8.5	5.7	4.2
5	SWP	0.015	0.1	0.69	0.09	43	9	6.0	4.5	3.0	2.2	1.5	1.1
5	SWP	0.015	0.2	0.98	0.13	60	13	8.5	6.4	4.2	3.2	2.1	1.6
5	SWP	0.015	0.3	1.20	0.16	74	16	10.4	7.8	5.2	3.9	2.6	1.9
5	SWP	0.015	0.4	1.39	0.19	85	18	12.0	9.0	6.0	4.5	3.0	2.2
5	SWP	0.015	0.5	1.55	0.21	95	20	13.4	10.1	6.7	5.0	3.4	2.5
5	SWP	0.015	1	2.19	0.30	135	28	19.0	14.2	9.5	7.1	4.7	3.6
5	SWP	0.015	2	3.10	0.42	190	40	26.8	20.1	13.4	10.1	6.7	5.0
5	SWP	0.015	3	3.80	0.52	233	49	32.8	24.6	16.4	12.3	8.2	6.2
6	SWP	0.015	0.1	0.78	0.15	69	15	9.8	7.3	4.9	3.7	2.4	1.8
6	SWP	0.015	0.2	1.11	0.22	98	21	13.8	10.3	6.9	5.2	3.4	2.6
6	SWP	0.015	0.3	1.36	0.27	120	25	16.9	12.7	8.4	6.3	4.2	3.2
6	SWP	0.015	0.4	1.57	0.31	138	29	19.5	14.6	9.8	7.3	4.9	3.7
6	SWP	0.015	0.5	1.75	0.34	155	33	21.8	16.4	10.9	8.2	5.5	4.1
6	SWP	0.015	1	2.48	0.49	219	46	30.8	23.1	15.4	11.6	7.7	5.8
6	SWP	0.015	2	3.50	0.69	310	65	43.6	32.7	21.8	16.4	10.9	8.2
6	SWP	0.015	3	4.29	0.84	379	80	53.4	40.1	26.7	20.0	13.4	10.0
6	DWP	0.012	0.1	0.98	0.19	87	18	12.2	9.1	6.1	4.6	3.0	2.3
6	DWP	0.012	0.2	1.38	0.27	122	26	17.2	12.9	8.6	6.5	4.3	3.2
6	DWP	0.012	0.3	1.70	0.33	150	32	21.1	15.8	10.6	7.9	5.3	4.0
6	DWP	0.012	0.4	1.96	0.38	173	37	24.4	18.3	12.2	9.1	6.1	4.6
6	DWP	0.012	0.5	2.19	0.43	193	41	27.3	20.4	13.6	10.2	6.8	5.1
6	DWP	0.012	1	3.10	0.61	274	58	38.5	28.9	19.3	14.5	9.6	7.2
6	DWP	0.012	2	4.38	0.86	387	82	54.5	40.9	27.3	20.4	13.6	10.2
6	DWP	0.012	3	5.36	1.05	474	100	66.8	50.1	33.4	25.0	16.7	12.5
8	SWP	0.015	0.1	0.95	0.33	149	32	21.0	15.8	10.5	7.9	5.3	3.9
8	SWP	0.015	0.2	1.34	0.47	211	45	29.7	22.3	14.9	11.1	7.4	5.6
8	SWP	0.015	0.3	1.64	0.57	258	55	36.4	27.3	18.2	13.6	9.1	6.8
8	SWP	0.015	0.4	1.90	0.66	298	63	42.0	31.5	21.0	15.8	10.5	7.9
8	SWP	0.015	0.5	2.12	0.74	333	70	47.0	35.2	23.5	17.6	11.7	8.8
8	SWP	0.015	1	3.00	1.05	471	100	66.4	49.8	33.2	24.9	16.6	12.5
8	SWP	0.015	2	4.24	1.48	667	141	93.9	70.4	47.0	35.2	23.5	17.6
8	SWP	0.015	3	5.20	1.81	817	173	115.0	86.3	57.5	43.1	28.8	21.6
8	DWP	0.012	0.1	1.19	0.41	186	39	26.3	19.7	13.1	9.8	6.6	4.9
8	DWP	0.012	0.2	1.68	0.59	264	56	37.1	27.8	18.6	13.9	9.3	7.0
8	DWP	0.012	0.3	2.05	0.72	323	68	45.5	34.1	22.7	17.1	11.4	8.5

SPRINGFIELD PLASTICS, INC.

AUBURN, IL

PIPE FLOW CHART

PIPE		MANNINGS VALUE	SLOPE ft./100ft.	VELOCITY ft./sec.	FLOW cu. ft./sec.	FLOW GPM	ACRES DRAINED						
DIAMETER INCHES	n						DRAINAGE COEFFICIENT						
						0.25	0.375	0.5	0.75	1	1.5	2	
8	DWP	0.012	0.4	2.37	0.83	373	79	52.5	39.4	26.3	19.7	13.1	9.8
8	DWP	0.012	0.5	2.65	0.93	417	88	58.7	44.0	29.4	22.0	14.7	11.0
8	DWP	0.012	1	3.75	1.31	589	125	83.0	62.3	41.5	31.1	20.8	15.6
8	DWP	0.012	2	5.31	1.85	833	176	117.4	88.1	58.7	44.0	29.4	22.0
8	DWP	0.012	3	6.50	2.27	1021	216	143.8	107.8	71.9	53.9	35.9	27.0
10	SWP	0.017	0.1	0.97	0.53	239	50	33.6	25.2	16.8	12.6	8.4	6.3
10	SWP	0.017	0.2	1.37	0.75	337	71	47.5	35.6	23.8	17.8	11.9	8.9
10	SWP	0.017	0.3	1.68	0.92	413	87	58.2	43.7	29.1	21.8	14.6	10.9
10	SWP	0.017	0.4	1.94	1.06	477	101	67.2	50.4	33.6	25.2	16.8	12.6
10	SWP	0.017	0.5	2.17	1.19	533	113	75.1	56.4	37.6	28.2	18.8	14.1
10	SWP	0.017	1	3.07	1.68	754	159	106.3	79.7	53.1	39.8	26.6	19.9
10	SWP	0.017	2	4.35	2.37	1067	225	150.3	112.7	75.1	56.4	37.6	28.2
10	SWP	0.017	3	5.32	2.90	1306	276	184.0	138.0	92.0	69.0	46.0	34.5
10	DWP	0.012	0.1	1.38	0.75	338	71	47.6	35.7	23.8	17.9	11.9	8.9
10	DWP	0.012	0.2	1.95	1.06	478	101	67.3	50.5	33.7	25.2	16.8	12.6
10	DWP	0.012	0.3	2.38	1.30	585	124	82.5	61.8	41.2	30.9	20.6	15.5
10	DWP	0.012	0.4	2.75	1.50	676	143	95.2	71.4	47.6	35.7	23.8	17.9
10	DWP	0.012	0.5	3.08	1.68	756	160	106.4	79.8	53.2	39.9	26.6	20.0
10	DWP	0.012	1	4.35	2.37	1069	226	150.5	112.9	75.3	56.5	37.6	28.2
10	DWP	0.012	2	6.16	3.36	1511	319	212.9	159.7	106.4	79.8	53.2	39.9
10	DWP	0.012	3	7.54	4.11	1851	391	260.7	195.5	130.4	97.8	65.2	48.9
12	SWP	0.017	0.1	1.10	0.86	388	82	54.6	41.0	27.3	20.5	13.7	10.2
12	SWP	0.017	0.2	1.55	1.22	549	116	77.3	58.0	38.6	29.0	19.3	14.5
12	SWP	0.017	0.3	1.90	1.49	672	142	94.6	71.0	47.3	35.5	23.7	17.7
12	SWP	0.017	0.4	2.19	1.72	776	164	109.3	82.0	54.6	41.0	27.3	20.5
12	SWP	0.017	0.5	2.45	1.93	867	183	122.2	91.6	61.1	45.8	30.5	22.9
12	SWP	0.017	1	3.47	2.73	1227	259	172.8	129.6	86.4	64.8	43.2	32.4
12	SWP	0.017	2	4.91	3.85	1735	367	244.4	183.3	122.2	91.6	61.1	45.8
12	SWP	0.017	3	6.01	4.72	2124	449	299.3	224.5	149.6	112.2	74.8	56.1
12	DWP	0.012	0.1	1.55	1.22	549	116	77.4	58.1	38.7	29.0	19.4	14.5
12	DWP	0.012	0.2	2.20	1.73	777	164	109.5	82.1	54.7	41.1	27.4	20.5
12	DWP	0.012	0.3	2.69	2.11	952	201	134.1	100.6	67.0	50.3	33.5	25.1
12	DWP	0.012	0.4	3.11	2.44	1099	232	154.8	116.1	77.4	58.1	38.7	29.0
12	DWP	0.012	0.5	3.48	2.73	1229	260	173.1	129.8	86.5	64.9	43.3	32.5
12	DWP	0.012	1	4.92	3.86	1738	367	244.8	183.6	122.4	91.8	61.2	45.9
12	DWP	0.012	2	6.95	5.46	2457	519	346.2	259.6	173.1	129.8	86.5	64.9
12	DWP	0.012	3	8.52	6.69	3010	636	424.0	318.0	212.0	159.0	106.0	79.5
15	SWP	0.018	0.1	1.20	1.48	664	140	93.6	70.2	46.8	35.1	23.4	17.5
15	SWP	0.018	0.2	1.70	2.09	939	199	132.3	99.3	66.2	49.6	33.1	24.8
15	SWP	0.018	0.3	2.08	2.56	1151	243	162.1	121.6	81.0	60.8	40.5	30.4
15	SWP	0.018	0.4	2.41	2.95	1328	281	187.2	140.4	93.6	70.2	46.8	35.1
15	SWP	0.018	0.5	2.69	3.30	1485	314	209.2	156.9	104.6	78.5	52.3	39.2
15	SWP	0.018	1	3.80	4.67	2101	444	295.9	221.9	148.0	111.0	74.0	55.5
15	SWP	0.018	2	5.38	6.60	2971	628	418.5	313.9	209.2	156.9	104.6	78.5
15	SWP	0.018	3	6.59	8.08	3638	769	512.6	384.4	256.3	192.2	128.1	96.1
15	DWP	0.012	0.1	1.80	2.21	996	211	140.4	105.3	70.2	52.6	35.1	26.3
15	DWP	0.012	0.2	2.55	3.13	1409	298	198.5	148.9	99.3	74.4	49.6	37.2
15	DWP	0.012	0.3	3.13	3.84	1726	365	243.1	182.3	121.6	91.2	60.8	45.6
15	DWP	0.012	0.4	3.61	4.43	1993	421	280.7	210.6	140.4	105.3	70.2	52.6
15	DWP	0.012	0.5	4.03	4.95	2228	471	313.9	235.4	156.9	117.7	78.5	58.9
15	DWP	0.012	1	5.71	7.00	3151	666	443.9	332.9	221.9	166.5	111.0	83.2

SPRINGFIELD PLASTICS, INC.

AUBURN, IL

PIPE FLOW CHART

PIPE		MANNINGS VALUE	SLOPE ft./100ft.	VELOCITY ft./sec.	FLOW cu. ft./sec.	FLOW GPM	ACRES DRAINED						
DIAMETER INCHES	n						DRAINAGE COEFFICIENT						
						0.25	0.375	0.5	0.75	1	1.5	2	
15	DWP	0.012	2	8.07	9.90	4456	942	627.7	470.8	313.9	235.4	156.9	117.7
15	DWP	0.012	3	9.88	12.13	5457	1153	768.8	576.6	384.4	288.3	192.2	144.2
18	SWP	0.02	0.1	1.22	2.16	972	205	137.0	102.7	68.5	51.4	34.2	25.7
18	SWP	0.02	0.2	1.73	3.06	1375	291	193.7	145.3	96.8	72.6	48.4	36.3
18	SWP	0.02	0.3	2.12	3.74	1684	356	237.2	177.9	118.6	89.0	59.3	44.5
18	SWP	0.02	0.4	2.45	4.32	1944	411	273.9	205.4	137.0	102.7	68.5	51.4
18	SWP	0.02	0.5	2.73	4.83	2174	459	306.3	229.7	153.1	114.8	76.6	57.4
18	SWP	0.02	1	3.87	6.83	3074	650	433.1	324.8	216.6	162.4	108.3	81.2
18	SWP	0.02	2	5.47	9.66	4348	919	612.5	459.4	306.3	229.7	153.1	114.8
18	SWP	0.02	3	6.70	11.83	5325	1125	750.2	562.6	375.1	281.3	187.5	140.7
18	DWP	0.012	0.1	2.04	3.60	1620	342	228	171	114	86	57	43
18	DWP	0.012	0.2	2.88	5.09	2291	484	323	242	161	121	81	61
18	DWP	0.012	0.3	3.53	6.24	2806	593	395	297	198	148	99	74
18	DWP	0.012	0.4	4.08	7.20	3241	685	457	342	228	171	114	86
18	DWP	0.012	0.5	4.56	8.05	3623	766	510	383	255	191	128	96
18	DWP	0.012	1	6.44	11.39	5124	1083	722	541	361	271	180	135
18	DWP	0.012	2	9.11	16.10	7246	1531	1021	766	510	383	255	191
18	DWP	0.012	3	11.16	19.72	8875	1875	1250	938	625	469	313	234
21	DWP	0.012	0.1	2.26	5.43	2444	517	344	258	172	129	86	65
21	DWP	0.012	0.2	3.19	7.68	3457	730	487	365	243	183	122	91
21	DWP	0.012	0.3	3.91	9.41	4234	895	596	447	298	224	149	112
21	DWP	0.012	0.4	4.52	10.86	4888	1033	689	517	344	258	172	129
21	DWP	0.012	0.5	5.05	12.15	5465	1155	770	577	385	289	192	144
21	DWP	0.012	1	7.14	17.18	7729	1633	1089	817	544	408	272	204
21	DWP	0.012	2	10.10	24.29	10931	2310	1540	1155	770	577	385	289
21	DWP	0.012	3	12.37	29.75	13388	2829	1886	1415	943	707	472	354
24	SWP	0.02	0.1	1.48	4.65	2094	442	295	221	147	111	74	55
24	SWP	0.02	0.2	2.09	6.58	2961	626	417	313	209	156	104	78
24	SWP	0.02	0.3	2.57	8.06	3627	766	511	383	255	192	128	96
24	SWP	0.02	0.4	2.96	9.31	4188	885	590	442	295	221	147	111
24	SWP	0.02	0.5	3.31	10.40	4682	989	660	495	330	247	165	124
24	SWP	0.02	1	4.68	14.71	6622	1399	933	700	466	350	233	175
24	SWP	0.02	2	6.62	20.81	9364	1979	1319	989	660	495	330	247
24	SWP	0.02	3	8.11	25.49	11469	2424	1616	1212	808	606	404	303
24	DWP	0.012	0.1	2.47	7.76	3490	737	492	369	245.8	184.4	122.9	92.2
24	DWP	0.012	0.2	3.49	10.97	4935	1043	695	521	347.7	260.7	173.8	130.4
24	DWP	0.012	0.3	4.28	13.43	6045	1277	852	639	425.8	319.3	212.9	159.7
24	DWP	0.012	0.4	4.94	15.51	6980	1475	983	737	491.7	368.7	245.8	184.4
24	DWP	0.012	0.5	5.52	17.34	7804	1649	1099	825	549.7	412.3	274.8	206.1
24	DWP	0.012	1	7.81	24.52	11036	2332	1555	1166	777.4	583.0	388.7	291.5
24	DWP	0.012	2	11.04	34.68	15607	3298	2199	1649	1099	824.5	549.7	412.3
24	DWP	0.012	3	13.52	42.48	19115	4039	2693	2020	1346	1010	673.2	504.9
30	DWP	0.012	0.1	2.86	14.06	6328	1337	891	669	446	334	223	167
30	DWP	0.012	0.2	4.05	19.89	8949	1891	1261	946	630	473	315	236
30	DWP	0.012	0.3	4.96	24.36	10960	2316	1544	1158	772	579	386	290
30	DWP	0.012	0.4	5.73	28.12	12656	2674	1783	1337	891	669	446	334
30	DWP	0.012	0.5	6.41	31.44	14150	2990	1993	1495	997	748	498	374
30	DWP	0.012	1	9.06	44.47	20011	4229	2819	2114	1410	1057	705	529
30	DWP	0.012	2	12.81	62.89	28300	5980	3987	2990	1993	1495	997	748
30	DWP	0.012	3	15.69	77.02	34660	7324	4883	3662	2441	1831	1221	916
36	DWP	0.012	0.1	3.24	22.87	10291	2175	1450	1087	725	544	362	272

SPRINGFIELD PLASTICS, INC.

AUBURN, IL

PIPE FLOW CHART

PIPE		MANNINGS VALUE	SLOPE ft./100ft.	VELOCITY ft./sec.	FLOW cu. ft./sec.	FLOW GPM	ACRES DRAINED						
DIAMETER INCHES	n						DRAINAGE COEFFICIENT						
							0.25	0.375	0.5	0.75	1	1.5	2
36	DWP	0.012	0.2	4.58	32.34	14553	3075	2050	1538	1025	769	513	384
36	DWP	0.012	0.3	5.60	39.61	17824	3767	2511	1883	1256	942	628	471
36	DWP	0.012	0.4	6.47	45.74	20581	4349	2900	2175	1450	1087	725	544
36	DWP	0.012	0.5	7.23	51.13	23011	4863	3242	2431	1621	1216	810	608
36	DWP	0.012	1	10.23	72.32	32542	6877	4585	3438	2292	1719	1146	860
36	DWP	0.012	2	14.47	102.27	46021	9725	6483	4863	3242	2431	1621	1216
36	DWP	0.012	3	17.72	125.25	56364	11911	7941	5955	3970	2978	1985	1489
42	DWP	0.012	0.1	3.59	34.50	15524	3280	2187	1640	1093	820	547	410
42	DWP	0.012	0.2	5.07	48.79	21954	4639	3093	2320	1546	1160	773	580
42	DWP	0.012	0.3	6.21	59.75	26888	5682	3788	2841	1894	1420	947	710
42	DWP	0.012	0.4	7.17	68.99	31047	6561	4374	3280	2187	1640	1093	820
42	DWP	0.012	0.5	8.02	77.14	34712	7335	4890	3668	2445	1834	1223	917
42	DWP	0.012	1	11.34	109.09	49090	10374	6916	5187	3458	2593	1729	1297
42	DWP	0.012	2	16.04	154.27	69423	14671	9780	7335	4890	3668	2445	1834
42	DWP	0.012	3	19.64	188.95	85026	17968	11978	8984	5989	4492	2995	2246
48	DWP	0.012	0.1	3.92	49.25	22164	4684	3123	2342	1561	1171	781	585
48	DWP	0.012	0.2	5.54	69.66	31345	6624	4416	3312	2208	1656	1104	828
48	DWP	0.012	0.3	6.79	85.31	38390	8113	5408	4056	2704	2028	1352	1014
48	DWP	0.012	0.4	7.84	98.51	44329	9368	6245	4684	3123	2342	1561	1171
48	DWP	0.012	0.5	8.76	110.14	49561	10473	6982	5237	3491	2618	1746	1309
48	DWP	0.012	1	12.39	155.75	70090	14811	9874	7406	4937	3703	2469	1851
48	DWP	0.012	2	17.53	220.27	99122	20947	13964	10473	6982	5237	3491	2618
48	DWP	0.012	3	21.47	269.78	121399	25654	17103	12827	8551	6414	4276	3207

$$V=(0.59/n) \times d^{0.667} \times i^{0.5}$$