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2-3 DESIGN CRITERIA – Pipe Section Properties



As in the design of other structural components, the shape of the pipe profile helps determine how it will perform in the pipe/soil structure. Pipe properties include the moment of inertia of the wall profile (I), distance from the inside diameter to the neutral axis (c), and the section area of a longitudinal section (A_s). Pipe stiffness (PS) is a measure of the flexibility of a prescribed length of pipe and is measured in the laboratory by gauging the force required to deflect the pipe 5% of its inside diameter. Although substituted directly in the design equations, PS is primarily a quality check and should not be interpreted to be a limiting pipe property. Section properties of Sure-Lok® and Hi-Q® are shown in Table 2-1; properties for AASHTO pipe are shown in Table 2-2.

Table 2-1 – Section Properties for Sure-Lok® and Hi-Q® Pipe

Inside Diameter, ID		Outside Diameter, OD		Pipe Stiffness, PS		Section Area, A_s		Distance from Inside Diameter to Neutral Axis, c		Moment of Inertia, I	
in.	mm	in.	mm	pii	N/m/mm	in ² /in	mm ² /mm	in.	mm	in ⁴ /in	mm ⁴ /mm
4	100	4.7	119	50	340	0.088	2.235	0.139	3.531	0.002	32.774
6	150	7.0	178	50	340	0.117	2.974	0.192	4.876	0.003	54.373
8	200	9.5	241	50	340	0.137	3.470	0.297	7.535	0.009	142.567
10	250	12.0	305	50	340	0.152	3.863	0.393	9.970	0.019	303.604
12	300	14.2	361	50	345	0.198	5.024	0.436	11.076	0.032	523.214
15	375	17.7	450	42	290	0.230	5.847	0.508	12.893	0.055	901.594
18	450	21.5	546	40	275	0.251	6.378	0.689	17.508	0.100	1636.928
24	600	28.4	721	34	235	0.308	7.831	0.857	21.778	0.184	3012.178
30	750	36.0	914	28	195	0.384	9.756	1.033	26.248	0.322	5269.812
36	900	41.4	1052	22	150	0.375	9.525	1.020	25.908	0.356	5837.072
42	1050	48.0	1219	20	140	0.422	10.719	1.110	28.194	0.543	8898.176
48	1200	55.0	1397	18	125	0.440	11.176	1.150	29.210	0.543	8898.176
54	1350	61.0	1549	16	110	0.473	12.014	1.250	31.750	0.827	13552.102
60	1500	67.3	1709	14	97	0.538	13.665	1.370	34.798	1.008	16518.161

Table 2-2 – Section Properties for AASHTO Pipe

Inside Diameter, ID		Outside Diameter, OD		Pipe Stiffness, PS		Section Area, A_s		Distance from Inside Diameter to Neutral Axis, c		Moment of Inertia, I	
in.	mm	in.	mm	pii	N/m/mm	in ² /in	mm ² /mm	in.	mm	in ⁴ /in	mm ⁴ /mm
3	75	3.6	91	35	240	0.0448	1.138	0.1528	3.881	0.0004	6.736
4	100	4.6	118	35	240	0.0568	1.444	0.1917	4.868	0.0007	10.810
6	150	7.0	178	35	240	0.0837	2.125	0.3158	8.022	0.0021	34.966
8	200	9.5	241	35	240	0.1044	2.653	0.4345	11.035	0.0054	87.673
10	250	12.0	305	35	240	0.1117	2.837	0.5319	13.510	0.0120	196.727
12	300	14.2	361	50	345	0.2084	5.292	0.6136	15.586	0.0286	468.272
15	375	17.7	450	42	290	0.1958	4.972	0.7239	18.386	0.0419	687.370

18	450	21.5	546	40	275	0.2335	5.931	1.0098	25.648	0.0784	1284.143
24	600	28.4	721	34	235	0.2906	7.380	1.2329	31.315	0.1478	2422.427

Pipe similar to Sure-Lok[®], Hi-Q[®] and AASHTO products but made by other manufacturers may have slightly different section properties depending on their design. Data for those products should be obtained from the respective manufacturer for use in this design procedure.

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