



Head loss calculations using Hazen Williams formula / AWWA M-45 Page 23, 24

**150** Hazen Williams "C" factor

ID	ND	0.30 m/sec		1.0 ft/s		0.61 m/sec		2.0 ft/s		0.91 m/sec		3.0 ft/s		1.22 m/sec		4.0 ft/s	
		Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss
inch	mm	m3/hr	US Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3 / hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km
158	4013	13,880	61,118	0.014	0.014	27,760	122,237	0.050	0.050	41,640	183,355	0.105	0.105	55,521	244,474	0.179	0.179
150	3810	12,510	55,086	0.015	0.015	25,020	110,172	0.053	0.053	37,530	165,258	0.112	0.112	50,041	220,344	0.191	0.191
144	3658	11,529	50,767	0.015	0.015	23,059	101,534	0.055	0.055	34,588	152,302	0.117	0.117	46,117	203,069	0.200	0.200
132	3353	9,688	42,659	0.017	0.017	19,376	85,317	0.061	0.061	29,064	127,976	0.130	0.130	38,751	170,634	0.221	0.221
126	3200	8,827	38,869	0.018	0.018	17,654	77,737	0.065	0.065	26,481	116,606	0.137	0.137	35,309	155,474	0.234	0.234
120	3048	8,006	35,255	0.019	0.019	16,013	70,510	0.069	0.069	24,019	105,765	0.145	0.145	32,026	141,020	0.247	0.247
114	2896	7,226	31,818	0.020	0.020	14,452	63,635	0.073	0.073	21,678	95,453	0.154	0.154	28,903	127,270	0.263	0.263
108	2743	6,485	28,557	0.022	0.022	12,971	57,113	0.078	0.078	19,456	85,670	0.164	0.164	25,941	114,226	0.280	0.280
102	2591	5,785	25,472	0.023	0.023	11,569	50,943	0.083	0.083	17,354	76,415	0.176	0.176	23,139	101,887	0.299	0.299
96	2438	5,124	22,563	0.025	0.025	10,248	45,126	0.089	0.089	15,372	67,690	0.189	0.189	20,497	90,253	0.321	0.321
90	2286	4,504	19,831	0.027	0.027	9,007	39,662	0.096	0.096	13,511	59,493	0.203	0.203	18,015	79,324	0.346	0.346
84	2134	3,923	17,275	0.029	0.029	7,846	34,550	0.104	0.104	11,770	51,825	0.221	0.221	15,693	69,100	0.376	0.376
78	1981	3,383	14,895	0.032	0.032	6,765	29,790	0.114	0.114	10,148	44,686	0.241	0.241	13,531	59,581	0.410	0.410
72	1829	2,882	12,692	0.035	0.035	5,765	25,384	0.125	0.125	8,647	38,075	0.264	0.264	11,529	50,767	0.450	0.450
66	1676	2,422	10,665	0.038	0.038	4,844	21,329	0.138	0.138	7,266	31,994	0.292	0.292	9,688	42,659	0.498	0.498
64	1626	2,277	10,028	0.040	0.040	4,555	20,056	0.143	0.143	6,832	30,084	0.303	0.303	9,110	40,112	0.516	0.516
60	1524	2,002	8,814	0.043	0.043	4,003	17,627	0.154	0.154	6,005	26,441	0.327	0.327	8,006	35,255	0.557	0.557
54	1372	1,621	7,139	0.048	0.048	3,243	14,278	0.175	0.175	4,864	21,417	0.370	0.370	6,485	28,557	0.630	0.630
48	1219	1,281	5,641	0.056	0.056	2,562	11,282	0.201	0.201	3,843	16,922	0.425	0.425	5,124	22,563	0.723	0.723
42	1067	981	4,319	0.065	0.065	1,962	8,637	0.234	0.234	2,942	12,956	0.496	0.496	3,923	17,275	0.845	0.845
40	1016	890	3,917	0.069	0.069	1,779	7,834	0.248	0.248	2,669	11,752	0.525	0.525	3,558	15,669	0.895	0.895
36	914	721	3,173	0.078	0.078	1,441	6,346	0.281	0.281	2,162	9,519	0.594	0.594	2,882	12,692	1.012	1.012
32	813	569	2,507	0.089	0.089	1,139	5,014	0.322	0.322	1,708	7,521	0.682	0.682	2,277	10,028	1.162	1.162
30	762	500	2,203	0.096	0.096	1,001	4,407	0.348	0.348	1,501	6,610	0.736	0.736	2,002	8,814	1.253	1.253
28	711	436	1,919	0.105	0.105	872	3,839	0.377	0.377	1,308	5,758	0.798	0.798	1,744	7,678	1.358	1.358
24	610	320	1,410	0.125	0.125	641	2,820	0.451	0.451	961	4,231	0.955	0.955	1,281	5,641	1.627	1.627
20	508	222	979	0.155	0.155	445	1,959	0.558	0.558	667	2,938	1.182	1.182	890	3,917	2.013	2.013
18	457	180	793	0.175	0.175	360	1,586	0.632	0.632	540	2,380	1.338	1.338	721	3,173	2.277	2.277
16	406	142	627	0.201	0.201	285	1,254	0.725	0.725	427	1,880	1.535	1.535	569	2,507	2.614	2.614
14	356	109	480	0.235	0.235	218	960	0.848	0.848	327	1,440	1.795	1.795	436	1,919	3.056	3.056
12	305	80	353	0.282	0.282	160	705	1.015	1.015	240	1,058	2.150	2.150	320	1,410	3.660	3.660
10	254	56	245	0.349	0.349	111	490	1.257	1.257	167	734	2.661	2.661	222	979	4.530	4.530
8	203	36	157	0.453	0.453	71	313	1.632	1.632	107	470	3.454	3.454	142	627	5.882	5.882
6	152	20	88	0.634	0.634	40	176	2.284	2.284	60	264	4.837	4.837	80	353	8.235	8.235



Head loss calculations using Hazen Williams formula / AWWA M-45 Page 23, 24

150 Hazen Williams "C" factor

ID	ND	1.5 m/sec		5.0 ft/s		1.8 m/sec		6.0 ft/s		2.1 8.0		7.0 ft/s		2.4 m/sec		8.0 ft/s	
		Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss
inch	mm	m3/hr	US Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km
158	4013	69,401	305,592	0.271	0.271	83,281	366,711	0.380	0.380	97,161	427,829	0.505	0.505	111,041	488,947	0.647	0.647
150	3810	62,551	275,430	0.288	0.288	75,061	330,515	0.404	0.404	87,571	385,601	0.537	0.537	100,081	440,687	0.687	0.687
144	3658	57,647	253,836	0.302	0.302	69,176	304,603	0.423	0.423	80,705	355,370	0.563	0.563	92,235	406,137	0.721	0.721
132	3353	48,439	213,293	0.334	0.334	58,127	255,951	0.469	0.469	67,815	298,610	0.623	0.623	77,503	341,268	0.798	0.798
126	3200	44,136	194,343	0.353	0.353	52,963	233,212	0.495	0.495	61,790	272,080	0.658	0.658	70,617	310,949	0.843	0.843
120	3048	40,032	176,275	0.374	0.374	48,039	211,530	0.524	0.524	56,045	246,785	0.697	0.697	64,052	282,040	0.892	0.892
114	2896	36,129	159,088	0.397	0.397	43,355	190,906	0.556	0.556	50,581	222,723	0.740	0.740	57,807	254,541	0.947	0.947
108	2743	32,426	142,783	0.423	0.423	38,912	171,339	0.593	0.593	45,397	199,896	0.788	0.788	51,882	228,452	1.009	1.009
102	2591	28,923	127,359	0.452	0.452	34,708	152,830	0.634	0.634	40,493	178,302	0.843	0.843	46,278	203,774	1.079	1.079
96	2438	25,621	112,816	0.485	0.485	30,745	135,379	0.680	0.680	35,869	157,942	0.905	0.905	40,993	180,505	1.158	1.158
90	2286	22,518	99,155	0.524	0.524	27,022	118,986	0.734	0.734	31,526	138,816	0.976	0.976	36,029	158,647	1.249	1.249
84	2134	19,616	86,375	0.568	0.568	23,539	103,650	0.795	0.795	27,462	120,925	1.058	1.058	31,385	138,200	1.354	1.354
78	1981	16,914	74,476	0.619	0.619	20,296	89,371	0.867	0.867	23,679	104,267	1.153	1.153	27,062	119,162	1.477	1.477
72	1829	14,412	63,459	0.680	0.680	17,294	76,151	0.952	0.952	20,176	88,843	1.267	1.267	23,059	101,534	1.622	1.622
66	1676	12,110	53,323	0.753	0.753	14,532	63,988	1.054	1.054	16,954	74,652	1.402	1.402	19,376	85,317	1.795	1.795
64	1626	11,387	50,140	0.780	0.780	13,664	60,168	1.093	1.093	15,942	70,197	1.454	1.454	18,219	80,225	1.861	1.861
60	1524	10,008	44,069	0.841	0.841	12,010	52,882	1.179	1.179	14,011	61,696	1.568	1.568	16,013	70,510	2.007	2.007
54	1372	8,107	35,696	0.952	0.952	9,728	42,835	1.333	1.333	11,349	49,974	1.774	1.774	12,971	57,113	2.271	2.271
48	1219	6,405	28,204	1.092	1.092	7,686	33,845	1.531	1.531	8,967	39,486	2.036	2.036	10,248	45,126	2.606	2.606
42	1067	4,904	21,594	1.277	1.277	5,885	25,912	1.789	1.789	6,866	30,231	2.380	2.380	7,846	34,550	3.047	3.047
40	1016	4,448	19,586	1.352	1.352	5,338	23,503	1.894	1.894	6,227	27,421	2.520	2.520	7,117	31,338	3.226	3.226
36	914	3,603	15,865	1.529	1.529	4,324	19,038	2.143	2.143	5,044	22,211	2.850	2.850	5,765	25,384	3.649	3.649
32	813	2,847	12,535	1.755	1.755	3,416	15,042	2.460	2.460	3,985	17,549	3.271	3.271	4,555	20,056	4.188	4.188
30	762	2,502	11,017	1.893	1.893	3,002	13,221	2.653	2.653	3,503	15,424	3.528	3.528	4,003	17,627	4.516	4.516
28	711	2,180	9,597	2.052	2.052	2,615	11,517	2.875	2.875	3,051	13,436	3.824	3.824	3,487	15,356	4.896	4.896
24	610	1,601	7,051	2.458	2.458	1,922	8,461	3.444	3.444	2,242	9,871	4.580	4.580	2,562	11,282	5.864	5.864
20	508	1,112	4,897	3.042	3.042	1,334	5,876	4.263	4.263	1,557	6,855	5.669	5.669	1,779	7,834	7.258	7.258
18	457	901	3,966	3.441	3.441	1,081	4,759	4.822	4.822	1,261	5,553	6.413	6.413	1,441	6,346	8.210	8.210
16	406	712	3,134	3.950	3.950	854	3,761	5.534	5.534	996	4,387	7.361	7.361	1,139	5,014	9.423	9.423
14	356	545	2,399	4.618	4.618	654	2,879	6.470	6.470	763	3,359	8.605	8.605	872	3,839	11.017	11.017
12	305	400	1,763	5.530	5.530	480	2,115	7.749	7.749	560	2,468	10.306	10.306	641	2,820	13.194	13.194
10	254	278	1,224	6.845	6.845	334	1,469	9.592	9.592	389	1,714	12.757	12.757	445	1,959	16.331	16.331
8	203	178	783	8.888	8.888	214	940	12.453	12.453	249	1,097	16.562	16.562	285	1,254	21.204	21.204
6	152	100	441	12.444	12.444	120	529	17.436	17.436	140	617	23.190	23.190	160	705	29.688	29.688



Head loss calculations using Hazen Williams formula / AWWA M-45 Page 23, 24

**150** Hazen Williams "C" factor

Note : Velocities shown here do not necessarily denote suitability of pipe for that service

ID	ND	2.7 m/sec		9.0 ft/s		3.0 m/sec		10.0 ft/s		3.4 m/sec		11.0 ft/s		3.7 m/sec		12.0 ft/s	
		Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss
inch	mm	m3/hr	US Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km
158	4013	124,921	550,066	0.804	0.804	138,801	611,184	0.977	0.977	152,682	672,303	1.165	1.165	166,562	733,421	1.369	1.369
150	3810	112,591	495,773	0.854	0.854	125,101	550,859	1.038	1.038	137,612	605,945	1.238	1.238	150,122	661,031	1.455	1.455
144	3658	103,764	456,905	0.896	0.896	115,293	507,672	1.089	1.089	126,823	558,439	1.299	1.299	138,352	609,206	1.526	1.526
132	3353	87,191	383,927	0.992	0.992	96,879	426,585	1.206	1.206	106,566	469,244	1.438	1.438	116,254	511,902	1.689	1.689
126	3200	79,444	349,818	1.048	1.048	88,272	388,686	1.273	1.273	97,099	427,555	1.519	1.519	105,926	466,423	1.784	1.784
120	3048	72,058	317,295	1.109	1.109	80,065	352,550	1.348	1.348	88,071	387,805	1.608	1.608	96,078	423,060	1.889	1.889
114	2896	65,033	286,359	1.178	1.178	72,259	318,176	1.431	1.431	79,484	349,994	1.707	1.707	86,710	381,811	2.005	2.005
108	2743	58,367	257,009	1.255	1.255	64,853	285,565	1.525	1.525	71,338	314,122	1.819	1.819	77,823	342,678	2.136	2.136
102	2591	52,062	229,246	1.342	1.342	57,847	254,717	1.630	1.630	63,632	280,189	1.945	1.945	69,416	305,661	2.284	2.284
96	2438	46,117	203,069	1.440	1.440	51,242	225,632	1.750	1.750	56,366	248,195	2.088	2.088	61,490	270,758	2.452	2.452
90	2286	40,533	178,478	1.553	1.553	45,037	198,309	1.887	1.887	49,540	218,140	2.251	2.251	54,044	237,971	2.644	2.644
84	2134	35,309	155,474	1.684	1.684	39,232	172,749	2.046	2.046	43,155	190,024	2.440	2.440	47,078	207,299	2.867	2.867
78	1981	30,445	134,057	1.836	1.836	33,827	148,952	2.231	2.231	37,210	163,848	2.662	2.662	40,593	178,743	3.126	3.126
72	1829	25,941	114,226	2.016	2.016	28,823	126,918	2.450	2.450	31,706	139,610	2.923	2.923	34,588	152,302	3.433	3.433
66	1676	21,798	95,982	2.232	2.232	24,220	106,646	2.713	2.713	26,642	117,311	3.236	3.236	29,064	127,976	3.801	3.801
64	1626	20,497	90,253	2.314	2.314	22,774	100,281	2.812	2.812	25,051	110,309	3.355	3.355	27,329	120,337	3.941	3.941
60	1524	18,015	79,324	2.496	2.496	20,016	88,137	3.033	3.033	22,018	96,951	3.618	3.618	24,019	105,765	4.250	4.250
54	1372	14,592	64,252	2.823	2.823	16,213	71,391	3.431	3.431	17,834	78,530	4.092	4.092	19,456	85,670	4.807	4.807
48	1219	11,529	50,767	3.240	3.240	12,810	56,408	3.938	3.938	14,091	62,049	4.697	4.697	15,372	67,690	5.517	5.517
42	1067	8,827	38,869	3.788	3.788	9,808	43,187	4.604	4.604	10,789	47,506	5.491	5.491	11,770	51,825	6.450	6.450
40	1016	8,006	35,255	4.011	4.011	8,896	39,172	4.874	4.874	9,786	43,089	5.814	5.814	10,675	47,007	6.829	6.829
36	914	6,485	28,557	4.537	4.537	7,206	31,729	5.514	5.514	7,926	34,902	6.577	6.577	8,647	38,075	7.725	7.725
32	813	5,124	22,563	5.208	5.208	5,694	25,070	6.328	6.328	6,263	27,577	7.548	7.548	6,832	30,084	8.867	8.867
30	762	4,504	19,831	5.616	5.616	5,004	22,034	6.825	6.825	5,504	24,238	8.141	8.141	6,005	26,441	9.562	9.562
28	711	3,923	17,275	6.088	6.088	4,359	19,194	7.398	7.398	4,795	21,114	8.825	8.825	5,231	23,033	10.366	10.366
24	610	2,882	12,692	7.291	7.291	3,203	14,102	8.861	8.861	3,523	15,512	10.569	10.569	3,843	16,922	12.415	12.415
20	508	2,002	8,814	9.025	9.025	2,224	9,793	10.967	10.967	2,446	10,772	13.082	13.082	2,669	11,752	15.367	15.367
18	457	1,621	7,139	10.209	10.209	1,801	7,932	12.406	12.406	1,982	8,726	14.798	14.798	2,162	9,519	17.383	17.383
16	406	1,281	5,641	11.718	11.718	1,423	6,268	14.239	14.239	1,566	6,894	16.985	16.985	1,708	7,521	19.951	19.951
14	356	981	4,319	13.699	13.699	1,090	4,799	16.647	16.647	1,199	5,278	19.857	19.857	1,308	5,758	23.325	23.325
12	305	721	3,173	16.406	16.406	801	3,525	19.937	19.937	881	3,878	23.782	23.782	961	4,231	27.935	27.935
10	254	500	2,203	20.307	20.307	556	2,448	24.678	24.678	612	2,693	29.436	29.436	667	2,938	34.577	34.577
8	203	320	1,410	26.366	26.366	356	1,567	32.040	32.040	391	1,724	38.218	38.218	427	1,880	44.893	44.893
6	152	180	793	36.916	36.916	200	881	44.861	44.861	220	970	53.512	53.512	240	1,058	62.857	62.857



Head loss calculations using Hazen Williams formula / AWWA M-45 Page 23, 24

**150** Hazen Williams "C" factor

Note : Velocities shown here do not necessarily denote suitability of pipe for that service

ID	ND	4.0 m/sec		13.0 ft/s		4.3 m/sec		14.0 ft/s		4.6 m/sec		15.0 ft/s		4.9 m/sec		16.0 ft/s	
		Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss
inch	mm	m3/hr	US Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km
158	4013	180,442	794,540	1.59	1.59	194,322	855,658	1.82	1.82	208,202	916,776	2.07	2.07	222,082	977,895	2.33	2.33
150	3810	162,632	716,117	1.69	1.69	175,142	771,203	1.93	1.93	187,652	826,289	2.20	2.20	200,162	881,374	2.48	2.48
144	3658	149,881	659,973	1.77	1.77	161,411	710,740	2.03	2.03	172,940	761,508	2.31	2.31	184,470	812,275	2.60	2.60
132	3353	125,942	554,561	1.96	1.96	135,630	597,219	2.25	2.25	145,318	639,878	2.55	2.55	155,006	682,536	2.88	2.88
126	3200	114,753	505,292	2.07	2.07	123,580	544,161	2.37	2.37	132,407	583,029	2.70	2.70	141,234	621,898	3.04	3.04
120	3048	104,084	458,315	2.19	2.19	112,091	493,570	2.51	2.51	120,097	528,825	2.85	2.85	128,104	564,080	3.22	3.22
114	2896	93,936	413,629	2.33	2.33	101,162	445,447	2.67	2.67	108,388	477,264	3.03	3.03	115,614	509,082	3.41	3.41
108	2743	84,308	371,235	2.48	2.48	90,794	399,791	2.84	2.84	97,279	428,348	3.23	3.23	103,764	456,905	3.64	3.64
102	2591	75,201	331,132	2.65	2.65	80,986	356,604	3.04	3.04	86,770	382,076	3.45	3.45	92,555	407,548	3.89	3.89
96	2438	66,614	293,321	2.84	2.84	71,738	315,885	3.26	3.26	76,862	338,448	3.71	3.71	81,986	361,011	4.18	4.18
90	2286	58,547	257,802	3.07	3.07	63,051	277,633	3.52	3.52	67,555	297,464	4.00	4.00	72,058	317,295	4.50	4.50
84	2134	51,001	224,574	3.32	3.32	54,925	241,849	3.81	3.81	58,848	259,124	4.33	4.33	62,771	276,399	4.88	4.88
78	1981	43,976	193,638	3.63	3.63	47,358	208,533	4.16	4.16	50,741	223,428	4.72	4.72	54,124	238,324	5.32	5.32
72	1829	37,470	164,993	3.98	3.98	40,353	177,685	4.57	4.57	43,235	190,377	5.19	5.19	46,117	203,069	5.85	5.85
66	1676	31,486	138,640	4.41	4.41	33,907	149,305	5.06	5.06	36,329	159,969	5.74	5.74	38,751	170,634	6.47	6.47
64	1626	29,606	130,365	4.57	4.57	31,884	140,393	5.24	5.24	34,161	150,421	5.95	5.95	36,438	160,449	6.71	6.71
60	1524	26,021	114,579	4.93	4.93	28,023	123,392	5.65	5.65	30,024	132,206	6.42	6.42	32,026	141,020	7.24	7.24
54	1372	21,077	92,809	5.57	5.57	22,698	99,948	6.39	6.39	24,320	107,087	7.26	7.26	25,941	114,226	8.19	8.19
48	1219	16,653	73,330	6.40	6.40	17,935	78,971	7.34	7.34	19,216	84,612	8.34	8.34	20,497	90,253	9.39	9.39
42	1067	12,750	56,144	7.48	7.48	13,731	60,462	8.58	8.58	14,712	64,781	9.75	9.75	15,693	69,100	10.98	10.98
40	1016	11,565	50,924	7.92	7.92	12,455	54,841	9.08	9.08	13,344	58,758	10.32	10.32	14,234	62,676	11.63	11.63
36	914	9,368	41,248	8.96	8.96	10,088	44,421	10.27	10.27	10,809	47,594	11.67	11.67	11,529	50,767	13.15	13.15
32	813	7,402	32,591	10.28	10.28	7,971	35,098	11.79	11.79	8,540	37,605	13.40	13.40	9,110	40,112	15.10	15.10
30	762	6,505	28,645	11.09	11.09	7,006	30,848	12.72	12.72	7,506	33,052	14.45	14.45	8,006	35,255	16.28	16.28
28	711	5,667	24,953	12.02	12.02	6,103	26,872	13.79	13.79	6,539	28,792	15.66	15.66	6,975	30,711	17.65	17.65
24	610	4,163	18,333	14.40	14.40	4,484	19,743	16.51	16.51	4,804	21,153	18.76	18.76	5,124	22,563	21.14	21.14
20	508	2,891	12,731	17.82	17.82	3,114	13,710	20.44	20.44	3,336	14,690	23.22	23.22	3,558	15,669	26.17	26.17
18	457	2,342	10,312	20.16	20.16	2,522	11,105	23.12	23.12	2,702	11,899	26.27	26.27	2,882	12,692	29.60	29.60
16	406	1,850	8,148	23.14	23.14	1,993	8,775	26.54	26.54	2,135	9,401	30.15	30.15	2,277	10,028	33.97	33.97
14	356	1,417	6,238	27.05	27.05	1,526	6,718	31.02	31.02	1,635	7,198	35.25	35.25	1,744	7,678	39.72	39.72
12	305	1,041	4,583	32.39	32.39	1,121	4,936	37.15	37.15	1,201	5,288	42.21	42.21	1,281	5,641	47.57	47.57
10	254	723	3,183	40.10	40.10	778	3,428	45.99	45.99	834	3,672	52.25	52.25	890	3,917	58.87	58.87
8	203	463	2,037	52.06	52.06	498	2,194	59.71	59.71	534	2,350	67.84	67.84	569	2,507	76.44	76.44
6	152	260	1,146	72.89	72.89	280	1,234	83.60	83.60	300	1,322	94.98	94.98	320	1,410	107.03	107.03



Head loss calculations using Hazen Williams formula / AWWA M-45 Page 23, 24

**150** Hazen Williams "C" factor

Note : Velocities shown here do not necessarily denote suitability of pipe for that service

ID	ND	5.2 m/sec		17.0 ft/s		5.5 m/sec		18.0 ft/s		5.8 m/sec		19.0 ft/s		6.1 m/sec		20.0 ft/s	
		Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss	Flow	Flow	Head loss	Head loss
inch	mm	m3/hr	US Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km	m3/hr	Gal/min	Ft H2O / 1000 ft	m H2O / Km
158	4013	235,962	1,039,013	2.61	2.61	249,843	1,100,132	2.90	2.90	263,723	1,161,250	3.20	3.20	277,603	1,222,368	3.52	3.52
150	3810	212,672	936,460	2.77	2.77	225,183	991,546	3.08	3.08	237,693	1,046,632	3.40	3.40	250,203	1,101,718	3.74	3.74
144	3658	195,999	863,042	2.91	2.91	207,528	913,809	3.23	3.23	219,058	964,576	3.57	3.57	230,587	1,015,343	3.93	3.93
132	3353	164,694	725,195	3.22	3.22	174,381	767,853	3.58	3.58	184,069	810,512	3.95	3.95	193,757	853,170	4.35	4.35
126	3200	150,062	660,766	3.40	3.40	158,889	699,635	3.78	3.78	167,716	738,504	4.17	4.17	176,543	777,372	4.59	4.59
120	3048	136,110	599,335	3.60	3.60	144,117	634,590	4.00	4.00	152,123	669,845	4.42	4.42	160,130	705,100	4.86	4.86
114	2896	122,840	540,900	3.82	3.82	130,065	572,717	4.25	4.25	137,291	604,535	4.69	4.69	144,517	636,352	5.16	5.16
108	2743	110,249	485,461	4.07	4.07	116,735	514,018	4.52	4.52	123,220	542,574	5.00	5.00	129,705	571,131	5.50	5.50
102	2591	98,340	433,019	4.35	4.35	104,124	458,491	4.84	4.84	109,909	483,963	5.34	5.34	115,694	509,434	5.88	5.88
96	2438	87,111	383,574	4.67	4.67	92,235	406,137	5.19	5.19	97,359	428,701	5.74	5.74	102,483	451,264	6.31	6.31
90	2286	76,562	337,126	5.04	5.04	81,066	356,957	5.60	5.60	85,569	376,788	6.19	6.19	90,073	396,619	6.80	6.80
84	2134	66,694	293,674	5.46	5.46	70,617	310,949	6.07	6.07	74,540	328,224	6.71	6.71	78,464	345,499	7.38	7.38
78	1981	57,507	253,219	5.96	5.96	60,889	268,114	6.62	6.62	64,272	283,009	7.32	7.32	67,655	297,905	8.04	8.04
72	1829	49,000	215,760	6.54	6.54	51,882	228,452	7.27	7.27	54,764	241,144	8.03	8.03	57,647	253,836	8.83	8.83
66	1676	41,173	181,299	7.24	7.24	43,595	191,963	8.05	8.05	46,017	202,628	8.89	8.89	48,439	213,293	9.78	9.78
64	1626	38,716	170,477	7.51	7.51	40,993	180,505	8.34	8.34	43,271	190,534	9.22	9.22	45,548	200,562	10.14	10.14
60	1524	34,028	149,834	8.09	8.09	36,029	158,647	9.00	9.00	38,031	167,461	9.94	9.94	40,032	176,275	10.93	10.93
54	1372	27,562	121,365	9.16	9.16	29,184	128,504	10.18	10.18	30,805	135,644	11.25	11.25	32,426	142,783	12.37	12.37
48	1219	21,778	95,894	10.51	10.51	23,059	101,534	11.68	11.68	24,340	107,175	12.91	12.91	25,621	112,816	14.20	14.20
42	1067	16,674	73,418	12.29	12.29	17,654	77,737	13.66	13.66	18,635	82,056	15.09	15.09	19,616	86,375	16.60	16.60
40	1016	15,123	66,593	13.01	13.01	16,013	70,510	14.46	14.46	16,903	74,427	15.98	15.98	17,792	78,344	17.57	17.57
36	914	12,250	53,940	14.72	14.72	12,971	57,113	16.36	16.36	13,691	60,286	18.08	18.08	14,412	63,459	19.88	19.88
32	813	9,679	42,619	16.89	16.89	10,248	45,126	18.77	18.77	10,818	47,633	20.75	20.75	11,387	50,140	22.81	22.81
30	762	8,507	37,458	18.21	18.21	9,007	39,662	20.25	20.25	9,508	41,865	22.38	22.38	10,008	44,069	24.60	24.60
28	711	7,410	32,630	19.75	19.75	7,846	34,550	21.95	21.95	8,282	36,469	24.26	24.26	8,718	38,389	26.67	26.67
24	610	5,444	23,973	23.65	23.65	5,765	25,384	26.29	26.29	6,085	26,794	29.05	29.05	6,405	28,204	31.94	31.94
20	508	3,781	16,648	29.27	29.27	4,003	17,627	32.54	32.54	4,226	18,607	35.96	35.96	4,448	19,586	39.54	39.54
18	457	3,062	13,485	33.11	33.11	3,243	14,278	36.80	36.80	3,423	15,072	40.68	40.68	3,603	15,865	44.72	44.72
16	406	2,420	10,655	38.00	38.00	2,562	11,282	42.24	42.24	2,704	11,908	46.69	46.69	2,847	12,535	51.33	51.33
14	356	1,853	8,158	44.43	44.43	1,962	8,637	49.38	49.38	2,071	9,117	54.58	54.58	2,180	9,597	60.01	60.01
12	305	1,361	5,993	53.21	53.21	1,441	6,346	59.15	59.15	1,521	6,698	65.37	65.37	1,601	7,051	71.87	71.87
10	254	945	4,162	65.86	65.86	1,001	4,407	73.21	73.21	1,056	4,652	80.91	80.91	1,112	4,897	88.96	88.96
8	203	605	2,664	85.51	85.51	641	2,820	95.05	95.05	676	2,977	105.05	105.05	712	3,134	115.50	115.50
6	152	340	1,498	119.73	119.73	360	1,586	133.08	133.08	380	1,675	147.08	147.08	400	1,763	161.72	161.72