

Table No. 43—Frictional Heads at Given Rates of Discharge in Clean Cast Iron Pipe for each 1,000 Feet of Length

U. S. Gallons Discharged per Minute	U. S. Gallons Discharged per Twenty-four Hours	Imp. Gallons Discharged per Blinute	Imp. Gallons Discharged per Hour	4-inch Pipe			6-inch Pipe			8-inch Pipe			10-inch Pipe			12-inch Pipe			14-inch Pipe		
				Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head	
					Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.
25	36,000	20.83	30,000	64	.59	.26	11	.05	.11	16	.04	.02	10	.02	.01	.07	.01	.01	.03	.01	.01
50	72,000	41.67	60,000	128	1.18	.52	23	.10	.32	32	.10	.04	20	.04	.02	.14	.02	.02	.06	.02	.02
100	144,000	83.33	120,000	256	2.35	1.04	46	.20	.64	64	.20	.08	40	.08	.04	.28	.04	.04	.12	.04	.04
150	216,000	125.00	180,000	384	3.53	1.56	69	.30	.96	96	.30	.12	60	.12	.06	.42	.06	.06	.18	.06	.06
200	288,000	166.66	240,000	512	4.71	2.08	92	.40	1.28	128	.40	.16	80	.16	.08	.56	.08	.08	.24	.08	.08
250	360,000	208.33	300,000	640	5.89	2.60	115	.50	1.60	160	.50	.20	100	.20	.10	.70	.10	.10	.30	.10	.10
300	432,000	250.00	360,000	768	7.07	3.12	138	.60	1.92	192	.60	.24	120	.24	.12	.84	.12	.12	.36	.12	.12
350	504,000	291.66	420,000	896	8.25	3.64	161	.70	2.24	224	.70	.28	140	.28	.14	.98	.14	.14	.42	.14	.14
400	576,000	333.33	480,000	1,024	9.43	4.16	184	.80	2.56	256	.80	.32	160	.32	.16	1.12	.16	.16	.48	.16	.16
450	648,000	375.00	540,000	1,152	10.61	4.68	207	.90	2.88	288	.90	.36	180	.36	.18	1.26	.18	.18	.54	.18	.18
500	720,000	416.66	600,000	1,280	11.79	5.20	230	1.00	3.20	320	1.00	.40	200	.40	.20	1.40	.20	.20	.60	.20	.20
600	864,000	500.00	720,000	1,536	13.54	6.12	272	1.20	3.84	384	1.20	.48	240	.48	.24	1.68	.24	.24	.72	.24	.24
700	1,008,000	583.33	840,000	1,792	15.29	6.99	314	1.40	4.48	448	1.40	.56	280	.56	.28	1.96	.28	.28	.84	.28	.28
800	1,152,000	666.66	960,000	2,048	17.04	7.86	356	1.60	5.12	512	1.60	.64	320	.64	.32	2.24	.32	.32	.96	.32	.32
900	1,296,000	750.00	1,080,000	2,304	18.79	8.73	398	1.80	5.76	576	1.80	.72	360	.72	.36	2.52	.36	.36	1.08	.36	.36
1,000	1,440,000	833.33	1,200,000	2,560	20.54	9.60	440	2.00	6.40	640	2.00	.80	400	.80	.40	2.80	.40	.40	1.20	.40	.40
1,200	1,728,000	1,000.00	1,440,000	3,072	24.64	11.52	528	2.40	7.68	768	2.40	.96	480	.96	.48	3.36	.48	.48	1.44	.48	.48
1,400	2,016,000	1,166.66	1,680,000	3,584	28.74	13.44	616	2.80	8.96	896	2.80	1.12	560	1.12	.56	3.92	.56	.56	1.68	.56	.56
1,600	2,304,000	1,333.33	1,920,000	4,096	32.84	15.36	704	3.20	10.24	1,024	3.20	1.28	640	1.28	.64	4.48	.64	.64	1.92	.64	.64
1,800	2,592,000	1,500.00	2,160,000	4,608	36.94	17.28	792	3.60	11.52	1,152	3.60	1.44	720	1.44	.72	5.04	.72	.72	2.16	.72	.72
2,000	2,880,000	1,666.66	2,400,000	5,120	41.04	19.20	880	4.00	12.80	1,280	4.00	1.60	800	1.60	.80	5.60	.80	.80	2.40	.80	.80
2,500	3,600,000	2,083.33	3,000,000	6,400	50.64	23.52	1,104	4.80	15.36	1,536	4.80	1.92	960	1.92	.96	6.72	.96	.96	2.88	.96	.96
3,000	4,320,000	2,500.00	3,600,000	7,680	60.24	27.84	1,328	5.60	17.92	1,792	5.60	2.24	1,120	2.24	1.12	7.84	1.12	1.12	3.36	1.12	1.12
3,500	5,040,000	2,916.66	4,200,000	8,960	69.84	32.16	1,552	6.40	20.48	2,048	6.40	2.56	1,280	2.56	1.28	8.96	1.28	1.28	3.84	1.28	1.28
4,000	5,760,000	3,333.33	4,800,000	10,240	79.44	36.48	1,776	7.20	23.04	2,304	7.20	2.88	1,440	2.88	1.44	10.08	1.44	1.44	4.32	1.44	1.44
4,500	6,480,000	3,750.00	5,400,000	11,520	89.04	40.80	2,000	8.00	25.60	2,560	8.00	3.20	1,600	3.20	1.60	11.20	1.60	1.60	4.80	1.60	1.60

APPLICATION OF THESE TABLES

These tables may be used to ascertain, approximately, (1) the maximum discharging capacity of a pipe under a given head; (2) the diameter of pipe for a given discharge and head; (3) the loss of pressure for a given rate of discharge; or (4) the volume of water flowing through a pipe from the reduction of pressure. Velocity and entrance head are not included in the figures for frictional head and may be omitted for ordinary mains, but should be added for high velocity.

(1) For example, what is the maximum discharge from 7.500 feet of 8-inch straight cast iron pipe under 160 ft. head? The frictional head per 1,000 feet is found by dividing 160 by 7.5, which gives 21.33. In the column 8-inch pipe, the closest frictional head to 21.33 is 21.74, and the table shows that an 8-inch pipe under a 21.74 feet head will discharge 833 Imperial gallons, or 1,000 U.S. gallons, per minute.

(2) For example, what diameter of pipe will be required to deliver 1,583,333 Imperial gallons, or 1,900,000 U.S. gallons, in 24 hours through a line 25,000 feet long under 150 ft. head? The frictional head per 1,000 feet, i.e. 150 divided by 25, is 6. The nearest discharge in the table is 1,680,000 Imperial gallons, or 2,016,000 U.S. gallons, in 24 hours, and the table shows that a 12-inch pipe under 5.74 frictional head will give this.