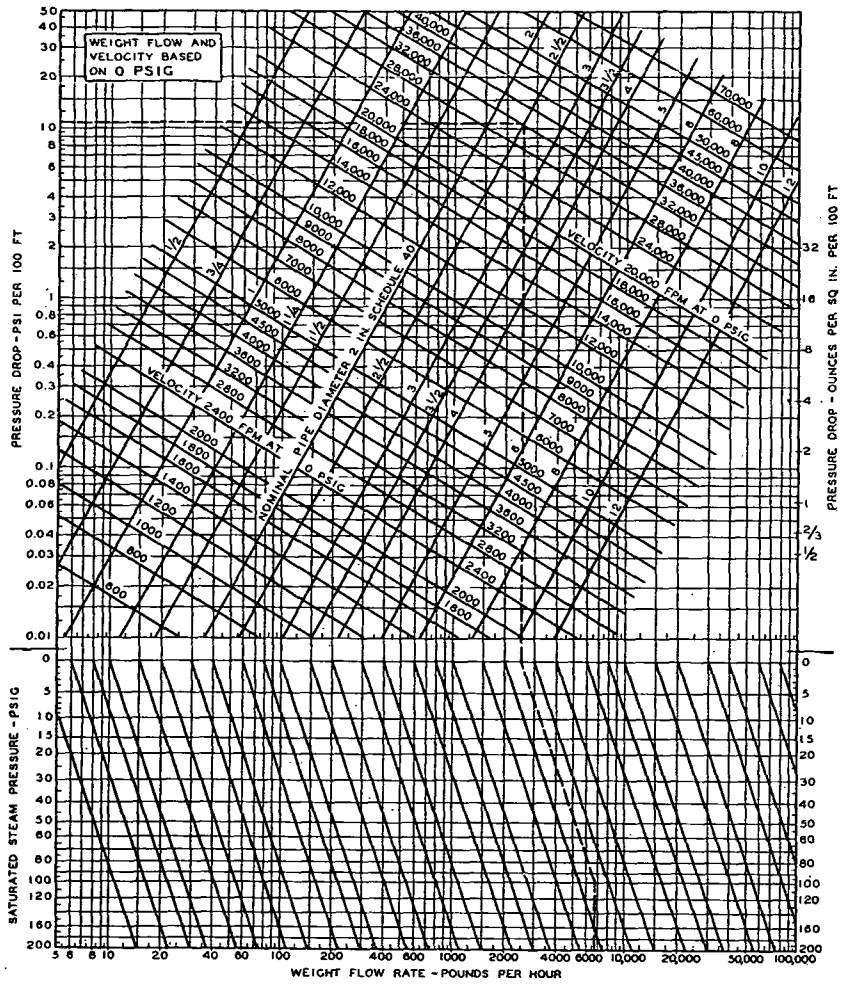


*Based on Moody Friction Factor where flow of condensate does not inhibit the flow of steam.*

Fig. 22 .... Basic Chart for Weight-Flow Rate and Velocity of Steam in Schedule 40 Pipe Based on Saturation Pressure of 0 Psig

*(With Multiplier Charts for Obtaining Weight-Flow Rates and Velocities at All Saturation Pressures Between 0 and 200 Psig)*



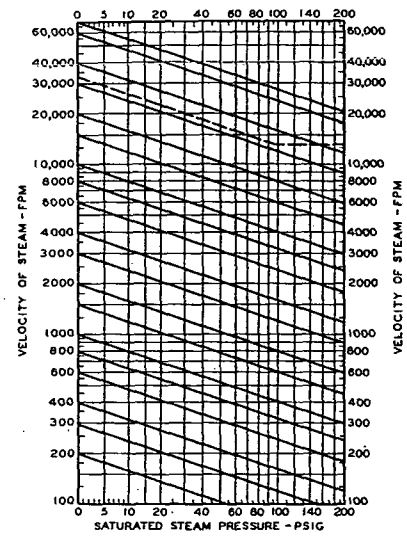


Fig. 22 (*Continued*).... Velocity Multiplier Chart

**Example of Use of Basic and Velocity Multiplier Charts.**

*Given:*

*a.* Weight-Flow Rate = 6700 lb per hr.
*b.* Initial Steam Pressure = 100 psig.
*c.* Pressure Drop = 11 psi per 100 ft.

*Find:*

*a.* Size of Schedule 40 pipe required.
*b.* Velocity of steam in pipe.

*Solution:* The following steps are illustrated by the broken line on Fig. 22:

*Step 1.* Enter Fig. 22 at a weight-flow rate of 6700 lb per hr and move vertically to the horizontal line at 100 psig.

*Step 2.* Follow along inclined multiplier line (upward and to the left) to horizontal 0 psig line. The equivalent weight flow at 0 psig is about 2500 lb per hr.

*Step 3.* Follow the 2500 lb per hr line vertically until it intersects the horizontal line at 11 psi per 100 ft pressure drop. The nominal pipe size is 2½ in. The equivalent steam velocity at 0 psig is about 32,700 fpm.

*Step 4.* To find the steam velocity at 100 psig, locate the value of 32,700 fpm on the ordinate of the velocity multiplier chart at 0 psig.

*Step 5.* Move along the inclined multiplier line (downward and to the right) until it intersects the vertical 100 psig pressure line. The velocity as read from the right (or left) scale is about 13,000 fpm.

Note: The preceding Steps 1 to 5 would be rearranged or reversed if different data were given.

Table 5 .... Weight Flow Rate of Steam in Schedule 40 Pipe[a] at Initial Saturation Pressures of 3.5 and 12 Psig.[b, c]

*(Weight Flow Rate Expressed in Pounds per Hour)*

| Nom. Pipe Size Inches | Pressure Drop—Psi Per 100 Ft in Length | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ⅛ Psi (1 oz) | | ¼ Psi (2 oz) | | ½ Psi (4 oz) | | ¾ Psi (8 oz) | | 1 Psi (12 oz) | | 1 Psi | | 2 Psi | |
| | Sat. press. psig | | Sat. press. psig | | Sat. press psig. | | Sat. press. psig | | Sat. press. psig. | | Sat. press. psig | | Sat. press. psig | |
| | 3.5 | 12 | 3.5 | 12 | 3.5 | 12 | 3.5 | 12 | 3.5 | 12 | 3.5 | 12 | 3.5 | 12 |
| ¾ | 9 | 11 | 14 | 16 | 20 | 24 | 29 | 35 | 36 | 43 | 42 | 50 | 60 | 73 |
| 1 | 17 | 21 | 26 | 31 | 37 | 46 | 54 | 66 | 68 | 82 | 81 | 95 | 114 | 137 |
| 1¼ | 36 | 45 | 53 | 66 | 78 | 96 | 111 | 138 | 140 | 170 | 162 | 200 | 232 | 280 |
| 1½ | 56 | 70 | 84 | 100 | 120 | 147 | 174 | 210 | 218 | 260 | 246 | 304 | 360 | 430 |
| 2 | 108 | 134 | 162 | 194 | 234 | 285 | 336 | 410 | 420 | 510 | 480 | 590 | 710 | 850 |
| 2½ | 174 | 215 | 258 | 310 | 378 | 460 | 540 | 660 | 680 | 820 | 780 | 950 | 1150 | 1370 |
| 3 | 318 | 380 | 465 | 550 | 660 | 810 | 960 | 1160 | 1190 | 1430 | 1380 | 1670 | 1950 | 2400 |
| 3½ | 462 | 550 | 670 | 800 | 990 | 1218 | 1410 | 1700 | 1740 | 2100 | 2000 | 2420 | 2950 | 3450 |
| 4 | 726 | 800 | 950 | 1160 | 1410 | 1690 | 1980 | 2400 | 2450 | 3000 | 2880 | 3460 | 4200 | 4900 |
| 5 | 1200 | 1430 | 1680 | 2100 | 2440 | 3000 | 3570 | 4250 | 4380 | 5250 | 5100 | 6100 | 7500 | 8600 |
| 6 | 1920 | 2300 | 2820 | 3350 | 3960 | 4850 | 5700 | 7000 | 7200 | 8600 | 8400 | 10,000 | 11,900 | 14,200 |
| 8 | 3900 | 4800 | 5570 | 7000 | 8100 | 10,000 | 11,400 | 14,300 | 14,500 | 17,700 | 16,500 | 20,500 | 24,000 | 29,500 |
| 10 | 7200 | 8800 | 10,200 | 12,600 | 15,000 | 18,200 | 21,000 | 26,000 | 26,200 | 32,000 | 30,000 | 37,000 | 42,700 | 52,000 |
| 12 | 11,400 | 13,700 | 16,500 | 19,500 | 23,400 | 28,400 | 33,000 | 40,000 | 41,000 | 49,500 | 43,000 | 57,500 | 67,800 | 81,000 |

[a] Based on Moody Friction Factor, where flow of condensate does not inhibit the flow of steam.
[b] The weight-flow rates at 3.5 psig can be used to cover sat. press. from 1 to 6 psig, and the rates at 12 psig can be used to cover sat. press. from 8 to 16 psig with an error not exceeding 8 percent.
[c] The steam velocities corresponding to the weight-flow rates given in this table can be found from the basic chart and velocity multiplier chart, Fig. 22.