INSTRUCTIONS FOR WATER LINE CAPACITY SLIDE RULE

EXAMPLE — To correct flows on this rule to other values of "C".

The example on the back side of the rule gives 500 g.p.m. when the loss of head in feet = 13.9, and "C" = 100. Required to find the flow in gallons per minute if "C" = 120. Set 500 g.p.m. opposite the arrow (100 on the coefficient scale), opposite 120 of the coefficient scale, read 600 g.p.m. which is the flow when "C" = 120.

EXAMPLE — To compute friction head loss where "C" is not 100.

Required to find the pressure loss through 5000 ft. of 10″ line with a flow of 650 gallons per minute where the coefficient of roughness (C) is 130. First compute the equivalent of 650 g.p.m. to a basis of "C" = 100. This is done by setting 650 g.p.m. opposite 130 (on coefficient of roughness scale) then opposite the arrow read 500 g.p.m. which is on a basis "C" =100. A water line with a flow of 650 g.p.m. on a basis 130 has the same loss in head or pressure drop as a water line with a flow of 500 g.p.m. on a basis of "C" = 100. This is now the same example that is shown on the back side of the slide rule and the answer is 13.9 loss of head in feet (or 6 lbs. pressure drop).

It may be necessary in some problems to compute the velocity of the flow in feet per second, the velocity may be determined from the formula:

$$V = Q \div A$$

Where V = Velocity of flow in feet per second.

Q = Volume of flow in cubic feet per second, read from slide rule on "cubic feet per second" scale.

A = Cross sectional area of pipe in square feet (which is $.005454d^2$, where d = inside diameter of pipe in inches).

The GRIZZLE WATER LINE CAPACITY SLIDE RULE computes capacity and pressure loss for straight pipe lines. If there are several fittings in the line the pressure drop through them should be considered. It is common practice to add to the length of the line to compensate for the friction loss through the fittings. Using the approximate factors given below, multiply the factor by the size of pipe and add as extra feet to the length of the line for figuring the flow.

	Factor		Factor
90° Elbow	2.5	Return Bend	6.0
45° Elbow	1.4	Gate Valve	0.8
Tee (straight through)	1.8	Angle Valve	13.0
Tee (side outlet)	5.5	Globe Valve	25.0

EXAMPLE USING THE ABOVE FACTORS — Required to figure the flow through 200 feet of 10″ pipe which has four 90° elbows in the line with a pressure drop of 3 feet of head (or 1.3 lbs). The length of line to add for one elbow is 2.5 x 10 (Factor x pipe size in inches) = 25 feet. For 4 elbows add 100 feet. A 10″ line 200 feet long with 4 elbows is equivalent to or has approximately the same pressure loss as 300 feet of straight line. On the rule set 300 feet opposite 10″ pipe size, opposite 3 (loss of head in feet) read 1000 gallons per minute.

(over)

To use this rule for diameters larger than 60″, another operation is necessary. Divide the diameter by 2.4 and find the rate of flow corresponding to this divided diameter, then multiply this rate by 10. The result will be the rate of flow for the larger diameter.

When the inlet and outlet of a water line has a different elevation, this difference in feet can be converted to lbs, per sq. in. by reading the lbs, per sq. in. under the loss of head in feet.

A new, clean and smooth pipe should deliver more water, or have a lower loss of head than the amount computed by this rule using C=100. Generally after a water line has been in service a few years, the Coefficient of Roughness (C) approaches 100, depending on age and the condition of the interior pipe surface. In some cases after long use the Coefficient may go below 100. This rule computes directly the flow or friction loss when C is assumed to be 100, which is a conservative value of a line in good condition; however, a scale is arranged to correct for other values of the Coefficient of Roughness to suit very good to very poor pipe conditions.

Approximate Coefficient of friction (or roughness) for different types of pipe are shown in various mechanical engineering handbooks for the length of time water lines have been in service.

Consideration of the changing condition of the pipe after it is in use a few years leads to a conclusion that in most water flow problems there is more to be gained by being on the "safe side" than to strive for great accuracy.