

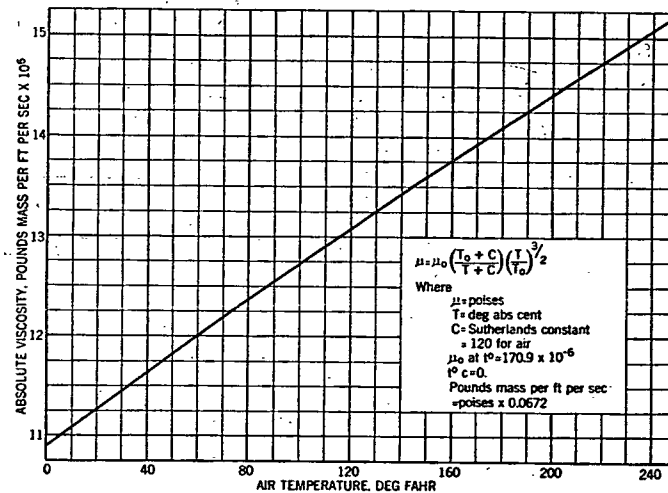


FIG. 4. TEMPERATURE—VISCOSITY CURVE FOR DRY AIR

Example 1. Assume that it is desired to circulate 10,000 cfm of air through 75 ft of 24 in. diameter galvanized duct. Find 10,000 cfm on the left scale of Fig. 2 and move horizontally right to the diagonal line marked 24 in. The other intersecting diagonal shows that the velocity in the pipe is 3200 fpm. Directly below the intersection it is found that the friction per 100 ft is 0.50 in.; then for 75 ft the friction will be $0.75 \times 0.50 = 0.38$ in. In a like manner any two variables may be determined by the intersection of the lines representing the other two variables.

Example 2. If the duct in Example 1 is very rough, instead of galvanized, with 40 joints per 100 ft, find the total friction.

On Fig. 3 find (by interpolation between 12 in. and 40 in. pipe) the intersection of the 24 in. *very rough pipe* line and the 3200 fpm velocity ordinate and at the left margin read a correction factor of 2. The friction loss in the rough duct is therefore $2 \times 0.38 = 0.76$ in.

Circular Equivalents of Rectangular Ducts

An air handling system is usually sized first for round ducts and, if rectangular ducts are desired, their sizes are selected to provide air carry-

TABLE 1. VALUES OF ROUGHNESS ϵ FOR DIFFERENT PIPES^a

PIPE	DEGREE OF ROUGHNESS	ϵ ROUGHNESS IN FEET
Drawn Tubing.....	Very smooth	0.0000015
New Steel or Wrought-Iron Pipe.....	Medium smooth	0.00015
Galvanized Iron.....	Average	0.0005
Average Concrete.....	Medium rough	0.003
Average Riveted Steel.....	Very rough	0.01

^aUsed in computing values for Fig. 3.

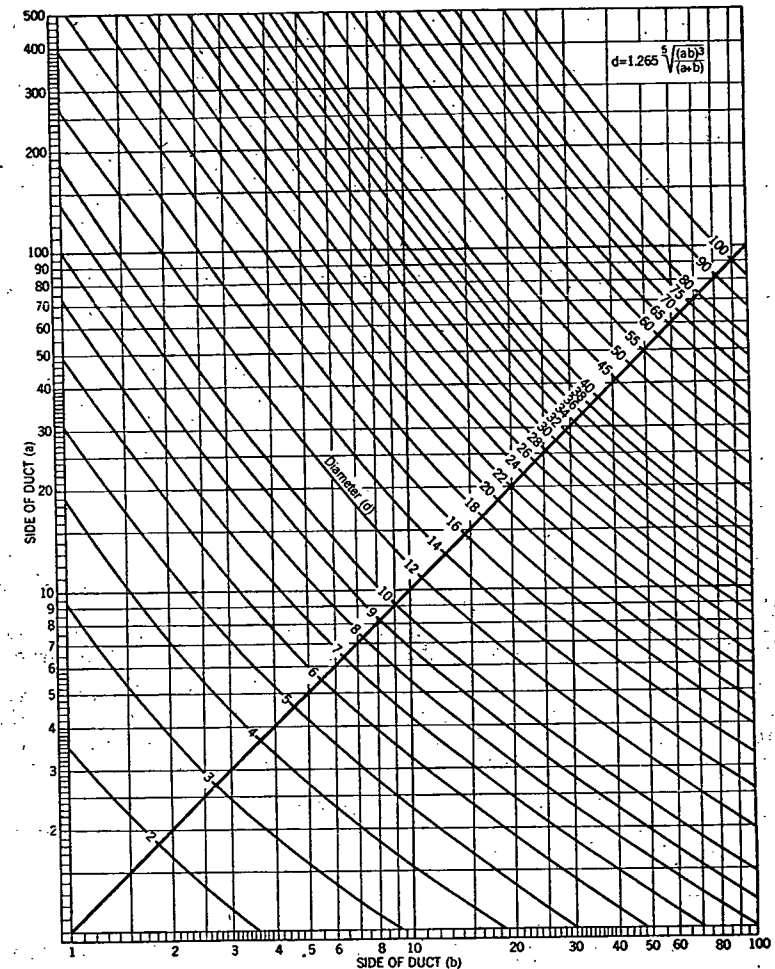


FIG. 5. RECTANGULAR EQUIVALENTS OF ROUND DUCTS

ing capacities equivalent to those of the round ducts originally selected. Table 2 gives directly the rectangular duct sizes equivalent to each size of circular duct in friction and capacity. The values in this table were obtained from the equation:

$$d = 1.265 \sqrt{\frac{(a b)^3}{a + b}} \quad (7)$$

where

a = one side of rectangular duct, feet or inches.

b = other side of rectangular duct, feet or inches.

d = equivalent diameter of round pipe for equal friction per foot of length to carry the same capacity, feet or inches.