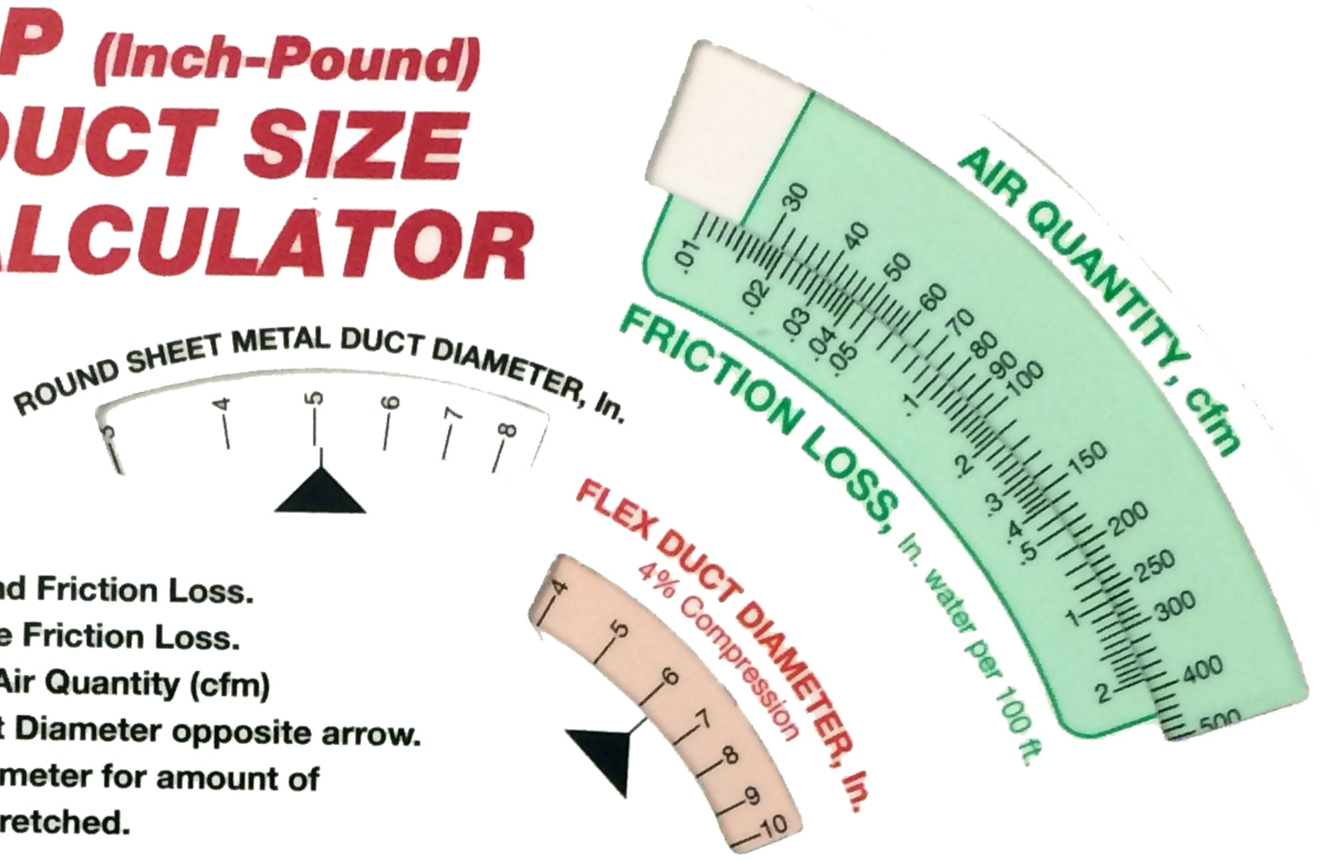
www.ashrae.org

This Duct Size Calculator is intended for use as a quick reference tool for approximating duct sizes and equivalent sizes of sheet metal duct vs flexible duct. For more information please refer to ASHRAE Fundamentals Handbook, Duct Design Chapter.

www.steelduct.org

I-P (Inch-Pound) DUCT SIZE CALCULATOR

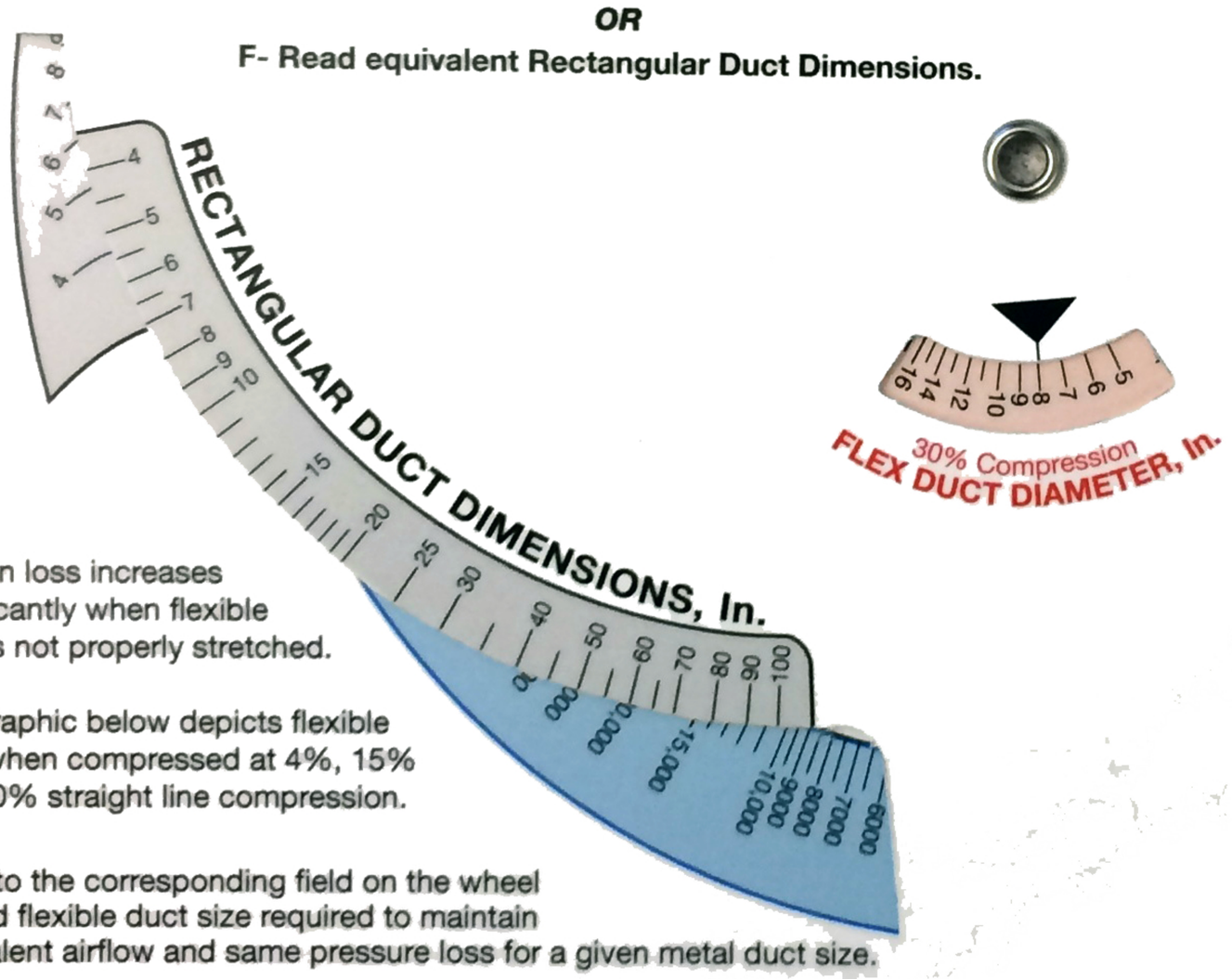


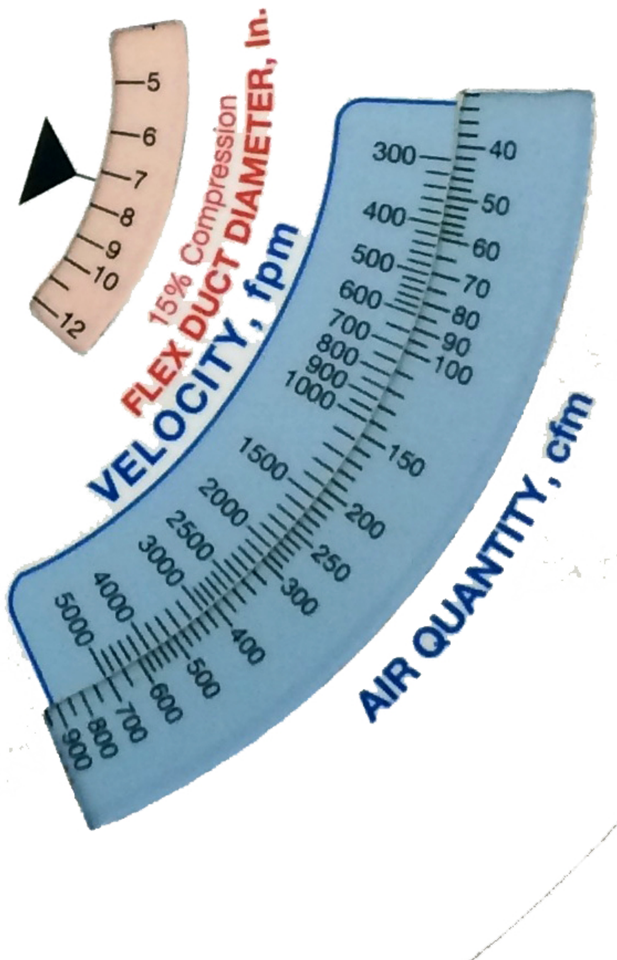
INSTRUCTIONS:

A- Establish Air Quantity (cfm) and Friction Loss.
B- Set Air Quantity (cfm) opposite Friction Loss.
C- Read Velocity (fpm) opposite Air Quantity (cfm)
D- Read Round Sheet Metal Duct Diameter opposite arrow.
E- Read equivalent Flex Duct Diameter for amount of compression when not fully stretched.

OR

F- Read equivalent Rectangular Duct Dimensions.



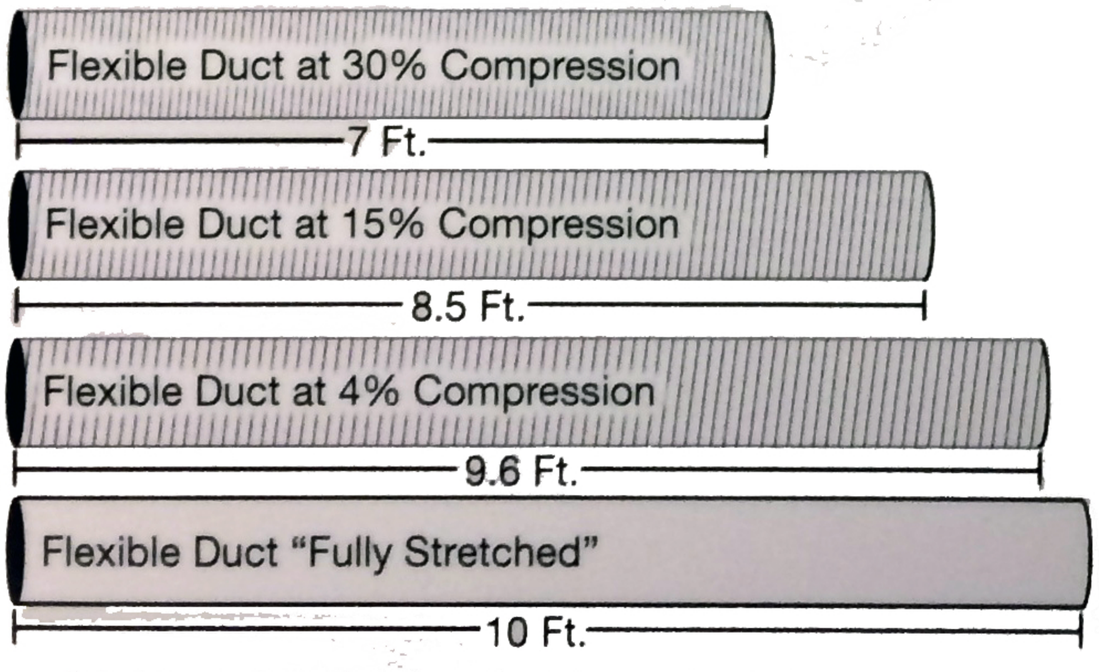


Friction loss increases significantly when flexible duct is not properly stretched.

The graphic below depicts flexible duct when compressed at 4%, 15% and 30% straight line compression.

Refer to the corresponding field on the wheel to read flexible duct size required to maintain equivalent airflow and same pressure loss for a given metal duct size.

Note: *Bends, curves and excessive lengths in flexible duct will add additional friction losses.*



…ne formulas below were used to calculate …values given in this duct size calculator and a …iction loss of .08 was used as a baseline reference.

…unit length through a round galvanized sheetmetal duct or a …round flexible duct was calculated using the Darcy equation

$$\frac{\Delta p_f}{L} = \frac{12f}{D}\rho\left(\frac{V}{1097}\right)^2$$

For either type of duct the friction factor was determined using the Colebrook equation

$$\frac{1}{\sqrt{f}} = -2\log\left[\frac{12\epsilon/D}{3.7} + \frac{2.51}{Re\sqrt{f}}\right]$$

In order to account for the increase in pressure loss that occurs when a flexible duct possesses a percent duct compression K_c, a pressure drop correction factor was employed. Therefore the flexible duct diameter D_{fl} that yielded the same pressure loss per unit length as a sheetmetal duct with a prescribed diameter D_{sm} at a specified average air velocity was evaluated iteratively using

$$\frac{f_{sm}}{D_{sm}}V_{sm}^2 - \frac{f_{fl}}{D_{fl}}V_{fl}^2\left(1 + 0.58K_c \cdot e^{-0.126D_{fl}}\right) = 0$$

Calculator based on ϵ=0.0003 & 0.003ft for sheet metal & flex duct, and standard air (ρ=0.075 lb_m/ft^3).