

Flexible Duct Pressure Loses Calculator Project

Developed by Eng. Bashar

Equations and inputs

1.Variables and user inputs

some of the variables are user inputs and the other are calculated

Variable Name	Equations	Description	Unit	Type
dh_inch	User input	Hydraulic diameter of the flexible duct	Inches	User input
e_rough	User input	The roughness of the duct with vary from 0.003-0.15 into 5 categories	Dimensionless	User input
a_duct	$A = \frac{\pi \left(\frac{Dh}{12}\right)^2}{4}$	The cross-sectional area of the flexible duct	Feet squared	To be calculated
q_airflow	$Q = V * A$	The airflow inside the duct V= v_duct (fpm) A= a_duct (ft²)	CFM	User input
v_duct	$V = \frac{Q}{A}$	The velocity inside the duct Q= q_airflow (cfm) A= a_duct (ft²)	FPM	To be calculated
re_number	$Re = 8.50 * dh * V$	Renaulds number Dh= dh_inch (inch) V = v_duct (fpm)	Dimensionless	To be calculated
f_factor	$f = \frac{0.25}{\left(\log\left(\frac{\epsilon}{3.7Dh} + \frac{5.74}{Re^{0.9}}\right)\right)^2}$	Friction factor Using Swamee–Jain formula Instead of modey cahry € =e_rough Re= re_number Dh=dh_inches	Dimensionless	To be calculated
raw_air	$\rho_{air} = 0.075 \text{ lb/ft}^3$	Density of air at 1 atm	lb/ft³	constant
l_length	User input	The total length of the flexible duct	ft	User input

Variable Name	Equations	Description	Unit	Type
bend_45degree	User input The equalvent length of the fittings are 45° = 10 ft length	The fittings in the flexible duct and we convert them to equalvent length	degree	User input
bend_90degree	User input The equalvent length of the fittings are 90° = 10 ft length	The fittings in the flexible duct and we convert them to equalvent length	degree	User input
bend_180degree	User input The equalvent length of the fittings are 180° = 10 ft length	The fittings in the flexible duct and we convert them to equalvent length	degree	User input
eq_length	$L_{eq} = \sum Bends$	Equalvent length = sum of the fittings and bends	Ft	To be Calculated
p_lose	$P_f = \left(\frac{12 * f * (L_{total} + L_{eq})}{D_h} \right) * (\rho) * \left(\frac{V}{1097} \right)^2$	Pf= pressure lose F= f_factor L=l_length Leq=eq_length $\rho = raw_air$ Dh=dh_inches V=v_duct	In.w.g	To be Calculated
k_percentage	User input	Kc = flexible duct compression percentage 0% = fully stretched	Percentage %	User input
pdcf_pressure	$PDCF = 1 + 0.58 * K_C * e^{-0.126 * D_h}$	PDCF= pressures drop correction factor Kc= k_percentage Dh= dh_inches	Dimensionless	To be calculated

Variable Name	Equations	Description	Unit	Type
sf_factor	10%	Safety factor	Percentage %	Constant
Total_pressure_drop	$\Delta P_{total} = P_f * PCDF * SF$	P _{total} = total pressure lose through flexible duct Pf= p_lose PCDF = pdcf_pressure SF=sf_factor	w.in.g	To be calculated