Duct Fitting Losses from Loss Coefficients

Pressure loss of up to six kinds of duct fittings from their loss coefficients (C), counts and the velocity pressure, with the total.

Method: ASHRAE Handbook—Fundamentals (2017); ch. 21 (duct design: dynamic losses Δp = C p_v)

Input parameters

Unit system: SI

Parameter	Value	Unit
Air velocity	8.0000	m/s
Air density	1.2000	kg/m³
Fitting 1: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	0.25000	
Fitting 1: number	4.0000	
Fitting 2: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	0.60000	
Fitting 2: number	2.0000	
Fitting 3: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	1.0000	
Fitting 3: number	1.0000	
Fitting 4: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	0.30000	
Fitting 4: number	2.0000	
Fitting 5: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	0	
Fitting 5: number	0	
Fitting 6: loss coefficient From a fitting loss table (ASHRAE, SMACNA or the maker).	0	
Fitting 6: number	0	

Calculated results

Parameter	Value	Unit
Velocity pressure	3.9157	mmWC
Sum of coefficients	3.8000	
Fitting losses	14.880	mmWC

Notes for this case

- Each C must refer to the velocity used here; tables sometimes base it on the branch or the outlet.

Formula and method

$$\Delta p = \left(\sum n_i C_i\right) \frac{\rho v^2}{2}$$

Variables

v	Air velocity	m/s
ρ	Air density	kg/m³
C_1	Fitting 1: loss coefficient	-
n_1	Fitting 1: number	-

C_2	Fitting 2: loss coefficient	-
n_2	Fitting 2: number	-
C_3	Fitting 3: loss coefficient	-
n_3	Fitting 3: number	-
C_4	Fitting 4: loss coefficient	-
n_4	Fitting 4: number	-
C_5	Fitting 5: loss coefficient	-
n_5	Fitting 5: number	-
C_6	Fitting 6: loss coefficient	-
n_6	Fitting 6: number	-
p_v	Velocity pressure	Pa
ΣnC	Sum of coefficients	-
Δp	Fitting losses	Pa

Method and standards

Loss coefficient method.

Assumptions and limits

- Fittings far enough apart.
- Numbers of fittings must be whole.

References

• ASHRAE Handbook—Fundamentals (2017)
• ch. 21 (duct design: dynamic losses Δp = C p_v)

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/ducts/duct-fitting-losses

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.