Cold Store Door Infiltration Load (Gosney–Olama)

Refrigeration load from warm air entering through an open cold store door by the Gosney–Olama relation, with door open time, flow factor and protection.

Method: Gosney and Olama (1975); Heat and enthalpy gains through cold room doorways; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Door width	2.0000	m
Door height	2.5000	m
Cold room temperature	-20.000	°C
Cold room relative humidity	85.000	%
Warm side temperature	30.000	°C
Warm side relative humidity	60.000	%
Share of time the door is open	10.000	%
Doorway flow factor EnergyPlus uses 0.8 for temperature differences above 11 K and 1.1 below.	0.80000	
Doorway protection effectiveness 0 none; about 0.5 for an air curtain and 0.9 for a strip curtain (EnergyPlus values).	0	%
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Cold air density	1.3940	kg/m³
Warm air density	1.1534	kg/m³
Density factor	0.95302	
Air exchange with the door fully open	10,871	kg/h
Average infiltration load	21.740	kW

Notes for this case

- Enthalpies treat moisture as vapour; frost formed on the coil adds the latent heat of fusion on top.

Formula and method

$$\dot{m} = 0.221 A \rho_c F_m \sqrt{\left(1 - \frac{\rho_w}{\rho_c}\right) g H}, \quad F_m = \left[\frac{2}{1 + (\rho_c/\rho_w)^{1/3}}\right]^{1.5}, \quad \dot{Q} = \dot{m}(h_w - h_c) D_t F_f (1 - E)$$

Variables

W_d	Door width	m
H_d	Door height	m
T_c	Cold room temperature	K
φ_c	Cold room relative humidity	-
T_w	Warm side temperature	K
φ_w	Warm side relative humidity	-
D_t	Share of time the door is open	-
F_f	Doorway flow factor	-
E	Doorway protection effectiveness	-

p	Barometric pressure (absolute)	Pa
ρ_c	Cold air density	kg/m³
ρ_w	Warm air density	kg/m³
F_m	Density factor	-
$\dot{m}$	Air exchange with the door fully open	kg/s
$\dot{Q}$	Average infiltration load	W

Method and standards

Gosney–Olama.

Assumptions and limits

- Rectangular door, steady exchange while open.
- Door area A = W_d H_d; the mass flow uses the cold-side density ρ_c, as in the cited form.
- Moisture enters as vapour: the latent heat of fusion of the frost it forms on the coil is not included.

References

• Gosney and Olama (1975)
• Heat and enthalpy gains through cold room doorways
• Proc. Inst. Refrig. 72; form as given in the EnergyPlus Engineering Reference (refrigeration door mixing)

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/refrigeration/cold-store-door-infiltration

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.