Room Moisture Load and Latent Heat (People, Process, Outdoor Air)

Moisture added to a room by people, open processes and outdoor air, and the latent cooling load to remove it, from rates you enter and the air states.

Method: Moisture balance; latent heat of vaporisation from IAPWS-IF97 at the room temperature

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of people	20.000	
Moisture per person From a handbook for the activity; your figure.	0.070000	kg/h
Evaporation from processes	1.0000	kg/h
Outdoor air entering (infiltration or fresh air)	1,000.0	m³/h
Outdoor dry bulb	35.000	°C
Outdoor relative humidity	60.000	%
Indoor dry bulb	24.000	°C
Indoor relative humidity	50.000	%
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Moisture from outdoor air	13.448	kg/h
Total moisture load	15.848	kg/h
Latent heat at the indoor temperature (IF97)	2,444.1	kJ/kg
Latent load	10.759	kW

Formula and method

$$\dot{m}_t = n g_p + \dot{m}_p + \dot{m}_{da}(W_o - W_i), \quad \dot{Q}_l = \dot{m}_t h_{fg}(T_i)$$

Variables

n	Number of people	-
g_p	Moisture per person	kg/s
$\dot{m}_p$	Evaporation from processes	kg/s
$\dot{V}_o$	Outdoor air entering (infiltration or fresh air)	m³/s
T_o	Outdoor dry bulb	K
φ_o	Outdoor relative humidity	-
T_i	Indoor dry bulb	K
φ_i	Indoor relative humidity	-
p	Barometric pressure (absolute)	Pa
$\dot{m}_o$	Moisture from outdoor air	kg/s
$\dot{m}_t$	Total moisture load	kg/s
h_{fg}	Latent heat at the indoor temperature (IF97)	J/kg
$\dot{Q}_l$	Latent load	W

Method and standards

Moisture balance.

Assumptions and limits

- Steady state.
- The latent heat is h_fg at the indoor temperature from IF97 (about 2 444 kJ/kg at 24 °C). The dehumidifier calculator uses the psychrometric convention of 2 501 kJ/kg, so the same moisture gives a latent load about 2 % higher there.

References

- Moisture balance; latent heat of vaporisation from IAPWS-IF97 at the room temperature

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

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

This calculator online

https://calc.firecad.com/hvac/psychrometry/moisture-load-latent

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.