Mine Natural Ventilation Pressure from Air Columns

Natural ventilating pressure from the weights of the intake and return air columns (humid-air densities) and the air it drives through the mine resistance.

Method: Peele (ed.); Mining Engineers' Handbook; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Depth (height of the air columns)	152.40	m
Mean temperature of the intake column	0	°C
Relative humidity of the intake air	50.000	%
Mean temperature of the return column	12.778	°C
Relative humidity of the return air	95.000	%
Barometric pressure	101.59	kPa
Mine resistance (N·s²/m⁸)	0.050000	

Calculated results

Parameter	Value	Unit
Intake air density	1.2942	kg/m³
Return air density	1.2314	kg/m³
Natural ventilating pressure (negative = reversed)	93.994	Pa
Natural air flow through the mine (negative = reversed)	43.358	m³/s

Notes for this case

• Columns of equal height with mean temperatures; densities at the surface barometric pressure (the compression of air with depth adds roughly equally to both columns). Natural pressure acts with or against a fan.

Formula and method

$$NVP = gH(\rho_i - \rho_r), \quad Q = \sqrt{\frac{NVP}{R}}$$

Variables

H	Depth (height of the air columns)	m
T_i	Mean temperature of the intake column	K
ϕ_i	Relative humidity of the intake air	-
T_r	Mean temperature of the return column	K
ϕ_r	Relative humidity of the return air	-
p_b	Barometric pressure	Pa
R	Mine resistance (N·s²/m⁸)	-
ρ_i	Intake air density	kg/m³
ρ_r	Return air density	kg/m³
NVP	Natural ventilating pressure (negative = reversed)	Pa
Q	Natural air flow through the mine (negative = reversed)	m³/s

Method and standards

Difference of air-column weights.

Assumptions and limits

- Equal column heights; mean column conditions.

References

- Peele (ed.)
- Mining Engineers' Handbook
- 3rd ed. (Wiley, 1941)
- sec. 14
- Mine Ventilation
- art. 12 (natural draft) and its worked example
- IAPWS-IF97 saturation pressure for the humid-air densities

Report details

Report reference	FCC-KHKW-S6E0 (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Mine Natural Ventilation Pressure from Air Columns
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/civil/mining-minerals/mine-natural-ventilation-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.