Coal Mill Primary Air: Hot and Tempering Air Split

Primary air for a coal mill from the air-to-coal ratio, and the split of hot air-heater air and cold tempering air for the mill inlet temperature.

Method: Mass and heat balance of air mixing (definitions); Babcock & Wilcox; Steam: Its Generation and Use; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Coal flow to the mill	40.000	t/h
Primary air-to-coal ratio	1.8000	kg/kg
Hot air temperature (air heater outlet)	320.00	°C
Cold (tempering) air temperature	35.000	°C
Required mill inlet temperature	250.00	°C
Air density at 0 °C, 1 atm	1.2930	kg/m³

Calculated results

Parameter	Value	Unit
Primary air flow	72.000	t/h
Hot air	54.316	t/h
Tempering air	17.684	t/h
Hot air share	75.439	%
Primary air at 0 °C, 1 atm	55,684	Nm³/h

Notes for this case

• Constant air specific heat assumed. The required inlet temperature comes from the mill drying balance (see the coal drying calculator) and the outlet temperature limit for the coal's volatile matter.

Formula and method

$$\dot{m}_{PA} = (A/C)\dot{m}_c, \quad x_h = \frac{T_m - T_c}{T_h - T_c}, \quad \dot{m}_h = x_h \dot{m}_{PA}$$

Variables

$\dot{m}_c$	Coal flow to the mill	kg/s
A/C	Primary air-to-coal ratio	kg/kg
T_h	Hot air temperature (air heater outlet)	K
T_c	Cold (tempering) air temperature	K
T_m	Required mill inlet temperature	K
ρ_n	Air density at 0 °C, 1 atm	kg/m³
$\dot{m}_{PA}$	Primary air flow	kg/s
$\dot{m}_h$	Hot air	kg/s
$\dot{m}_t$	Tempering air	kg/s
x_h	Hot air share	-
$\dot{V}_n$	Primary air at 0 °C, 1 atm	Nm³/s

Method and standards

Mixing balance of hot and tempering air with one specific heat for both streams.

Assumptions and limits

- Equal specific heats: the specific heat of air rises about 2–3 % from 35 °C to 320 °C, so the hot air share is slightly overstated.
- The normal density is your input (default 1.293 kg/m³, dry air at 0 °C and 1 atm).

References

• Mass and heat balance of air mixing (definitions); Babcock & Wilcox
• Steam: Its Generation and Use
• 41st ed. (2005)
• ch. 13 (coal pulverisers)

Report details

Report reference	FCC-DJVB-NQ58 (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Coal Mill Primary Air: Hot and Tempering Air Split
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/boilers-power-plant/fuel-ash-handling/mill-primary-air-tempering

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.