Blaine Specific Surface from Air Permeability Time

Specific surface (Blaine fineness) of cement from the air flow time through a compacted bed, calibrated with a reference powder, by the Carman–Kozeny relation.

Method: Air-permeability (Blaine) method on the Carman–Kozeny relation; calibrated with a reference powder

Input parameters

Unit system: SI

Parameter	Value	Unit
Specific surface of the reference powder	334.00	m²/kg
Flow time of the reference	52.000	s
Density of the reference	3,150.0	kg/m³
Porosity of the reference bed	50.000	%
Flow time of the sample	60.000	s
Density of the sample	3,150.0	kg/m³
Porosity of the sample bed	50.000	%

Calculated results

Parameter	Value	Unit
Specific surface of the sample	3,587.7	cm²/g
Ratio to the reference	1.0742	

Notes for this case

• Air flows more slowly through a bed of finer powder. By the Carman–Kozeny relation the specific surface is proportional to √t·√(ε³)/[ρ(1 − ε)] for the same apparatus, so a reference powder of known surface calibrates the instrument: S = S_s (ρ_s/ρ) √(t/t_s) [(1 − ε_s)/(1 − ε)] √(ε³/ε_s³). Use the same air temperature for both, or correct for the change in air viscosity. Ordinary Portland cement is typically 300–400 m²/kg.

Formula and method

$$S = S_s \frac{\rho_s}{\rho} \sqrt{\frac{t}{t_s}} \frac{1-\varepsilon_s}{1-\varepsilon} \sqrt{\frac{\varepsilon^3}{\varepsilon_s^3}}$$

Variables

S_s	Specific surface of the reference powder	m²/kg
t_s	Flow time of the reference	s
ρ_s	Density of the reference	kg/m³
ε_s	Porosity of the reference bed	-
t	Flow time of the sample	s
ρ	Density of the sample	kg/m³
ε	Porosity of the sample bed	-
S	Specific surface of the sample	m²/kg
S/S_s	Ratio to the reference	-

Method and standards

Blaine method.

Assumptions and limits

- Same apparatus and air temperature as the reference.

References

Air-permeability (Blaine) method on the Carman–Kozeny relation, calibrated with a reference powder

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/chemical/cement/blaine-specific-surface

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.