Fresh Concrete Temperature from Ingredient Temperatures

Temperature of fresh concrete from the masses and temperatures of aggregates, cement, mixing water and aggregate water, with ice as an option.

Method: ACI 305R (hot weather concreting) fresh concrete temperature equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Aggregate mass (dry)	1,850.0	kg
Aggregate temperature	35.000	°C
Cement mass	350.00	kg
Cement temperature	50.000	°C
Mixing water mass (excluding ice)	140.00	kg
Mixing water temperature	15.000	°C
Free water on aggregates	40.000	kg
Ice replacing part of the mixing water	0	kg

Calculated results

Parameter	Value	Unit
Fresh concrete temperature	32.523	°C
Cooling from melting the ice (latent term only)	0	K

Notes for this case

• ACI 305 / 306 mixture formula with specific heat of solids 0.22 of water's and latent heat of ice 80 cal/g (ice at 0 °C, fully melted). Many specifications limit placing temperature to about 32–35 °C.

Formula and method

$$T = \frac{0.22(T_a W_a + T_c W_c) + T_w W_w + T_a W_{wa} - 80 W_i}{0.22(W_a + W_c) + W_w + W_{wa} + W_i}$$

Variables

W_a	Aggregate mass (dry)	kg
T_a	Aggregate temperature	K
W_c	Cement mass	kg
T_c	Cement temperature	K
W_w	Mixing water mass (excluding ice)	kg
T_w	Mixing water temperature	K
W_{wa}	Free water on aggregates	kg
W_i	Ice replacing part of the mixing water	kg
T	Fresh concrete temperature	K
ΔT_{ice}	Cooling from melting the ice (latent term only)	K

Method and standards

Heat balance (°C, kg).

Assumptions and limits

- Ice at 0 °C, fully melted; a result below 0 °C (ice cannot all melt) is flagged.
- ΔT_ice is the latent term 80 W_i over the heat-capacity sum: the cooling against the same batch with the ice's melt water at 0 °C, not against the ice replaced by mixing water at T_w.

References

- ACI 305R (hot weather concreting) fresh concrete temperature equation

Report details

Report reference	FCC-8XMG-M8XN (the same inputs always give the same reference)
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Calculator	Fresh Concrete Temperature from Ingredient Temperatures
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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/civil/concrete/fresh-concrete-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.