Ice Thermal Storage: Ice Mass and Tank Volume

Ice mass and tank volume for an ice thermal storage system from the cooling to be stored, latent heat of fusion, usable share and packing.

Method: Latent heat storage m = Q/(L u)

Input parameters

Unit system: SI

Parameter	Value	Unit
Cooling to store	2,000.0	TR·h
Latent heat of fusion of ice	333.50	kJ/kg
Usable share of the ice (melt-out)	85.000	%
Ice density	917.00	kg/m³
Ice share of the tank volume (packing) From the storage maker; coil and container designs differ widely.	50.000	%

Calculated results

Parameter	Value	Unit
Ice mass	89.325	t
Ice volume	97.410	m³
Tank volume	194.82	m³

Notes for this case

- Latent storage only; the sensible heat of the water around 0 °C adds a little.

Formula and method

$$m = \frac{Q}{Lu}, \quad V_t = \frac{m}{\rho_i \phi}$$

Variables

Q	Cooling to store	J
L	Latent heat of fusion of ice	J/kg
u	Usable share of the ice (melt-out)	-
ρ_i	Ice density	kg/m³
ϕ	Ice share of the tank volume (packing)	-
m	Ice mass	kg
V_i	Ice volume	m³
V_t	Tank volume	m³

Method and standards

Latent heat.

Assumptions and limits

- Latent storage.

References

- Latent heat storage m = Q/(L u)

Report details

Report reference	FCC-43GK-JXRH (the same inputs always give the same reference)
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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/hvac/refrigeration/ice-thermal-storage-size

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.