



## Freeze-Thaw Testing of Concrete (ASTM C666 / C666M)

### Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

#### What is Freeze-Thaw testing?

Freeze-thaw testing is performed to assess the ability of a hardened concrete beam specimen to resist deterioration when subjected to repeated and rapid cycles of freezing and thawing.

#### How is Freeze-Thaw performance evaluated?

Molded beam specimens are cast from a concrete mixture, moist cured for 14 days, and then placed in a chamber where the internal temperature of the specimens is lowered from 40 to 0 °F (4 to -18 °C) and back to 40 °F (4 °C) between 2 and 5 hours. This rapid cycling is repeated for 300 cycles, unless failure occurs earlier, and typically with the specimens submerged in water. Acoustic readings from which a durability factor is determined are made periodically during the cycling to determine any internal damage.

#### What are the concerns about Freeze-Thaw on durability?

Freezing and thawing can lead to premature deterioration of concrete in the form of scaling and cracking. Concrete sidewalks, driveways, parking lots and bridge decks, can exhibit scaling after the first winter or two if the concrete mixture used was not properly air entrained.

#### Where should I be concerned about Freeze-Thaw durability?

Freeze-thaw exposure varies by region throughout North America (see map), but it is of particular concern in areas where deicing salts are used to melt snow and ice during the winter months.

#### How is this standard used in the industry?

This test method is used to provide documentation and assurance that a given concrete mixture will be able to resist the effects of cyclic freezing and thawing under service conditions. To prevent premature deterioration, air-entraining admixtures are used to ensure an adequate volume and spacing of air voids in the hardened concrete. The air voids provide space to accommodate the increase in volume of water during the freezing process.

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