

Dufferin Concrete Technical Bulletin

Cold Weather Concreting Consideration for Exterior Applications

What is considered Cold Weather Concreting?

As per CSA A23.1-14 Clause 7.1.2.1, cold weather job site preparation for concreting needs to occur **when there is a probability of the air temperature falling below 5 °C within 24 h of placing (as forecast by the nearest official meteorological office).** Additionally, **if the temperature of the concrete is expected to drop below 5 °C then protection is required.**

All snow and ice shall be removed before concrete is deposited on any surface and concrete shall not be placed on or against any surface that will lower the temperature of the concrete in place below 10 °C for slabs less than 1 m thick or 5 °C for slabs more than 1 m thick.

Why consider Cold Weather Concreting?

Weather conditions at a jobsite may be vastly different from the optimum conditions assumed at the time a concrete mix is specified, designed, or selected based on the laboratory conditions in which concrete specimens are stored and tested. Concrete can be placed in cold weather conditions provided adequate precautions are taken to account for the following:

- Extended time required to reach the initial set, which may require finishing crews to be available for a longer period
- Decrease in the strength gain of the concrete, which may require delaying the stripping and early loading operations
- Cold weather protection of concrete placements may require the combined use of heated enclosures, coverings and insulation
- Rapid cooling of the concrete upon termination of the heating period increases the potential for thermal cracking
- The longer set times during cold weather in combination with the effects of hot dry air and fumes blown from heaters greatly increases the surface defect potential for carbonation and dusting (Surface Defects)
- Concrete placed late in the construction season may not be mature enough or have had a sufficient air-drying period, typically 30 days, to properly withstand freeze-thaw and salt scaling damage

Cold Weather Best Practices and Recommendations

- On the project site all ice/snow must be removed from the subgrade or formwork
- A combination of coverings, insulation and supplemental heating will be required to ensure that forms, subgrades and reinforcing steel is maintained at a minimum temperature of 5°C prior to concrete placement
- Special attention must be taken to avoid the rapid cooling of the concrete upon termination of the heating period
- Order and place the concrete with the lowest practical water slump and avoid adding water on-site which can lead to delays to the set time of the concrete. As such, the use of plant-added Super Plasticizers is recommended
- The surface of the concrete should not be allowed to dry out while the concrete is plastic as this might cause plastic shrinkage cracking
- Special care should be taken with concrete test specimens. The test specimens should be stored initially for 24 hours in a controlled environment that maintains the temperature between 15°C and 25°C as per CSA A23.1. An insulated cooler is not an adequate curing environment which can lead to low curing initial conditions affecting proper strength development of the concrete specimens used for compressive strength acceptance

What Value-Added solutions are available?

Thermalcrete: Range of concrete mixes specifically designed to reduce the finishing times in combination with Thermal +6°C to Thermal -10°C dosages that suit the 12hr temperature window after concrete placement.

Accelerators (Calcium Chloride and Non-Chloride): Plant-added admixtures that provide some set time acceleration proportional to the requested dosage and not designed to provide an early strength gain. Best suited for concrete that is placed in heated and protected environments (interior pours, heated formwork, etc.).

Accelerated Mixes (24, 48 and 72 hours): Specialty concrete mixes designed to reach early stripping or loading strengths faster by achieving 75% of the strength at the given age of 24, 48 or 72 hours based on laboratory cured samples.