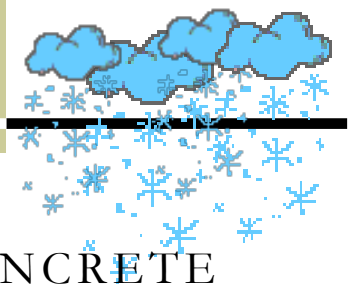
The Concrete Promotional Group

Volume 2, Issue 9

COLD WEATHER CONCRETE



ON THE BACK FIND:

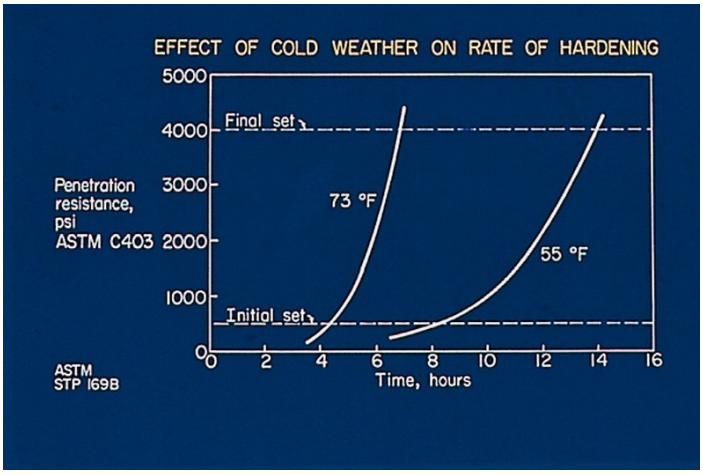
Cold Weather Guidelines 2

Sources 2

COLD WEATHER CONCRETE

Why bother with cold weather concreting procedures?

- **Set time and strength.** Lower temperatures slow the cement hydration process (chemical reaction of the cement particle with water). This results in slower set time (the finisher has to wait to finish the concrete until it is ready), slowing the construction process. It also slows the strength gain too. An average rule of thumb is: a 20ºF drop in temperature will double the setting time.
- **Job scheduling on time.** Chemical admixtures can help modify the concrete mixture to accelerate the rate of setting and strength gain for proper finishing and stripping forms. This will help keep the jobsite on schedule. Ready mix suppliers can help adjust and advise mix designs.
- **Quality and durability.** If plastic concrete freezes (approximately below 25ºF) before it reaches it's hardened state, potential strength is compromised by 50% or more. This jeopardizes the durability. Frozen concrete will need to be replaced almost always. Concrete needs to be protected until a minimum compressive strength of 500 psi.
- **Proper preparation and materials used**. Using proper cold weather curing practices will help, this includes using blankets for protection. Don't forget the subgrade, it needs to be protected too, you don't want to place warm plastic concrete on frozen subgrade and forms. The hydration process creates heat as a byproduct. Blankets will help insulate this heat in and help keep the concrete from freezing.
- **Better service and life span**. Air entrainment in concrete is a must when the concrete is exposed to weather elements, especially freezing temperatures. The tiny holes left in the hardened concrete become safety valves for freezing water. Water turning to ice expands approximately 9%. This expansion must have somewhere to go or the concrete will be forced to break up to make room for the ice.



Notice the difference 18ºF makes in both the initial set and the final set times.

The initial set has approximately 2 hours difference and the final set has approximately 7 1/2 hours difference between the warmer weather and the colder weather.

The finishing crews need to practice more patience in cold weather.

What is Cold Weather?

Cold Weather is defined as three successive days of average daily temperature falling below 40ºF (4 degrees Celsius).

Cold Weather requires special precautions for placing, finishing and curing quality concrete.

Good concrete practices and planning are critical for winter concrete placement here in the Greater Kansas City Area.

Other Sources:

National Ready Mixed Concrete Association (NRMCA)
* *CIP #11, #27*
* *Cold Weather Ready Mixed Concrete Pub130*
www.nrmca.org

American Concrete Institute (ACI)
Cold Weather Concreting ACI 306R
www.concrete.org

American Society for Testing Materials (ASTM)
ASTM C94 Standard Specification for Ready Mixed Concrete
www.astm.org

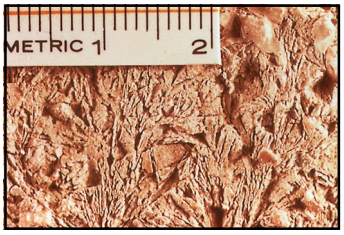
American Cement Association (ACA)
Cold-Weather Concreting, Chapter 19 in Design and Control of Concrete Mixtures, ed. 17
www.cement.org

GUIDELINES FOR COLD WEATHER CONCRETE

- Use air-entrained concrete when concrete will be exposed to moisture and freeze/thaw conditions. (Exterior concrete)
- Modify mix designs, use admixtures to accelerate set time and strength gain if needed, and ask for help from your ready mix supplier.
- Prior and during placement, keep surfaces exposed to concrete free of ice/snow and at above freezing temperatures.
- Place concrete at recommended temperatures.
- Place concrete at lowest practical slump.
- Limit water addition at the jobsite, a water-reducer may be a better solution, if improved workability is desired.
- Keep plastic (fresh moist) concrete from freezing or drying out.
- Regulate drastic temperature changes when protective precautions are removed.
- Do not start finishing operations while concrete bleed water is on the surface, as this will result in a weak surface.
- Cure concrete properly, keep it from early freeze/thaw temperatures until concrete has met minimum desired strengths. Pay special attention to corners and edges they are more susceptible to heat loss.
- Salamanders and heaters need to be vented from an enclosed work area, both for the workers safety and to prevent carbonization and dusting of the concrete surface.

Protective blankets for curing in cold weather

Non Air Entrained Concrete breaking up from the inside out



Unacceptable frozen concrete, not cured properly

Mission Statement:

The Concrete Promotional Group, Inc. supports quality concrete construction though education, information exchange, recognition, and promotion

CPG serving the Greater Kansas City Professional Construction Community since 1987.

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