PCI Plant Quality Talk
Quality Enhancement Committee

NPCA National Precast Concrete Association

PCI Precast/Prestressed Concrete Institute

SERIES 2, ISSUE 4 – COLD WEATHER CONCRETING

Cold Weather Considerations

Cold weather is when air temperature has fallen to, or is expected to fall below, 40 degrees F during the protection period. These conditions require special safeguards when placing, finishing, and curing concrete.

In its plastic state, concrete will freeze if its temperature falls below about 25°F. If fresh concrete freezes, its potential strength can be reduced by more than half, and its durability will be negatively affected as well. Concrete should be protected from from rapid cooling to maintain favorable curing.

As concrete cures, cement hydration generates heat. Newly placed concrete should be protected to retain this heat and thereby maintain favorable curing temperatures. Large temperature differences between the surface and the interior of the concrete mass should be prevented, as thermal cracking may result when this difference exceeds about 35°F.

Best Practice Options

- Concrete temperature can be controlled by heating the mixing water and/or the aggregates. The aggregates should not be heated to above 180°F.
- Chemical admixtures can accelerate the rate of setting and strength gain. Accelerating chemical admixtures are commonly used in the winter. Nonchloride accelerators should be used for prestressed concrete or when corrosion of steel reinforcement or metal in contact with concrete is a concern. Accelerating admixtures do not prevent concrete from freezing.
- Accelerating the rate of set and strength gain can also be accomplished by increasing the amount of portland cement or by using a Type III cement (high early strength).
- Preparations should be made before concrete placement in cold weather conditions. Snow, ice, and frost should be removed and the temperature of surfaces and metallic embedments in contact with concrete should be above freezing. This might require heating the formwork before concrete placement.
- Insulated blankets and/or tarps should be ready before casting starts. Enclosures and insulated forms may be needed for additional protection, depending on ambient conditions. Corners and edges are most susceptible to heat loss and need particular attention.
- If heat is applied to accelerate curing, the concrete surface should not be allowed to dry out while it is in a plastic state as this can cause plastic shrinkage cracks. Subsequently, concrete should be cured.
- Concrete temperature at the mixer shall be maintained above 50°F. Under best practices, MNL 116 requires that the combined concrete and forms temperature maintain a minimum of 50 degrees after placement and during curing. Materials shall be free of ice, snow, and frozen lumps before entering the mixer.

References

ACI 306R-16 *Guide to Cold Weather Concreting*

PCI MNL-116, *Manual for Quality Control for Plants and Production of Structural Precast Concrete Products*

Note: Please complete this form and return to the Quality Control Manager. All crew members should be observant and report to their foreman anything out of the ordinary on a project. *See something, say something.*

NOTES	ATTENDEE SIGNATURES
_____ DATE _____ PRESENTER	_____ _____ _____ _____ _____ _____