

PRECAST CONCRETE PRODUCTION IN COLD WEATHER

Precast concrete products are typically manufactured in a controlled indoor plant environment. However, large structural products, such as bridge girders, piling, and double tees are often cast outdoors on long-line steel casting beds, exposed to the elements where cold-weather conditions need to be considered. Concrete can be placed safely throughout the winter months in cold climates if certain precautions are taken. Cold weather is defined by ACI 306 as “a period when for more than 3 successive days the mean daily temperature drops below 40 degrees F.” Normal concreting practices generally can be resumed once the ambient temperature is above 50 degrees F. Concrete gains very little strength at low temperatures. Therefore, freshly mixed concrete must be protected against the disruptive effects of freezing until, through the process of hydration, the concrete attains a minimum compressive strength of at least 500 psi.

In cold weather special consideration needs to be given to concrete mixture designs including the use of Type III high-early-strength Portland cement, additional cement content, and the use of chemical accelerating admixtures. To maintain concrete temperatures at the mixer above a minimum of 50 degrees F, mixing water and fine and coarse aggregates may be heated prior to discharge into the mixer. All materials must be free from ice, snow, and frozen lumps before entering the mixer. When concrete temperatures are less than 50 degrees F, the time required for the concrete to gain strength is greatly extended.

Concrete can be placed successfully when ambient temperatures fall below 40 degrees F. This is accomplished by heating the forms to maintain a minimum concrete temperature of 50 degrees F. The existence of windy and cold conditions may dictate added protection to maintain the temperature of the forms and concrete after placement. Once the concrete is placed, the forms will be covered with insulated curing blankets or rigid enclosures and when the concrete has reached an initial set of approximately 500 psi, accelerated curing will commence, through the use of live steam or radiant heat.

Concrete temperatures will be monitored during the curing process. Concrete test cylinders will be cured under the same conditions as the product by either storing them next to the

product, or through the use of an insulated curing control box maintained at the same curing temperatures as the product. Curing will continue until stripping strengths have been achieved at which time curing covers will be removed and the products will be stripped from the forms and placed in storage for final curing to continue.

