



Cold Weather Concreting Procedures for Public Improvements

PDS

Engineering Services Division

ES Policy # 1-03

For privately funded projects that will be maintained by the City, this procedure shall be used as the basis for the acceptance or rejection of any concrete element of infrastructure with minor modifications. The procedure follows the provisions of ACI 306.1 -90 as modified below:

General

This specification covers requirements for cold weather concreting and protection of concrete from freezing during the specified protection period.

Definitions

Cold weather – A period when more than three successive days the average daily outdoor temperature drops below 40 F. The average daily temperature is the average of the highest and the lowest temperature during the period from midnight to midnight. When temperatures above 50 F occur during more than half of any 24-hour duration, the period shall no longer be regarded as cold weather. A cold weather situation exists solely based upon previous temperatures and not upon forecasted temperatures. The months of December, January and February have been designated as cold weather months and will require concrete protection, regardless of temperature.

Cold weather concreting – Operations concerning the placing, finishing, curing, and protection of concrete during cold weather.

Day – A time period of 24 consecutive hours.

Protection – Insulated blankets are required as cover for the concrete.

Suitable subgrade – Concrete shall not be placed on frozen subgrade.

Tracking cold weather

Does a cold weather situation exist?

Contact Engineering Services at (913)895-6223 or visit the web site:

<http://www.stormwatch.com/weather/coldWeatherConcrete.asp> for current and past requirements for specific dates.

Subgrade

Concrete shall not be placed on frozen subgrade.

Protection of concrete

Protection – Insulated blankets are required as cover for concrete. It is the responsibility of the contractor, in extreme cold, to determine if additional measures are needed to maintain the temperature requirements.

When cold weather conditions exist – Concrete temperatures must be maintained at 55 F for three days (two days if an approved accelerator is used, the cement content is increased by 100 lbs. per cubic yard, or Type III Portland Cement is used). Protection may be removed after the appropriate length of time or when the average of three field cured cylinder breaks show that the concrete has reached a compressive strength of 3000 psi.

During periods not defined as cold weather, but when freezing temperatures may occur, concrete surface must be protected against freezing for the first 24 hours after placing. Where concrete has frozen in the first 24 hours, it shall be rejected.

Protection Deficiency

If the temperature requirements during the three days are not met, the concrete must continue to be protected until twice the deficiency in degree-days is made up. For example, if the average temperature for the three days was maintained at 50 degrees (5 degrees below the requirement), the concrete would need to be maintained at 65 degrees (twice the deficiency) for an additional three days, or at 55 degrees for an additional 6 days. Note: If the concrete is found to have frozen in the first 24 hours, it shall be rejected.

In practice, if the contractor is unable to maintain 55 degrees F, he may also be unable to provide the increased protection requirement, three days after placement, without the use of heat generating equipment. Failure to provide the additional protection required, after first failing to provide the three days at 55 degrees F, shall be grounds for rejecting the concrete.

Backfilling Requirements

This procedure does not address the strength of the concrete necessary for backfilling or form removal. Generally, concrete should reach 75% of its design strength prior to backfilling. This strength can be determined through the use of field-cured cylinders. Concrete must have 5 days where the average daily temperature is above 50 degrees F prior to backfilling unless field-cured cylinders are taken. These days do not need to be consecutive.

In practice, this policy gives the contractor a guarantee that concrete that is placed in the winter, but which is not “cold weather,” will not be rejected for lack of protection so long as it is protected from freezing for 24 hours.