

hot weather concreting

Definition

Hot weather may be defined as any period of high temperature in which special precautions need to be taken to insure proper handling, placing, finishing and curing of concrete. Hot weather problems are most frequently encountered in the summer, but the associated climactic factors of high winds, low relative humidity and solar radiation can occur at any time, especially in arid or tropical climates. Hot weather conditions can produce a rapid rate of evaporation of moisture from the surface of the concrete and accelerated setting time, among other problems. Generally, high relative humidity tends to reduce the effects of high temperature.

It is important that hot weather be taken into account when planning concrete projects because of the potential effects on fresh and recently placed concrete. High temperatures alone cause increased water demand, which, in turn, will raise the water-cement ratio and result in lower potential strength. Higher temperatures tend to accelerate slump loss and can cause loss of entrained air. Temperature also has a major effect on the setting time of concrete: concrete placed at high temperatures will set quicker and can, therefore, require more rapid finishing. Concrete that is cured at high temperatures at an early age will not be as strong at 28 days as the same concrete cured at temperatures in the range of 70F.

High temperatures, high wind velocity, and low relative humidity can affect fresh concrete in two important ways: the high rate of evaporation may induce early plastic shrinkage or drying shrinkage cracking, and the evaporation rate can remove surface water necessary for hydration unless proper curing methods are employed. Thermal cracking may result from rapid drops in temperature of the concrete, such as when concrete slabs or walls are placed on a hot day followed by a cool night. High temperature also accelerates cement hydration and contributes to the potential for thermal cracking in massive concrete structures. Hot weather increases likelihood of ASR occurrence.

Hot Weather Concrete Recommendation

Use proven local recommendations for adjusting concrete proportions, such as the use of water reducing and set retarding admixtures.

Modifying the mixture to reduce the heat generated by cement hydration, such as the use of an ASTM. Type II moderate heat cement and the use of pozzolans and slag can reduce potential problems with high concrete temperature.

Advance timing and scheduling to avoid delays in delivery, placing and finishing is essential. Trucks should be able to discharge and adequate personnel should be available to place and handle the concrete. When possible, deliveries should be scheduled to avoid the hottest part of the day.

The purchaser may waive limits on maximum concrete temperature if the concrete consistency is adequate for the placement and excessive water addition is not required. In the case of extreme temperature conditions or with mass concrete, the concrete temperatures can be lowered by using chilled water or ice as part of the mixing water. The ready mixed concrete producer should use other measures, such as sprinkling and shading the aggregate prior to mixing, to help lower the temperature of the concrete. If low humidity and high winds are predicted, use one or a combination of; wind-breaks, sunscreens, mist fogging, or evaporation retardant may be needed to avoid plastic shrinkage cracking.

References

NRMCA CIP 4 (1998). *What, Why and How? Cracking Concrete Surfaces*
National Ready Mixed Concrete Association

Hot Weather Concreting, ACI 305R,
American Concrete Institute, Farmington Hills, MI.