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Aci 305 guide to hot weather concreting

While hot weather conditions are commonly found in summer, combinations of high temperatures, winds and low humidity could result in conditions leading to problems with placing concrete and ending at any time. ACI 305 Hot Weather Concreting defines hot times as any combination of the following conditions that tend to impair the quality of freshly mixed or hardened concrete: High room temperature High concrete temperature Low relative humidity Wind speed Radius problems Solaration in hot weather Specifying The success of many hot climate concrete operations depends on the steps taken to slow down cement hydration reactions within the concrete and minimize the speed of moisture evaporation moisture Concrete. Possible concrete problems in hot weather are likely to include: Increased water demand Increase sinking loss rate Rise in trend to plastic reduction cracks Increased difficulty in the control of the trained air content Decrease of 28 days and subsequent strengths Increased trend in differential thermal crack Greater variability in the surface appearance Increased permeability effects of hot weather on the Concrete: The hot climate imposes the harmful effects on the following concrete properties : Reduce the strength of concrete. Reduce the dimensional stability of concrete. Reduce the resistance to the meteorization of concrete. Cracks due to plastic contraction. To avoid the harmful effects mentioned on the hot climate on the quality of concrete the temperature of the concrete will not exceed the temperature shown in the following table: Maximum temperature of perishable concrete during the placement of concrete Relative humidity (%) During the time of placement of concrete Maximum concrete temperature allows (degree celsius) More than 60 33 C 40-60 30 C Less than 40 27 C High temperatures accelerate the hardening of concrete and generally more water is required to maintain feasible consistencies. If the water-cement ratio is not maintained by adding additional cement, strength and durability will be reduced. For example, if the concrete temperature is increased from 50 degrees F (10ºC) to 100 degrees F (38ºC), about 33 pounds (approximately 15 liters) of additional water per cubic meter of concrete are needed to maintain a three-inch drop. If the content of concrete water is increased without increasing the cement content, strength and other concrete properties are adversely affected. The high water content also means a greater reduction in drying. In addition, it speeds up the configuration that shortens the time when the concrete can be handled and finished. Cured concrete requires it to stay moist so that hydration can be completed, therefore it cannot afford to dry too quickly. equipment such as mixers, chutes, forklifts, etc. in the shade or covered with moist burlap will reduce the effect of the sun's heat. Shapes, steel reinforcement and subgrade must be with cold water just before placing the concrete. Wetting the area cools the surrounding air and increases relative humidity. This not only reduces the temperature, but also minimizes the evaporation of concrete water. Aggregates have a pronounced effect on fresh concrete temperature because they account for 60 to 80 percent of the total concrete weight. Stockpiles should be shaded from the sun and kept moist by spraying. Since evaporation is a cooling process, sprinkleration provides effective cooling, especially when relative humidity is low. The cement temperature has only a minor effect on the temperature of freshly mixed concrete because it represents a relatively small percentage of the total mixture. Concrete curing is a hydration process and requires water to be present. Shapes should be sprayed with water to keep them moist, or they will absorb some of the mixing water. As soon as the concrete has been sufficiently established to prevent the marada from the surface, it should be covered with straw, burlap, or other materials such as sand and keep moist for several days. Covering with polyethylene plastic sheets or using cured compounds helps prevent evaporation by air or wind. Anything to prevent rapid dehydration will be helpful. The high room temperature causes low relative humidity because the loss of concrete water is very high which translates into a high water requirement for the preparation of the mixture. Precautions in the dumping of concrete of hot weather: To control the high temperature of concrete can take the following steps: Schedule the specification. Concrete can be programmed in times when the temperature is not high, for example, in summer it can be programmed at night or early in the morning Material and mixed proportions: use material and mix the proportion of design that has good climate resistance, for example select sand with little specific heat. Covered environment: Concrete can be made in a covered environment. Creepy: The cooling of the aggregate can be done by watering or keeping them covered. Efficient workforce: use efficient labor and machinery to improve handling. Use of low heat cement: Use cement at low temperature. Concrete temperature: The formula for calculating the temperature of the concrete is given as: O on Ta, Tc, Tw and Twa and Ma, Mc, Mw, Mwa are temperature and mass of aggregate content, cement, water and water in aggregate respectively. Mine is the mass of ice. Material mass (kg) Specific heat (kJ/kg°C) Initial temperature (°C) Heat to vary temperature by 1°C (kJ) Total heat (KJ) Cement 300 0.92 66 276 18216 Water 150 4.41 25 627,6 15690 Added 1800 0,92 25 1656 41400 Total 2559,6 75306 To reduce the temperature of concrete in 1 ºC, decrease the temperature of any of the following for: Cement or Water or Aggregate Sometimes the gel is used to decrease the concrete Mass material (kg) Specific heat (kJ/kg°C) Initial temperature (°C) Heat to vary temperature in 1°C (kJ) Total Heat (KJ) Cement 300 0.92 66 276 18216 Water 110 4,184 25 460.24 11506 11506 1800 0.92 25 1656 41400 Gel 40 4,184 0 167.36 0 Melting heat=335 kJ/kg -1 13400 Total 2559 .6 57722 Measures to take during the dumping of concrete hot weather: Schedule a pre-placement conference to discuss the general checklist of concrete placement checklist and current concrete placement plan in hot weather. Place the concrete first thing in the morning at the time of day or late afternoon when the room temperature is low. Keep the concrete plant, mixers and vibrators in good working condition, as the intermediate concrete stop due to the breakdown of the equipment can be much more severe in hot weather conditions than in moderate time. Keep stocks of arid thin and thick as cool as possible by nuanced stocks or spraying water on stocks. Painting of white mixers. Cooling mixers for water spraying before unloading concrete from plants to mixers. Hydration of the cement, increased temperature, loss of fall, aggregate grinding and gain of air content occur over time while the concrete is in the mixer, so the time elapsed between the start of the mixture and the start of the placement should be minimized. To minimize time, good communication must be established between the workplace and the plant and the shipment of the mixers and the rate of concrete placement must be well coordinated. If mixers are required to deliver the concert via a route with a large volume of traffic, the placement must be planned during the period of lower traffic load. Paint the water tanks with white color. Replace some percentage of the ice mixing water. The general influence of the temperature of the concrete ingredients on the temperature of the concrete is calculated from the equation. No ice (units of LB and SI) T= With ice (UNITS YES) T= Where Ta = aggregate Ct temperature = Tw cement temperature = water mixing temperature of normal supply excluding Ti ice = ice temperature. (Note: The temperature of the free water and absorbed in the aggregate is supposed to be the same temperature as the aggregate. All temperatures are in F or C.) Note: For a correct proportion, the gel must be weighted. Cooling with block ice involves using a crusher/smelter unit, which can finely crush a block of ice and blow it into the blender. 11. Keep the fall on the high side (7.5 to 10 cm). 12. Proper healing according to the specification of project 13. Use of admixtures: Delaying admixtures that meet the C 494, type D requirements have both water reduction and established retardant properties, and are widely used in hot weather conditions. They can be included in concrete in different proportions and in combination with other which, as the temperature increases, you can use higher doses of the admixtura to obtain a uniform establishment time. Its water-reducing properties largely offset the higher demand for water as a result of the increase in concrete temperature. Because water reduces delayers in general Concrete resistance can be used, with suitable mixing adjustments, to avoid loss of strength that would otherwise result from high concrete temperatures (Gaynor et al 1985; Mittelacher 1985 and 1992). Compared to unmeded concrete, a concrete mixture that uses a mixture of reducing and retardant water may have a higher rate of falling loss. Note: The number of precautions mentioned above depends on the type of construction, ambient air temperature, low relative humidity, wind speed, concrete temperature and others. Few, or all of the above caution will be taken at a time based on necessity. References: ACI-305 ACI 207.1R ACI 224R Let us know in the comments what you think about the concepts of this article! Article!

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