

Using concrete in hot weather



Precautions need to be taken when placing concrete in abnormally hot weather. Any influence that tends to remove water from fresh or immature concrete, or causes an abnormal rate of reaction between cement and water, may impair its properties. Loss of water between mixing and placing may reduce workability to an extent that compaction becomes difficult, whilst that taking place between placing and maturity may give rise to premature cracking and imperfect cement hydration. Plastic cracking can occur when water is unable to rise to the surface of fresh concrete fast enough to replace that being evaporated. An increased rate of cement hydration in warm concrete gives higher strengths in the first few days of hardening but generally reduces ultimate strength.

The following is advice on practical measures that may be taken to minimise adverse effects of abnormally hot weather.

Materials

Avoid use of rapid hardening (high early strength) cements. Consider use of lower heat cements such as CEM II.

Avoid use of accelerating admixtures. Consider use of retarders to depress the early rate of cement hydration and reduce premature stiffening from this cause. Water-reducing admixtures may also be useful in reducing workability loss. Note that combined retarding / water-reducing admixtures are available.

Storage of materials

Aggregates



Measures taken to limit the temperature of stored aggregates produce the greatest effect in minimising the temperature of fresh concrete. Obstructing the sun's rays by a suitable screen can keep aggregate stockpiles down to air temperature. Plastic netting, intended to produce maximum shade with minimum wind resistance is available for this purpose. A continuous fine spray of water applied to the stockpile can be used to reduce aggregate temperature still further.

Where stockpile size renders such measures impractical, it may be possible to limit shading / cooling to the quantity of aggregate required for the next day's concreting.

Water

Avoid use of stored water. Take water directly from the main, if possible. Cooling with ice is feasible but rarely practical due to the quantities required for a significant effect.

Cement



Cement silos should be protected against heat by shading, coating with white or reflective paint and, where possible, lagging.

Cement can often be hot when received, due to heat from the grinding process. Supplies should, therefore, be ordered well in advance to permit cooling on site.

Packed cement should be kept in a ventilated dry store at the lowest feasible temperature.

Batching, mixing and transporting



Ensure there are no undue delays between mixing and placing a batch of concrete in order to minimise the length of time during which loss of workability may occur. Do not hold concrete for too long in rotating mixer drums, where internal friction will compound the effects of solar radiation.

Placing and finishing



If the rate of evaporation from placed / compacted concrete exceeds the rate of water migration to the surface, then shrinkage can cause plastic or 'wind' cracking. To minimise this tendency, provide covers, if possible, that can be positioned immediately after placing, rolled back in sections as finishing proceeds and replaced to complete the curing process.

Curing



Under any conditions, the aims of curing are to confine water within the concrete for reaction with the cement and to maintain a temperature at which the reaction will proceed at an acceptable rate. Drying conditions caused by hot weather makes efficacy of curing even more important.

An impervious sheet such as polythene, preferably pigmented white to reflect radiation should be placed over the concrete as finishing proceeds. The sheet may require supporting initially to avoid marring the finished surface but should be lowered into close contact as soon as possible and securely fastened down to prevent wind blowing underneath. Sheeting should be kept in place for several days.

Ponding or application of wet hessian or sawdust is generally impractical in hot weather as drying damage can occur before the surface is hard enough for such treatments. Sawdust and Hessian can also act as evaporation wicks in hot weather.

Intermittent spraying of water on to the surface should be avoided as the resulting temperature fluctuations may induce cracking.

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