

# PRODUCT INFORMATION

## CONCRETING IN HOT WEATHER

### WHAT ARE HOT WEATHER CONDITIONS?

Hot weather may be defined as any period of high temperature in which special precautions need to be taken to ensure proper handling, placing, finishing and curing of concrete.

Hot weather problems are most frequently encountered in the summer, but the associated factors of moderate to strong breeze, low relative humidity and solar radiation can occur at any time of the year.

In the UK when temperatures exceed approximately 20, there are two main factors leading to problems with concreting:

1. When the temperature of the concrete itself increases, the rate of reaction between the cement and the water is increased and this, in turn, leads to an increased rate of stiffening and loss of consistence. There is also an increased risk of early-age thermal cracking because the peak temperature will be increased. British Standard (BS 8500-2: 5.4) requires that the temperature of fresh concrete at the time of delivery shall not be greater than:
  - the specified value (where specified) and
  - 35°C (in all areas)
2. High air temperatures, especially when accompanied by low humidity, increase the rate at which water evaporates from the concrete and this can lead to plastic shrinkage cracking on exposed surfaces. Evaporation of water due to delays between mixing and placing will also cause a loss of consistence.

### LOSS OF CONSISTENCE

Stiffening due to high temperatures and / or water loss can cause problems by:

- Making it difficult to place and compact the concrete
- Increasing the risk of 'cold joints' in large pours
- Creating surface finishing problems with floors and paved areas

The existence of rapid drying conditions makes it more important to ensure that exposed surfaces of concrete after compaction and finishing are protected against loss of moisture by efficient curing methods.

Accelerated stiffening and loss of consistence can best be minimised by placing the concrete as soon after mixing as possible. It is essential that concrete should be of the required consistence at the point of placing and any site delays are kept to a minimum.

Rapid stiffening can be minimised by using a suitable admixture and / or cements containing significant amounts of fly ash or GGBS, which reduce temperature rise and minimise the risk of early-age thermal cracking.

## MOISTURE LOSS

The rapid loss of moisture from the surface of exposed concrete increases the risk of plastic shrinkage cracking and the concrete should be cured thoroughly as soon as possible after finishing. As soon as the surface has hardened sufficiently, polythene sheeting can be used, or a sprayed-on curing membrane applied, preferably using a pigmented type that reflects solar radiation.

Mixes with low water content - eg low slump, semi-dry mixes - make concrete more susceptible to the adverse effects of the moisture loss.

Concrete that has lost consistence due to early stiffening should not be retempered by additional water.

## THE PROBLEMS CREATED WHEN CONCRETING IN HOT WEATHER

Hot weather conditions can lead to a number of potential problems in the supply, placing and properties of ready-mixed concrete, these include:

- Concrete dries out quickly / loses workability
- Shorter setting times and early stiffening
- Difficulties in placing and finishing
- Increased tendency for plastic shrinkage
- Increased risk of cold joints (A cold joint is formed when fresh concrete is placed against concrete that has set and started hardening)
- Possible loss of 28 days compressive strength
- Increased risk of cracking due to thermal contraction
- Potential for surface delamination to slabs finished by power-floating due to incorrect timing of the finishing operation

## MINIMISE THE EFFECTS OF HOT WEATHER

- Schedule concrete pours for the cooler part of the day
- Reduce times of transport and placing where possible
- Increase workability to help placing
- Ensure adequate manpower available on site to place concrete
- Protect against moisture loss with efficient curing
- Use blended cement rather than CEM I
- Use admixtures to enable an increase in consistence without increasing water:cement ratio
- Specify a retarding admixture to delay the setting time
- Ensure test samples (cubes / cylinders) are stored in the shade away from direct sunlight (at a temperature between 15 - 25°C) and protected against moisture loss