ADVICE FOR COLD WEATHER - CONCRETE

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Special care must be taken when placing concrete in cold weather. If young concrete is allowed to drop in temperature to the extent that it freezes, it will be damaged and become unfit for use. It should also be noted that **even if temperatures do not drop below zero** the concrete will develop strength much slower than during the warmer months.

The following is advice on practical measures that need to be adopted on small and medium size jobs.

Two different temperatures have to be considered when working with concrete in cold weather – that of the ambient air temperature and that of the concrete itself, the following advice makes it clear which is being referred to, it is important not to confuse the two.

If freshly placed concrete cools below 0ºC the water in the mix will freeze and expand. This could damage the concrete so much that it becomes useless and has to be removed.

However, provided the concrete is able first to reach a strength of about 2 N/mm2 , it is likely to resist this disruptive expansion. For most mixes this strength is achieved within 48 hours if the concrete is kept at or above 5ºC. However, even after the concrete has reached 2 N/mm2 low temperatures will slow down the strength development.

The aim therefore, during cold weather must be to keep the concrete warm (above 5ºC) for the first 48 hours and then ensure that the strength is permitted to develop, albeit at a lower rate.

The severity of the weather determines the precautions that need to be taken. For the purposes of concreting, cold weather can be divided into the following three categories.

Ambient temperature below 5ºC but no frost.

When the temperature is low but does not drop below freezing there is no danger that the concrete will be permanently damaged but it will take longer to develop strength.

It is important that formwork is not removed too soon otherwise there is a risk that corners and arises could be knocked off and that concrete in beams and suspended slabs may be too weak to carry its own weight and collapse.

It is impossible to give a hard and fast rule as to how long formwork should be left in place as the rate of gain of strength depends upon many factors including the ambient temperature, the amount of cement in the mix and the type of cement.

If necessary the rate of gain in strength can be speeded up by:

- Increasing strength of mix
- Removing GGBS from the mix
- Removing any retardant admixture
- Adding an accelator

Slight frost at night.

Any concrete must be prevented from freezing so all freshly placed concrete must be protected straightaway. The temperature of concrete should not be less than 5ºC when delivered. There will be occasions when we cannot guarantee this temperature on delivery and you will need to decide whether you can adequately protect the concrete in these circumstances if you wish to proceed with concreting.

Necessary protection is frost blankets and insulated formwork, timber formwork by itself often offers sufficient insulation and when used for beams, columns and walls the only additional precaution necessary is to cover the exposed surfaces with insulating material or erect temporary covers and provide heating with space heaters.

Prior to placing ensure that sub-bases, formwork, reinforcement and any transporting or placing equipment are free from ice and snow.

Severe frost day and night.

Concreting should be delayed until ambient temperature has increased above 3ºC.

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