

Cracked Concrete, Curing & Weather

What causes cracking?

The main causes of concrete cracking are down to either not curing the concrete or ineffective curing.

Early or rapid drying of concrete builds surface tension and can start cracking it. The size, direction and occurrence of the crack can vary greatly due to different weather conditions and the time the slab is laid. The humidity, wind speed and outside temperature are all contributors by themselves or in combination.

Many people have never cured concrete and not experienced cracking however the likelihood is there is a high chance that micro cracks have happened which are not visible to the naked eye.

By not curing concrete effectively the surface can be less durable by 50% and can be prone to delamination and dusting.

Cracks

Cracks can occur within a few hours of laying though are not normally visible until the next day. Even though they are on the top the crack will continue to develop right through to the base of the laid concrete. These are known as plastic shrinkage cracks but are not classified as structural cracks and will not affect the overall structural integrity of the concrete. If the concrete is intended for driveway, road, warehouse etc known as a direct wearing course then the durability of the surface may be an issue as explained. The cracks can occur randomly or seem to be in a pattern, the thickness of the cracks can be as little as a hairline up to a few mm.

Repair

The best way to repair any crack is to take some dry cement and brush it in. the cement dust fills the crack and the residual water in the concrete will react with the cement causing a seal. If a crack is not repaired water can penetrate it which could cause freeze thaw. This could cause further edge damage and internal damage to the concrete.

Curing Concrete

Curing freshly laid concrete assists in the strength development and improves durability potential. Occasionally curing also helps surface finishes and reduces thermal contraction effects.

Correct curing prevents water evaporating from the slab surface. Curing using applied insulation helps stabilising internal temperature in large areas of laid concrete as well as maintain and adequate temperature in cold or frosty weather to ensure that all the water reacts with the cement.

It is important that when laying concrete, you understand how to carry out effective curing.

By curing concrete you will increase wear, frost & thermal contraction resistance, improve the life span, reduce cracking and get the optimum strength of the concrete required.

Water & Cement

Developing the durability and strength of all concrete comes down to maximum hydration with the cement. If the concrete dries too early the chemical reaction stops and the strength and durability of the mix design are majorly reduced. This is a critical concern where a slab is subject to wear as explained in "Cracks" and can happen over a brief time frame. Prevention of water loss is key so a full cement hydration reaction can occur to ensure hardened concrete.

Vertical Surfaces

Most of the year due to the climate in England, formwork left in place for 3 or more days is sufficient in protecting immature concrete from losing water due to evaporation. During particularly cold weather formwork should be left for more than a full week in conjunction with insulation.

In very dry or windy conditions it is advised to leave the formwork on considerable longer.

Where formwork is needed for another section the following day extra curing could be required. This can be done by using insulated panels or plastic sheets providing they are applied as soon as the formwork is removed and kept in close contact with concrete surface. Using spray compound on vertical surfaces is not as effective unless sprayed immediately after the formwork is taken off. To be effective the coverage must be complete leaving no unprotected area. This can be useful when concrete can be exposed from the form from as little as 4 hours after being placed. Wet hessian draped beneath the formwork can be used as an alternative. If painting rendering or putting another form of coating is to be done it is not advised to use a curing compound.

The use of cold water in hot climates could lead to surface cracking and irregularities due to rapid cooling. Misting can be an effective method to cure concrete as it helps stop evaporation and early water loss. As with any curing it must be applied immediately when the formwork is taken away.

Horizontal Surfaces

Curing surfaces such as floor slabs, roads and pavements tend to be done by using a waterproof sheet (such as polythene) laid closely to the concrete surface or a registered spray applied film (applied as soon as concrete loses its top sheen). Early curing minimises plastic shrinkage cracking especially in hot & windy conditions.

Spray compounds are measured by their efficiency to reduce water loss due to evaporation. The rating is carried out by the manufacturer. The films normally degrade over time however these curing compounds are not suitable on surfaces such as screed as it could reduce the bond.

In hot windy weather, it is advisable to try and build wind breaks and shelters to minimise air movement, loss of water and maintain constant temperature. Extra care should be taken when laying a waterproof sheet.

In cold dry weather immediate protection and curing must be taken. This will help maintain a steady temperature between the centre and the surface of the concrete and also minimise evaporation. An effective way to protect and reduce water loss to the concrete is to lay wool insulation blankets or polythene with lightweight insulation such as straw. In cold weather water should not be used for curing.

Cubes

Test cubes must be correctly cured. Ineffective curing will lead to invalid results and are not a true representation of the quality of the concrete delivered. Failure to do so can cause unjustified concern and the instigation of further costly assessments of compliance.