

cure” we should always try to avoid such problem by using adequate construction material and technique, proper design, and efficient supervision. The things to be taken care of to avoid crack can be listed as:

- Check for predicted extreme temperature variance during the first 24 hours of expected placement
- Review the mix design to ensure the mix is using the lowest water content for workability/performance purposes. Excessive water in the mix may contribute to the possibility of shrinkage.
- Review the mix design to ensure the maximum size of coarse aggregate is used. This will help to minimize the water used in the mix.
- Review the mix design to ensure the contractor is familiar with finishing technique for the cementitious material in the mix. Cementitious materials may increase or decrease the rate of bleed water migration to the surface. This, in turn, may shorten or lengthen the window of time for ease of finish ability
- During the pre-placement meeting; review the plan for subgrade preparation. The subgrade should be properly compacted at required moisture content. This preparation will ensure the subgrade will be able to uniformly support the slab as well as not draw moisture from the slab during placement
- Have a plan in place for curing the concrete for the specified period. This curing plan should include steps for both maintaining of the concrete during placement while in a plastic state as well as after concrete has hardened.
- There are chemical admixtures that may help to reduce the amount of drying shrinkage.
- There are synthetic fibers that may help control the extent of early drying shrinkage crack
- Construction on expansion/contraction joints so that temperature effect can be neutralized.

If buildings are built without considering above mentioned measures it is obvious that different types of crack will start to appear sooner or later. Hence in such case the cracks are required to be cured before they cause serious problem. It is very important to read the characteristics of crack and analyze carefully by experts in order to come up with most effective and sustainable solution to deal with different concrete crack problem. The scientific method of determining cause of cracking is:

- State problem
- Make observation:

The important points to be considered in this step are-

- structural or non-structural crack
- crack details i.e. orientation, location, length, width, depth, shape, frequency, age
- crack location within a member
- environmental exposure condition
- type of member
- appearance

- Form hypothesis i.e., possible cause
Depending on observations made the basic idea of possible causes are made with the help of expert's opinion.

- Test the hypothesis by performing tests, making calculations, making more extensive observation

The surface cracks are detected by dye penetration method, using optical comparator or by visual inspection and some simple measurement.

The sub surface cracks that do not show on the surface are detected by ultrasonic wave method, magnetic particle method, electric potential method and using Digital Rissmess System (DRS)

- Analyze the results and iterate if necessary
- Form conclusion

The various techniques to cure crack are as below:

Epoxy injection

Cracks as narrow as 0.002 in. (0.05 mm) can be bonded by the injection of epoxy. The technique generally consists of establishing entry and venting ports at close intervals along the cracks, sealing the crack on exposed surfaces, and injecting the epoxy under pressure. Epoxy injection has been successfully used in the repair of cracks in **buildings**, bridges, dams, and other types of concrete structures (ACI 503R). However, unless the cause of the cracking has been corrected, it will probably recur near the original crack. If the cause of the cracks cannot be removed, then two options are available.

Routing and sealing

Routing and sealing of cracks can be used in conditions requiring remedial repair and where **structural repair** is not necessary. This method involves enlarging the crack along its exposed face and filling and sealing it with a suitable joint sealant. This is a common technique for crack treatment and is relatively simple in comparison to the procedures and the training required for epoxy injection. The procedure is most applicable to approximately flat horizontal surfaces such as floors and pavements. However, routing and sealing can be accomplished on vertical surfaces (with a non-sag sealant) as well as on curved surfaces (pipes, piles and pole).