



**CONCRETE**  
ALBERTA

# Concrete Tech Tip # 3

## Crazing Concrete Surfaces

### 1. WHAT is Crazing?

Crazing is the development of a network of fine random cracks or fissures on the surface of concrete or mortar caused by shrinkage of the surface layer. These cracks are rarely more than 3mm deep and are more noticeable on steel troweled surfaces. The irregular hexagonal areas enclosed by the cracks are typically no more than 40mm across and may be as small as 20mm in unusual instances. Generally, crazing cracks develop at an early age and are apparent the day after placement or at least by the end of the first week. Often they are not readily visible until the surface has been wetted and it is beginning to dry out.



**Crazing Concrete Surface (Dampened)**

Crazing cracks are sometimes referred to as shallow map or pattern cracking. They do not affect the structural integrity of concrete and rarely do they affect durability or wear resistance. However, crazed surfaces can be unsightly. They are particularly conspicuous and unsightly on concrete which contains calcium chloride.

### 2. WHY Do Concrete Surfaces Craze?

Concrete surface crazing usually occurs because one or more of the rules of “good concrete practice” were not followed. The most frequent violations are:

- A) Poor or inadequate protection and/or curing. Intermittent wet curing and drying, or even the delayed application of curing, will permit rapid drying of the surface and crazing.
- B) Too wet a mix, excessive floating, the use of a jitterbug, or any other procedures which will depress the coarse aggregate and produce an excessive concentration of cement paste and fines at the surface.
- C) Finishing while there is bleed water on the surface, or the use of a steel trowel (because the smooth surface of the trowel brings up too much water and cement fines). Use of a bull float or darby, while bleed water is on the surface, will produce a high water – cement ratio weak surface layer which will be susceptible to crazing, dusting and other defects.
- D) Sprinkling cement on the surface, to dry up the bleed water, is a frequent cause of crazing surfaces. This concentrates fines on the surface.

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- References:
- 1. Guide for Concrete Floor and Slab Construction, ACI 302.1R, American Concrete Institute, Farmington Hills, MI.
  - 2. Concrete Slab Surface Defects: Causes, Prevention, Repair, IS 1771, Portland Cement Association, Skokie, IL.
  - 3. Ward Malisch, Avoiding Common Outdoor Flatwork Problems, Concrete Construction, July 1990.
  - 4. Ralph Spamenberg, Use the Right Tool at the Right Time, Concrete Construction, May 1996.
  - 5. Concrete in Practice # 3: Crazing Concrete Surfaces with permission from the National Ready-Mixed Concrete Association.



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Concrete Alberta  
4944 Roper Road, Edmonton, Alberta T6B 3T7  
Ph: 780-436-5645 Fax: 780-436-6503  
Email: [info@concretealberta.ca](mailto:info@concretealberta.ca)  
[www.concretealberta.ca](http://www.concretealberta.ca)



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E) Occasionally, carbonation of the surface causes crazing. Carbonation is a chemical reaction between cement and carbon dioxide or carbon monoxide from unvented heaters. In such instances the surface will be soft and will dust as well.

### 3. HOW to Prevent Crazing

A) When concrete is placed under drying conditions (hot windy days or even cold days with warm concrete), one means of reducing the surface drying that may cause crazing is to use a spray applied evaporation reducer between finishing operations such a strike-off, floating and troweling or texturing.

B) To prevent crazing start curing the concrete as soon as possible. The surface should be kept wet by either flooding the surface with water or, covering the surface with non-woven geotextile under polyethylene sheeting and keeping it continuously moist for a minimum of 3 days and maintaining a minimum temperature of 10°C. Curing retains the moisture required for proper combinations of cement and water. This chemical reaction between cement and water is called hydration.

C) Use moderate slump 80 to 120 mm, air entrained concrete. High slumps can be used providing the mixture is designed to produce the required strength without excessive bleeding and / or segregation. Air entrainment, when used in appropriate concrete flatwork applications, helps to reduce the rate of bleeding of fresh concrete and there by reduces the likelihood of crazing.

D) NEVER sprinkle or trowel dry cement, or a mixture of cement and fine sand, into the surface of the plastic concrete to absorb bleed water. Remove bleed water by dragging a garden hose across the surface. DO NOT perform any finishing operation while bleed water is present.

E) Dampen the subgrade prior to concrete placement to prevent it absorbing too much water from the concrete. If an impervious membrane, such as polyethylene, is required on the subgrade cover it with 25 to 50 mm of damp sand to reduce bleeding.

#### Follow These Rules to Prevent Crazing

1. Use moderate slump 80 – 120 mm concrete with reduced bleeding characteristics.
2. Finish properly.
  - a. Remove bleeding water before performing any finishing operations. DO NOT broadcast any cement onto the surface to absorb bleed water.
  - b. Avoid excessive manipulation of the surface, which can depress the coarse aggregate, increase the cement paste at the surface, and increase the water – cement ratio at the surface.
  - c. Delay final floating or troweling until water sheen has disappeared from the surface.
3. Cure properly, as soon as finishing has been completed.



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Ph: 780-436-5645 Fax: 780-436-6503  
Email: [info@concretealberta.ca](mailto:info@concretealberta.ca)  
[www.concretealberta.ca](http://www.concretealberta.ca)