



TECHNOTES

CFA-TN-004

Cracking in Concrete Walls

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Goal and Purpose

This edition of Tech Notes answers common questions about cracking in concrete walls: What causes them? How can they be reduced? When should you be concerned?

Cracks in concrete walls and slabs are a common occurrence. They appear in floors, driveways, walks, structural beams and walls. Cracking cannot be prevented, but it can be significantly reduced or controlled when the causes are taken into account and preventative steps are taken. Most cracks should not be a cause for alarm.

CAUSES OF CRACKS

Cracking can be the result of one or a combination of factors, all of which involve some form of restraint. Some examples include:

- **Drying shrinkage:** This occurs as water used in the mix design evaporates.
- **Thermal contraction/expansion:** Due to temperature changes.
- **Subgrade settlement (or expansion):** Resulting from poor soil conditions or changes in soil moisture content.
- **Differential bearing capacity:** Harder soils under part of the foundation can cause stresses as the building “settles in.”
- **Applied stresses:** Forces such as building load, earth load, hydrostatic pressure, or heavy equipment operated too close to the wall.

TYPES OF CRACKS

Tremendous forces can build up inside the wall due to any of these causes. When the forces exceed the strength of the material, cracks will develop. Each of these causes normally leave a “signature” in the type of crack it creates. The vast majority of cracks are of little concern by themselves.



Shrinkage and temperature cracks are most often vertical to diagonal. They typically emanate from a corner of a window, beam pocket or other opening. Cracks of this type are called reentrant cracks. These are very common and, unless they leak or show significant lateral displacement, are of no structural concern.

Cracks which are horizontal are most likely caused by an applied load. Vertical cracks which are significantly wider at the top or bottom could indicate heaving or settlement. With these cracks it is very likely that the crack itself is not the problem, but rather the result of an external problem such as poor drainage, overloading, etc.



MINIMIZING THE PROBLEM

Contractors can employ several methods of reducing the occurrence and width of cracks.

- The first is the use of proper concrete mix designs. A mix with sufficient strength using the minimum amount of water necessary to distribute the concrete throughout the wall without voids should be used. The type and amount of cement, as well as coarse and fine aggregates, can also have a large effect on the amount of shrinkage.
- A small amount of temperature steel reinforcement will reduce the width of cracks that do occur.
- Control joints are intentional weak spots designed to induce shrinkage or thermal cracks in pre-determined locations. These can be very effective if waterproofed carefully.

- Rapid water loss and extreme temperature swings while the concrete is in the early stages of curing should be avoided where possible.
- Careful backfilling is mandatory. Typical basement walls are not designed to act as retaining walls. They must be secured with the basement floor at the bottom and the floor deck at the top, or be braced adequately, before being backfilled. The use of heavy equipment near the wall should be restricted and carefully considered.
- Anchoring the deck in accordance with local building codes, including the use of anchor bolts/straps and blocking, is very important. Improper anchoring has been the cause of a number of failures.

When Should You Be Concerned

Temperature and shrinkage cracks in walls or slabs are likely to occur in nearly all structures. When the width of a crack exceeds 1/4" in width; when they show 1/4" in lateral displacement; when water leaks through the cracks; or you find long horizontal cracks, it is probably time to seek professional assistance.

The contractor that built the wall, or your local CFA member, should be able to help you. ■

ABOUT THE CFA

The Concrete Foundations Association (CFA) was formed in 1975 to serve the interests of poured wall contractors. As an international nonprofit trade association with a diverse membership spread throughout the United States and Canada, maintains a network that permits individuals with needs and interests to seek advice and professional experience while curating forums where contractors exchange ideas and gain insight for technological and practice advancements.