

What Causes My Concrete to Crack?

This has been the most frequent question to the Hotline over many years. Sometimes the cause of the crack can be easily determined but on a few occasions the cause may never be known. The ability of the Hotline to assist in assessing the cause of cracking depends on YOU! Yes, we need information from you to use our engineering judgment in determining the most likely cause for one crack or several. What type of information? We're glad you asked. Ward Malisch and I have put together our *wish list* of information that would be useful to have when evaluating crack causes.

The information is important because there are often a number of cracks but they may not all be caused by a single issue. For instance, there could be plastic settlement cracks, plastic shrinkage cracks, and drying shrinkage cracks on the same project— each with a different cause. Ward and I need to obtain, analyze, and evaluate the information to make sure that we address the cause of all the cracks. The information below helps in making that determination. However, we know that it may not be possible to provide all the information.

RELEVANT INFORMATION TO GATHER

<p><u>Crack Information</u></p> <p>A. Identify Location (slab on ground, elevated slab, foundation wall, column, etc.)</p> <p>B. Determine how soon after concrete placement crack occurred</p> <p>C. Take crack photos: close up and from a distance</p> <p>D. Provide current age of concrete</p> <p>E. Prepare a crack map showing (on scaled paper; a typical bay might be enough)</p> <ol style="list-style-type: none"> 1. Crack orientation 2. Crack widths 3. Location of any photos on crack map 4. Joint locations 5. Concrete member (e.g. beams supporting elevated slabs) locations with dashed lines on the map 	<p><u>Construction Information</u></p> <p>A. Fresh concrete properties: temperature, slump, air content, density (unit weight)</p> <p>B. Hardened concrete properties: field- and lab-cured cylinder strengths</p> <p>C. Placement history; start time, finish time, curing time</p> <p>D. Finishing tools and procedures</p> <p>E. Concrete curing method and procedures</p> <p>F. Forming methods including shoring and reshoring</p> <p>G. Batch ticket information</p> <p>H. Early-age loading history</p>
<p><u>Design Information (Specified)</u></p> <p>A. Concrete sizes of members and specified concrete compressive strength</p> <p>B. Bar and post-tensioning reinforcement size and spacing</p> <p>C. Joint types and location including joint load transfer devices</p> <p>D. Concrete mixture design (submittals are most helpful)</p>	<p><u>Environmental Information</u></p> <p>A. Weather during placement and before cracks occurred</p> <p>B. Hot or cold weather precautions taken</p> <p>C. Rainfall history before, during, and after concrete placement</p>

We rarely get all of this information, but the more we have the easier it is to identify the most likely cracking cause(s). Establishing causes then helps to assess responsibility among the design and construction team members.