

The Mysteries and Myths of Foundation Performance

Almost every homeowner worries to some degree or another over the performance of their slab foundation. In many cases, this worry stems not from any functional problem in the home, but a visual one—usually a crack that has appeared (or has just been discovered).

For about as long as homeowners have worried about their foundations, engineers have tried to come up with objective ways to measure foundation performance. Their professional societies even sponsor conferences to discuss the subject. And the conclusion is always the same—there is not now, nor will there likely ever be, a uniform standard for foundation performance. It always boils down to the subjective judgment of someone who, hopefully, has seen thousands of foundations over a career and compares the current one to all of those he or she has seen in the past.

Worry over foundation cracks is usually wasted. Most cracks occur during the initial curing of the slab because concrete shrinks as it hardens. This can sometimes be avoided through careful design and construction, but concrete seems to have a mind of its own and will frequently crack during the most rigidly controlled installations. And very few residential foundations are rigidly controlled. In all but the rarest cases, it doesn't matter anyway. Cracking that occurs during curing may not be pretty, but almost never affects foundation performance. Most of it gets covered with some type of flooring and is never thought about again—until that carpet in the living room is replaced and the home's new owner starts the worry cycle over again.

Some cracks deserve a little more worry. These occur because the foundation has moved in some way—sometimes settling, sometimes uplifting. However, even most of these are fairly benign. The experienced engineer will look past them to find other problems associated with movement, such as sticking doors and windows, cracks in drywall, and noticeable slopes in the slab, before rendering an opinion on performance. A settlement crack without this other evidence is usually nothing more than a warning to take preventive maintenance actions and watch for the possible onset of these other problems.

So what does the practiced engineer look for in making his subjective evaluation of a slab if the crack doesn't tell him much? He considers the whole "picture:"

- **Are there conditions around the foundation that contribute to foundation failure?** The most common of these is large trees or overgrown shrubs, whose roots may be causing uplift or whose water demands are creating an imbalance in the moisture level of underlying soils. The only true solution for this problem is to remove the tree. A second concern is poor drainage, which can cause water to accumulate on one side of the home while other sides remain dry. The result is the same moisture imbalance caused by large trees.

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Trees can be death to house foundations.

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- **Is the soil type conducive to foundation movement?** Heavy clay soils, typical in Houston and many other areas of Texas, swell and shrink as they get wet and dry out. Foundations sitting on these soils, if improperly designed, will move in harmony (possibly a poor choice of words for the affected homeowner) with the moisture level, and—usually over time—fail from differential settlement or uplift. Sandy or other granular soils don't have this problem, but are sensitive to erosion effects and can be undermined from a foundation not properly designed to prevent it.
- **Are concentrated loads properly accounted for in the foundation design?** The foundation for the simplest frame home is designed to withstand loads uniformly distributed along the entire length of exterior walls. As homes get larger and more complex in configuration, concentrated loads occur, either within the home or along these exterior walls. Foundations must account for these much larger loads. Many homes that are built without the aid of a structural engineer have problems that result from the builder's misunderstanding of the nature of such loads.
- **Is there extensive evidence of foundation movement in the entire structure?** As foundations move, or sometimes even twist, they exert forces on the framing and finishes above. This will almost always appear in the form of sticking doors or windows and cracking of drywall, especially at the corners of these openings. Severe settlement might result in noticeable slope to floors—in the worst cases causing wheeled furniture to slide downhill. Most homes will show some evidence of these problems as they age, and the broad experience of the professional engineer is critical here in determining whether the condition is so extensive that repair must be undertaken.

So what is the diligent homeowner to do? First and foremost, don't do any repairs in haste. Secondly, take preventive action. Remove trees near the home, especially those with root structures that are close to the surface. Nurture grass or small plants along the foundation and maintain a constant moisture level on all sides. A lawn irrigation system is the best alternative for peace of mind in this case. And pay attention to the interior of your home. One sticky door is a warning; four or five are should be a wake-up call.

What should a homeowner not do if he thinks there may be a problem? Don't ask a foundation repair company for advice. Their bias in favor of repair is overwhelming, even if they have engineers on their staff. Don't even call a home inspector. They are trained to look for signs of trouble, not to diagnose or repair them.

Who is best qualified to evaluate your foundation? A professional engineer in the civil or structural disciplines with years of experience looking at problems like yours. Spend a little time looking for the right individual or firm, and don't quibble over the cost. A poorly qualified engineer who agrees to evaluate your home for \$75 will cost you much more in the long run than the real professional who charges four or five times that amount. Neither fee is significant as compared to the cost of a bad diagnosis.



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