

Foundation Flatness/Levelness

Many homeowners and home buyers become concerned at one time or another with the levelness or flatness of their home foundation. In many parts of Texas and in more scattered areas of the United States where clay soils provide support to these foundations this issue is of particular concern. However, expectations for levelness are often unrealistic, and many repairs have undoubtedly been made on foundations that were perfectly serviceable.

We should explain that levelness and flatness are not the same thing. "Levelness" refers to the degree to which all points of a foundation, and in particular the most extreme points, vary from an imaginary plane that has the exact same elevation at all points on its perimeter. "Flatness" has more to do with the variation in top of slab elevation from point to point *within* the foundation perimeter. A foundation could be perfectly level and very "unflat". An example of such a condition would be a home whose perimeter is absolutely dead-on level, but whose interior surfaces are poorly finished, containing lots of hills and valleys. A foundation could also be perfectly flat, but grossly out of level. Just visualize a table top with two legs lifted off the floor.

It is certainly reasonable for homeowners to be concerned with both levelness and flatness. However, in determining the extent of a problem, several factors should be considered:

- **As-Built Conditions.** The contractors who specialize in residential foundations (and almost all foundations are placed by specialty contractors) are by and large fairly efficient and reasonably competent. However, the competitive nature of residential construction makes it difficult for them to be extremely precise in setting forms and finishing concrete to level and flat conditions. As a rule, their degree of precision is sufficient to satisfy most homeowners. The most widely-known standard in the United States, by the American Concrete Institute, calls for no more than $\frac{3}{4}$ " variance over an entire slab, but many studies have found that functional foundations are often placed with 2" or more of such variance.

- **Individual Tolerance for Levelness.** DEI has investigated homes with foundations as much as 5" out of level with the residents completely unaware of the condition. This can usually be explained by the fact that the variation within any one room is rarely more than 1", and most people simply can't detect this minor change over 15 to 20'. We generally believe that if it takes an instrument to verify an out-of-level condition, then levelness isn't a real problem unless other signs of distress are present.

(continued)



Great flatness, poor levelness.



Great levelness, poor flatness.

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- **Foundation Settlement.** Foundation movement can unquestionably impact on the levelness of a home, sometimes with very destructive results. Since most foundation movement is non-uniform (i.e., it is worse on one side of the home than the other), it usually affects the superstructure (walls, doors, windows and ceilings) in ways that create damage well beyond the foundation. However, in light-moderate cases, it is often difficult to tell the difference between foundation movement and as-built conditions. And if damage is not pervasive and significant, re-leveling the home can often cause more problems than it solves.

So what is the typical homeowner to do when he thinks he has a levelness problem? Call an independent structural engineer with no ties to foundation repair companies. Select one with extensive experience in residential foundations, preferably one who has seen hundreds or thousands of them. It is this kind of expertise that can best judge whether your concern is justified or not. Many times, he or she will tell you to worry about something else.



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