

## Cracks

It is the nature of many construction materials to crack as they age and as they expand and contract, particularly with exposure to moisture as they get wet and dry out. The more common of these include concrete, asphalt, stucco, stone, brick, mortar, concrete block, plaster, and drywall (also called sheetrock or Gypsum).

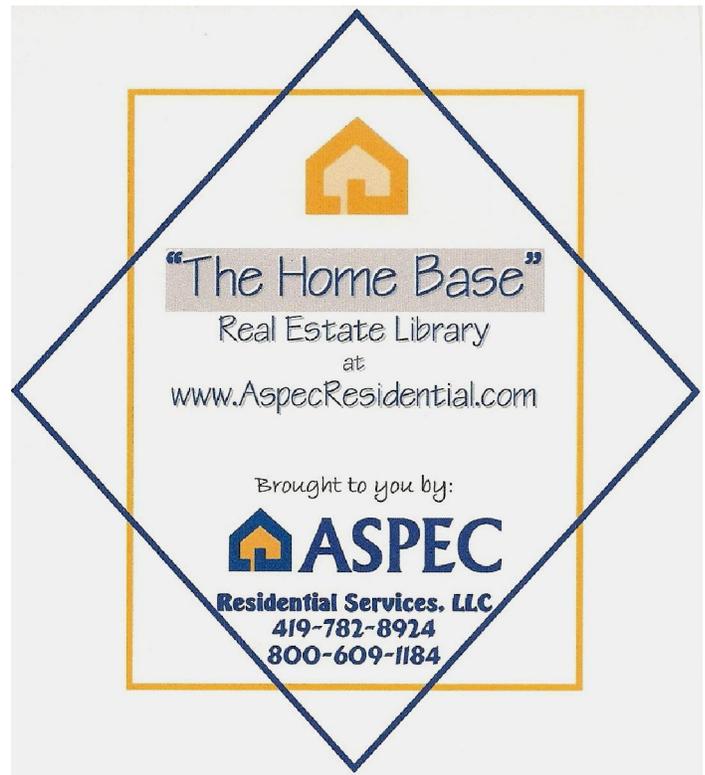
It is highly likely that your home, even if brand new, has what are considered common cracks in common areas, such as exterior walls, interior walls at corners of doors and windows, ceilings (usually in the middle), foundations (also usually in the middle of each foundation wall), garage floor, patios and porches, walkways, decks and balconies, retaining walls, and solid fences. It is virtually impossible for me to determine whether cracks are caused by structural failure or by some other cause, or, if caused by structural failure, whether the cause is active and ongoing. Cracks in patios and porches, driveways, walkways, fences, and planters typically are not of a major concern to the structural integrity of the building. However, continued cracking could result in failure in those structures and, depending on the proximity to the house, damage to the structure. The closer other damaged structures are to the house, the more attention needs to be paid to those structures, their cracks, and the causes of those cracks.

### Common definitions I use in documenting cracks

Common cracks are typically, but not always, defined as hairline cracks less than one-eighth inch wide or less than about eighteen inches in length, depending on location. Almost by definition, concrete and stucco will crack simply because the material cracks as it dries, cures, and ages. Common cracks in concrete and stucco are also called shrinkage cracks. Common cracks can appear at any time in the life of a structure, usually at door and window corners where they typically are of least concern. However, all cracks need to be monitored regularly to determine if they are expanding or lengthening, at which point other problems might be present. But you probably won't know until many years have passed since we tend not to notice incremental changes.

Major cracks are typically, but not always, defined as more than one-eighth inch wide, more than about eighteen inches in length, excessive in number, unusual (stair-step, V-shaped, straight horizontal, or straight vertical), or in unusual locations (such as middle of a wall with no doors or windows nearby). If major cracks are present or appear, you should seek additional evaluation from a qualified structural engineer specializing in foundations and structures. Some major cracks occur simply due to neglect and lack of knowledge about how to take care of common cracks. In other words, a common crack can easily become a major crack if it is ignored.

In most areas of Ohio, due to the type of weather and rainfall patterns we have, if the affected structure is over ten years of age, cracks **PROBABLY** do not pose any threat of significant additional short-term damage with **NORMAL CLIMATE** and **NORMAL RAINFALL**. However, rain can have a detrimental effect on our houses and foundations at any time. So it is best if cracks and areas around all cracks are patched, repaired, weatherproofed, and monitored on a regular basis, especially during periods of high rainfall.



If you are unfamiliar with common cracks, you should seek the specialized services of a licensed structural engineer for further evaluation and information before close of escrow. Major cracks, particularly in the foundation, walls, ceilings, and/or attached porches/patios, should be inspected **BEFORE CLOSE OF ESCROW** to help protect your investment in your home. Major cracks in driveways, walkways, garages (usually, but not always), and other areas typically are more cosmetic than of a critical failure nature but should still be evaluated by a qualified professional to weatherproof the cracks to help prevent additional damage and accelerated deterioration.

Note that in many areas of Northwest Ohio, particularly with older lathe-and-plaster structures, cracks, even major cracks, are not only common, they are the norm. However, all cracks, regardless of their size and where they are located, should be sealed from the weather and regularly monitored to ensure that, if they are active, they don't cause major damage. Additionally, although you might be willing to accept a property with more than its fair share of undiagnosed and/or unrepaired common and major cracks in various areas, the person who wants to buy your property somewhere down the road may not be so accepting, thereby leaving you to make repairs then, at which time additional damage might have occurred due to ongoing neglect. It is in your best interest to take care of both common and major cracks now, before close of escrow and while the property belongs to someone else.

In a newer home (one that is no more than ten years old), cracks typically have not developed yet, but they will. Just wait. They will, and when they do, please re-read this section on cracks, and then weatherproof the cracks and monitor them for widening or lengthening. Since many builders provide a one-year warranty, I offer [Warranty Inspections](#) to note problem areas which you can then take to your builder and ask him for repairs.

### **Plaster cracks**

Old houses with plaster walls (lathe and plaster) often have cracks. There are many reasons why cracks appear, including, but not limited to, structural settling, extreme temperature changes, high winds, poor plaster mixing, and improper curing. Don't panic if your walls and ceilings have common cracks (see the definitions above), but monitor them to determine if they are active. However, also take into account weather conditions. For example, cracks commonly widen in cold, dry weather and close during wet weather. High winds and seismic movement can also cause cracks to appear or to reappear if they were patched.

In many older homes, cracks typically mean that the plaster "keys" have broken off from their connection to the lathe behind the plaster. If the crack is old and does not have any loose material, it probably is not any-thing to worry about. However, you still need to monitor it, especially after high winds, rainfall, and seismic movements. Bulging plaster is an indication that many plaster "keys" have broken off and allowed the plaster layers to separate from the lathe behind them. Bulging can usually be repaired with plaster washers.

Diagonal cracks over doorways indicate settlement or a nearby source of vibration, such as a highway or railroad. New cracks can indicate conditions that need to be corrected or modified, while older cracks that are no longer active simply indicate that the stress has already been accommodated by the structure.

### **Repair options**

To repair minor cracks, use fiberglass mesh tape, then go over the crack with a wide trowel and joint compound. There are also plaster patch compounds available that are excellent. For larger cracks and holes, you need to remove all the debris and enlarge the crack until you reach solid plaster. Remember that in the case of impact damage, the damaged area can extend 6-12" from the actual hole. Make sure that you clean out the lathe as well. Then, back-cut the hole, fit a piece of drywall into the void, place some mesh tape over the edges, and fill the hole with several thin layers of joint compound or plaster patch. You also have the option of actually putting down plaster—scratch coat, brown coat, and finish

coat—if the hole is large enough. Plastering is a tough skill to learn, and even harder to finish properly (there is a reason that professional plasterers are expensive!). They make it look so easy on *This Old House*, but it's really hard to do, so if you have the desire to do it yourself, try it in a closet or other hidden area first.

If the walls are slightly wavy or oddly textured, you may want to apply a highly textured wall covering. The pattern and texture can hide many imperfections. Another option is to apply canvas or a product called NuWall (<http://www.thewarnerco.com/global/html/nuwall.htm>) crumbling plaster to smooth out the walls for further wall coverings or paint effects.

If the problem is too bad to salvage, you can resort to laminating drywall over the crumbling plaster. Use 3/8" drywall over the plaster, screwed through the studs. Often the lower part of the wall (which suffers the most damage from kicks, furniture, and movers) can be covered and the top edge masked with chair rail molding to save the appearance of the old walls. This faux wainscoting effect is very believable and quite appropriate in many houses.

If you choose to put wallboard over the plaster, use the following tips:

- ü Apply wallboard horizontally.
- ü Use the largest sections available. Although it's difficult to bring 4x12 sections up the stairs, it's well worth it.
- ü Use screws, not nails, 12" apart in ceilings, 16" on walls.
- ü Use a floating joint—the wall holds up the ceiling sheets.
- ü Use corner clips at all corners.
- ü Use fiberglass mesh tape, not paper, and special compound that is available for plaster walls.
- ü Caulk interior corners with acrylic latex caulk. Although historically incorrect, the effect is smooth and unnoticeable.

## Concrete cracks

It's the rare slab of concrete that doesn't crack. Usually, it's just a matter of when and where. In fact, many concrete professionals state, "There are two types of concrete, that which has cracked, and that which will crack." As long as the cracks are hairline (less than 1/4" wide—see the definitions above) and appear to be "shrinkage" cracks, there is little reason for concern. Builders often use expansion joints or control joints—intentionally placed shallow lines or plastic dividers—to force stresses to specific areas to discourage cracking. There are several reasons why concrete cracks, and methods to address them, which are described below.

### Excess water in the concrete mix

Concrete does not require much water to achieve maximum strength, but often contractors will add excess water to the mix on the job site to keep it workable and make it easier to install. Unfortunately, some contractors, especially for new construction, also add excess water to the mix in order to "stretch" the amount of concrete they have, thereby being able to pour a concrete driveway at five homes instead of four. This can significantly reduce the strength of the concrete. As the water evaporates, the concrete hardens, dries, and shrinks. The more water present, the greater the degree of shrinkage, and the greater the possibility of cracking. Concrete slabs can shrink as much as 1/2" per 100 feet.

### Rapid drying or curing

When concrete dries, the chemical reaction produced requires some water content. This hydration often occurs for a period of several days after the concrete is poured, and even longer depending on the size of the concrete pour. Curing the slab properly ensures that an adequate amount of water is available. This can be achieved by the application of water, certain damp materials, or specially designed membranes.

### **Improper concrete strength poured on the job**

Because of its varied uses, concrete is available in many different strengths. This is typically an item that is known only to the contractor performing the pour, and should be verified with the National Ready Mix Concrete Association or other professional associations prior to the pour to ensure an appropriate strength is being used. In addition, the placement and spacing of rebar or structural support material should be verified to be in compliance with local standards and codes.

### **Lack of control joints**

Control joints help concrete crack where you want it to. The joints should be  $\frac{1}{4}$  of the depth of the slab and spaced no more than 2-3 times (in feet) of the thickness of the concrete (in inches). A typical 4" concrete slab should have joints set 8-12' apart.

### **Improper ground preparation or weather-related issues**

Concrete should not be poured on frozen ground, and the ground under the pour should be properly compacted. The subgrade must be prepared according to the soil conditions. Some flatwork can be poured right on native soil. In other areas, 6" of base fill (often a gravel base) is required along with steel rebar installed in the slab.

### **Repairs and solutions**

Most homeowners have encountered the frustrating problem of cracks in basement walls and stubborn water leaks after a heavy rain. They usually try to fix the crack with caulk, but this is only a superficial repair. Water will still fill the crack on the inside and efflorescence (a white, powdery substance), which will push off the caulk. In a year or two, the caulk will peel.

Disappointed, the homeowner will pull off the caulk, chisel out the crack in a V-groove and fill it with hydraulic cement. But hydraulic cement does not bond well to concrete and is very rigid, while the concrete continuously moves, shrinks, and expands. Efflorescence will start coming up around the rigid plug, followed by drops of water. After a couple of years, the cement plug will get loose and water will start seeping around it. Other methods, like excavating and repairing the foundation crack, and waterproofing on the exterior, may cost thousands of dollars and may not be permanent solutions.

Addressing grading and drainage issues is always recommended prior to undertaking any repairs. This is because you must address any water issues (if present) or the crack will simply reappear, or possibly migrate to a new location. The next solution is a low-pressure concrete injection. The main purpose of concrete crack injection is to permanently fill the full length and depth of the crack to keep water out. Then, water cannot deteriorate the concrete and widen the crack further.

While there are professionals who can apply these injections and sealing methods, low-pressure crack injection (below 40 psi) has made the repair of cracks in poured concrete walls or concrete floors much easier and less costly. It is even possible to order do-it-yourself crack repair kits using just a conventional caulking gun. Numerous products exist to seal such cracks, including, but not limited to, hydraulic cement, resilient caulks such as polyurethane (flexible, expands well, and adheres even to wet concrete), and epoxy sealants (both a waterproof and structural repair, dramatically improving the structural strength of the area, but non-expansive and adhering only to dry concrete.) In the end, concrete cracks can be addressed, and it is even possible to improve on the existing structural strength of the concrete.

### **Recurring cracks**

In some instances, cracks will reappear after being repaired. This condition sometimes is related to soil conditions rather than actual foundation problems. If the soil has high clay content, cracks will be more prevalent in the home. If there are a lot of cracks and the home is old, the cracks might simply be the result of age. Without repairing the foundation, repairing cracks in the home will simply be a band-aid rather than a cure; the cracks will reappear.

### **Recommend further evaluation**

If I recommend further evaluation of specific cracks, I mean that you need a licensed structural engineer or a qualified foundation professional to look at the cracks, determine their causes, determine if they are active or have the potential to become active, and design appropriate fixes for the specific types of cracks and causes. After that, as with everything else in our homes, you will need to practice **regular homeowner monitoring and maintenance**. Remember that home inspectors are generalists and are not acting in any capacity as licensed engineers under State of Ohio laws. Practicing engineering without a license can result in severe civil and/or criminal penalties. I only document cracks and where they are located. By law, I have to leave determination of the causes and appropriate fixes to licensed structural engineers, civil engineers, geotechnical engineers, or other qualified foundation professionals.

### **Other helpful websites**

Concrete repair/maintenance - [www.all-things-concrete.com](http://www.all-things-concrete.com)