Ask Jon Eakes

Foundation settling - Reading the cracks

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Our camera caught up with Alfred at the renovation centre and he says that he has cracks in the concrete and in the plaster. What to do? (Be sure to read all the way to the end of the article to learn how to read a crack.)
The important first step is to determine which one of three possibilities apply to Alfred's house:
1) It moved once, cracked and is not moving any more;
2) the cracks are caused by vibrations that are still present but nothing is shifting;
3) the crack is growing larger and larger. Each case must be handled differently.
If there are minor cracks all over, but nothing is moving, you can simply seal up the cracks with any appropriate material and you have a new house.
If the cracks are subject to vibrations such as heavy road traffic or construction in the neighbourhood you will find that any rigid patching or sealing material will not hold, or if it does hold like an epoxy injection, it may just crack next to the repair. For vibration, plaster repairs must either be done with flexible materials or hidden with moulding that allows the crack to continue moving. Concrete repairs should be done with polyurethane, a material almost like rubber when cured, that can move a bit without loosing its seal.
If the crack is getting larger, don't even try to seal the cracks -- nothing will hold and the settling may be the sign of a larger problem. You need a professional to take a look at it to figure out why it is moving and how to stop it before you patch the cracks.
To some extent you can "read a crack" just by studying how the two sides of the crack relate to each other. For a moving crack you can get even more detailed information by drawing lines across the crack and studying the lines and the crack over time.

Give yourself a tool
What I recommend is to draw one horizontal and one vertical line over any cracks, either in concrete walls or plaster walls - as you see me illustrating in the photo above on my HGTV show years ago. Use a level to draw these lines because if with time any of them move out of horizontal or vertical, that tells a story, so don't do it sloppy like I did free hand on the tv show. Then put marks at some easy-to-measure distance across the crack, like four inches apart. It is really hard to measure the width of a small crack, but with the distance marks on the cross, it becomes easy to measure horizontal and vertical movement down to a fraction or a mm.

Keep a Diary
Start with the date you made the marks, the starting point, and every month measure between the marks, noting any changes in the distances and check all four lines for horizontal and vertical. This kind of long-term history over a year's time will give valuable information that will allow a contractor to tell exactly what is moving in what direction and how fast, and to prescribe the right solution. If nothing changes, that is valuable information too -- it that tells you that you don't have to hire a contractor, just patch the cracks. If the cracks open up again but the marks don't show growing movement, indicating a vibration problem, then use flexible sealant. Follow this link for information on injection sealants.

READING THE CRACKS
Just studying the two sides of a crack can tell you a lot. If you look carefully, you can see if there is a right/left shift between them, or an up/down shift. For instance, a horizontal crack is usually caused by frost problems lifting the upper portion of the wall away from the lower portion – Ad Freezing. If the crack is wider on one end than the other that can indicate a tilting of one or both sides of the wall. That information helps, but what is much better is to draw a vertical/horizontal cross with the distance

marks over the crack and follow it over a years' time – that will tell you much more about which side is moving and why.

Starting point

To study something over time, you need to record a starting point – which is simply "today". Draw or scratch very carefully a horizontal line and a vertical cross line over the crack. Put your distance marks on the line. Take written note of the start date and distance mark measurements and of what you think is happening just by the observation of the shape of the crack and one side compared to the other for shifting direction. This is graphic #1.

Left side lift or right side fall

In graphic #2 note that the vertical line is still lined up and both are vertical. The horizontal line is still horizontal but shifted. This indicates a clear shift of one side up or the other side down. There appears to be no tilting of the house. Close inspection of the crack itself shows a vertical section sliding with respect to the other side, and a horizontal section widening the crack. What we can tell from this is that the house is not tilting but there are spread out lifting pressures or erosion on the other side.

Right side sinking

In graphic #3 we see a crack that is wider at the top than the bottom, indicating a tilting of the building problem. If you have the cross mark to indicate what has happened over time you can see that the right side of the cross is no longer horizontal nor vertical, while the left remains as it was. This gives us the additional information that the right side of the house is falling away and that the whole sidewall on the right may be sinking. Without the cross mark over time we would not know if the left side was moving or not.

Both ends rising or centre sinking

Graphic #4 shows a crack wider on the bottom than the top. Without the cross mark we know something is moving but no real indication here as to what is moving. With the cross mark note that they are both out of horizontal, indicating that both sides are tilting. This could be rising foundations on both left and right side of the house, but more likely an erosion problem just under the crack, allowing the centre to fall.

Both ends sinking or centre rising

Graphic #5 is the opposite problem of #4 with the crack wider on the top. This is most likely a generalized sinking foundation with a rock under the crack point supporting all the weight.

Finding better solutions

When trying to read a crack, you can have several of these problems happening at the same time. Being able to study the crack over time with the cross marks and the distance marks allowing you an accurate measurement of changes in the width and movement of the crack is a great aid in looking for solutions – especially discovering that this is a one-time event and it is stable and simply needs being sealed. Or that it is dynamic movement and sealing the crack is a waste of time before fixing the underlying cause.

So, if you are not in a flooding crises or a rush to finish the basement, taking a year to read the crack over time is quite worthwhile. Always check the landscaping outdoors to see if you can prevent any water from getting to this crack. That can buy you lots of time. If you are finishing the basement and the crack is in one specific place, consider placing an insulated trap door over the problem area allowing you to both use your finished basement and have access to follow the crack movement and leakage. Use water shedding insulation in this area, like Roxul.

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