

How Level is Level?

By George Porter

How can you tell when a home is out of level? There are some regulators that say that you have to be within an inch all over the home and there are others that say that if everything is working, doors, windows, etc., then it's level enough. There should be a way to absolutely say when the home is too bent on the frame or in the roof. How about when the tail ends of the main beam are hanging above the supports at the rear of the home because of the camber? How much is too much there?

These and many other questions have been coming up over the last 30+ years for me and I guess I thought no one really knew. I certainly never asked anyone who gave me an answer other than "well, when I look at a problem like that, this is what I do" and then they proceed to tell me what they believe to be the facts. Guess what, all this is written down and has been available to everyone for over twenty years. It is somewhat embarrassing for me to tell you where I found this wealth of information. It has been right under my nose and I never thought of looking there. All about this question and thousands more besides are found in a government document called Part 3280; you might know it better as the HUD Code. This is so typical, where is the last place you always look for help when you can't figure something out and all the stuff you have been dreaming up doesn't seem to work? Well it's the instructions of course! Somehow I've got to get it into my head that getting caught with instructions in your hand doesn't prove to the world that you are too dumb to figure this out by yourself. There is always room for improvement I guess.

Back to the question of level! According to Part 3280, subsection 3280.305 (d) it clearly states the formula for allowable deflection (bending) of girders (main beams) is $L/180$. "L" is defined by the clear span between supports or two times the length of a cantilever. So.. If you support your homes eight feet apart under the beams then "L" is eight feet in your case. A cantilever is a projection supported only on one end, like a diving board, or in our case, the distance between the beams and the sidewall of the home. What you do is divide that length (eight feet) by 180 and you get the maximum deflection allowed under the HUD Code. It is easier to do this in inches so let's use 96 inches instead of 8 feet. $96 \div 180 = .53$ inches or a little over 2 inch.

The sidewalls can be measured the same way but they are not beams, they are floor, and the floor has a different standard $L/240$. If the floor extends out from the beams 48 inches then you must use the rule for cantilever and double the distance. This makes sense because if you cut a span between two supports in half you would have two cantilevers pointing at each other. It is assumed that each cantilever is half-way to the next imaginary support so you double its length to keep the deflection ratio equal. To get the number you take the 48 inches multiply times 2 (this gets you "L") and divide by 240. The answer is .4 inches or about $3/8$ of an inch.

That's the way you prove you are right and it is in the federal code, and yes, I have called several different industry engineers about this and they all agree that this is correct but, they also all said there is more to it than that. And then I learned one more thing that I always knew but didn't realize

it. The HUD Code is a performance code. What this means is that in addition to the “Level over whatever thing” the home must also fit and function correctly.

For instance, if you were within the tolerances of the HUD Code but the doors did not work right then you would have to do whatever would be the corrective measures for them to close as they should. Another example would be if the frame camber was holding up the tail of the home a half inch above perfect level and everything inside fit and functioned correctly then you could just wedge it tight and leave it there.

One last example, if the home is perfectly dead level but the doors don't work and the marriage walls have a two inch gap between them you still are not done. In order to complete the assembly of the home so it complies with the HUD Code these problems will have to be addressed. The solution might be to actually take it out of level, but within the HUD tolerances for the floor and frame.

For all these years I have been referring to whether the home was level or not. What I should have been doing was asking if the home fit and functioned correctly. Level is important, but there is more to good installation than that. Whether or not the home meets the performance criteria for the HUD Code is the measure whether the home is correctly installed or not.