I Don't Understand All I Know About Anchors

By George Porter

This is the second in a series of articles that I probably should not be writing. The first dealt with what seems to be a strange system for determining the footing size under a home by ignoring a 2000 lb stack of blocks. This time we will examine the rules for anchoring.

Let me start by saying that in most cases of government regulation you rarely start with a clean slate. Governments, no matter whether they are state, local or federal never seem to throw away an old rule, no matter what. Every new rule is layered on top of some regulation that preceded it.

An excellent example of layering (although it has nothing to do with anchoring) is how did railroad tracks get to be the width they are between the rails? The first railroads in this country got their locomotive and freight car designs from England. The axles were of course designed to fit English rails so our rails had to fit their axles. The original English designs were sized to fit the wagons that were in use all over the country. The wagons axles were designed to fit the existing ruts in the roads, if they didn't fit the ruts the wagons would ride on a tilt and probably damage the wheels. The original roads and wagon ruts were first established by the Romans when they conquered England about two thousand years ago. The Romans made the roads to fit their chariots and their chariots were made to be pulled by two horses side by side. The chariot wheels had to be wider than the horses so the horses would not stumble in the wheel ruts. The bottom line is that the rail width you see today is based on the width of two Roman horse butts. I suggest that we refer to this process of rule making as "The Horses Butt Syndrome". We may know where the rail width came from but there seems to be a few differing ideas as to where the rules for anchoring came from. Let's look at some.

Wind zone 1 (almost all of the nation) requires that the home resist a horizontal load of 15 lbs/sq/ft and an uplift force of 9 lbs/sq/ft. When the wind hits the side of the home it certainly tries to push the home off it's foundation. In fact if the wind hits a 70 footer squarely it can, at the limit of the standard, produce a force of approximately 9,000 lbs. on the side of the home. This is fairly easy to understand because all of us have felt the force of the wind trying to push us around just like the house. Uplift is another matter, almost no one has been picked up by the wind. The upward force is the result of the airfoil effect that the roof exerts on the home. When the wind tries to turn the corner over the top of the roof it creates a low pressure area on the back side of the roof and pulls the home upward. Or does it? The lift is a result of the differential in pressure between one side of the roof and the other. The low pressure side (the top) causes the higher pressure side (the underside of the roof) to push up. In a metal roofed home all this is very apparent because you can see the roof changing shape and causing a considerable amount of "roof rumble." The wind is really trying to tear the roof off and if it pulls on the home doing this then it affects the whole structure. Does the bottom of the home get pulled when the roof is pulled by the wind? The answer is "yes" but the question is "how much?" I think that it cannot exceed the ability of the fasteners that hold on the covering of the roof. It is sort of hard for me to imagine a home lifted by staples when it takes two 12 inch steel beams to hold it up off the road, but, I guess, if the engineers say so then it must be so. Seriously,

there are a lot of different forces here, and they are not as simple as I have depicted them. The engineers are the authority but it never hurts for the rest of us to think about it.

There is one part that I believe we as ordinary folks can figure out, that's the 9 lbs/sq/ft uplift on the home. I have talked to some old time industry engineers whose names have been withheld at their request, they don't want to be known as "old timers." They say that the current wind rule started about 1964 in an ANSI document and was still being used when the HUD Code was put together in 1974 and went into effect in 1976. Some say that the average weight of a home at that time was subtracted from the available uplift force, and others say that it wasn't. What we have, either way, is wind acting on a typical 1964 home. It didn't weigh much and it wasn't built to the HUD code.

How much force are we talking about? If you had a 1500 sq/ft home with 9 lbs/sq/ft uplift on the roof you would have a lift of 13,500 lbs. Now of course the roof has a little more area than the home so let's call it 15,000 lbs. What does the average 28 x 52 weigh? That would be hard to say because there is an enormous difference between a metal on metal and a shingle roof model with hardboard siding. A conservative average would be about 25,000 lbs for the home. How do you move 25,000 lbs with a force of 15,000 lbs? Maybe you could have moved a 1964 home but it might be time to take another look at it.

In engineering models used last year by Tie Down Engineering in Atlanta, GA., it was found that homes topple rather than lift off the supports. This means that the supports tip over as the force of the wind moves the structure sideways. If this is the case with modern homes then the power we now use to resist an upward force could be directed to concentrate on resisting lateral movement, and we would have stronger safer homes for the same money and effort.

To rely on technology that is 35 years old might be a little like the "syndrome" mentioned earlier. What might have been good and proper then might not be exactly what we need now. We need to sometimes re-examine what we take for granted, just to make sure we are not following ruts in the road.