Don't get Bent out'a Shape about Cambering

By George Porter

Cambering a frame is literally bending it so it can hold the home. I have had recent occasion to learn more about frame cambering and, as usual, I learned I had to forget a few things I thought I knew. I have never cambered a frame and you can't really watch someone else do it without welding glasses. So how do you do it; why do you do it; and how much do you do it?

Cambering the frame of a home is necessary so the "box" will stay straight when it sits on the frame. The frame, or more correctly the main beams of the frame, acts like a big leaf spring under the home. If you have ever seen the leaf springs under a boat trailer then you can see that they look different when the boat is on the trailer and when it is off. The weight of the boat flattens the springs out a bit. When the trailer is empty the springs have a much more pronounced upward curve to them. Suppose you wanted to make a boat trailer spring so that when the boat was on the trailer the spring was perfectly straight? How would you do it? First you would have to know how strong the spring was and how much it bent with a certain amount of weight on it. If the spring bent 2 inches per hundred pounds and the boat weighed 500 pounds then if you bent the spring up 10 inches maybe it would go straight when the boat was on the trailer. So you try it and low and behold it worked, so now you know what to do, right? Well maybe, how about if your boat next time has a full tank of gas that weighs 50 pounds, now the spring is bent past straight. Next maybe you get a bigger anchor or even a different boat and that changes the weight again.

The point is that if your boat was exactly the same weight each time you could probably figure out the bend of the spring pretty close to perfect, but because it changes, you can't. If you can't do this with a 500 pound boat can you imagine trying to do this with a 20,000 pound house! Not only that, thousands of houses and each one is a little bit different from the last. Well, this is what the guy in the frame shop has to do and he has to do it in a somewhat limited time and also before the home is even built! Not only that, the main beams of the home are not spring steel like the boat trailer springs and they won't hold their shape as long. In other words they act like a spring for a while but over time they lose their ability to hold the weight. So you also have to figure in how long the home will be supported by the frame only, as well as the average duration of road travel it will get.

There are a thousand variables that go into the cambering of the frame under a home. Sometimes even the steel in the frame is slightly different. To figure them all out on an individual basis might take longer than it takes to build the home and there are still some things nobody could know, like how long before a stock home, sitting on its wheels, will be sold and installed. Add to this that all of our homes are getting heaver and the frames are not really getting bigger and it all looks impossible to get right. But this is manufactured housing and we do the impossible every day and it turns out pretty well.

Frames are cambered according to the length of the home, the individual manufacturers production techniques, type of box construction, and sometimes the roof style. The manufacturer of either the frame or the steel in the frame makes recommendations but each factory tinkers with the camber after it runs a few homes. There is positive camber and reverse camber. When you are looking at a frame sitting on its wheels wherever the frame is arched up between the hitch and the axel is known as

reverse camber in the trade. After the frame leaves the axle area the frame goes up again all the way to the tail end of the home which is called positive camber. This reverse and positive camber is put in by a pretty scientific set of rules. The frame can be built up-side down or right-side up with the use of what is known as camber blocks. They come in different heights depending on how much bend you want to put in the beam. The blocks are placed at very specific points along each beam at what will become the resistance points of the frame when it receives the weight of the home. These blocks hold the whole frame off a frame fixture and you heat the frame at specific points to position the positive or reverse camber. How much you heat it is measured by how many welding rods you use and where you use them. The average frame uses about 20 rods per beam. When it is done the frame looks like a lazy "S" on its side with the bottom part of the "S" at the tail of the home

Did you know that sometimes each beam is cambered differently? In the case of large multi-section homes the exterior wall side has more camber than the lighter marriage wall side. This is because travel may cause the heaver side to lose more camber so it has to start with more.

I had a conversation with a service manager in a major manufacturing plant recently and I asked him if he knew about this different camber thing for the beams of a multi-section home. He said yes and that they in fact, ordered their frames from a local frame manufacturer with that extra camber in them. I asked if the off site frame manufacturer delivers these frames to the back lot of the plant and then you just go get them when you need them? He said yes, so I asked him if the guy who went to go get the frames for the production line knew about the camber difference? There was this pause and he said, "I sure hope so, but I am going to find out for sure just as soon as we hang up the phone" Getting it backwards could be ugly. Did you ever have the tail end roof sections of a multi-section home look like they were in two different zip codes? When you lower the outside and raise the inside beams this is what happens. Of course there are several other ways it can happen as well. A long rough trip or sitting on a retailers lot not blocked for 8 months will do it too. Retailers really should level at least the back end of the frame to insure that the positive camber remains in the frame for the delivery of the home.

You don't have to use heat to camber a frame you can also use "cold cambering". This is a matter of chaining down the frame and bending it with hydraulics into the shape you want. It's sort of like straightening a car frame in a body shop except you are putting in bends instead of taking them out. Some frame manufacturers do a combination of heat and cold cambering on each frame.

Cambering is an unexacting industrial art form. It is a forging operation that takes more than mathematics to make it work and there are very few perfect combinations of house weight and frame camber. So the next time you have a problem with the tail of the home in the air a couple of inches above the level piers, just call the factory, they can fix it. Don't get all bent out of shape about it, considering how impossible this is to get perfect you're lucky it only happens once in a while.

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