Hunter 34 Compression Post Replacement Project

November 2017 to March 2018

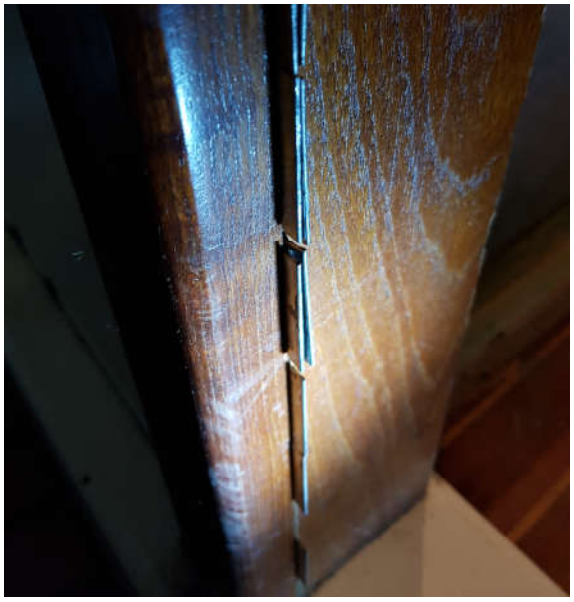
Brian J. Gallagher

I'm going to start this by thanking all those who trod this path before and took the time to write about it. I didn't do much if anything original, but instead combined ideas and methods developed by others.

The post didn't look too bad at first. The FRP above it had crushed upwards slightly, but you couldn't really see how much at this point.

Not being sure of the internal construction of the post, I took the front face off first. I drilled out the teak plugs and removed the screws. Many of them didn't come out peacefully, even with a screw extractor, and some of the holes were damaged (later fixed by using larger teak plugs). Once the screws were out, however, I discovered the wood was very securely glued on. I hammered dozens of single-edged razor blades in the joints, and eventually got it to come off.

The damage to the beam was now much more visible and quite a bit worse than I thought. Also, there was significant rot of the douglas fir post within the teak.



It took a lot more of the razor blades to get the doorjamb off. I had to hammer them in two per spot to finally get it to come off.

Looking from the head door jamb side(below), the coachroof had compressed downward enough to crush a hole above the jamb. Interestingly, the teak won that battle. Strong stuff, that teak. I later fixed the FRP, which came out beautifully (but forgot to take a picture of it).

What it looked like behind the jamb is to the right.

I had concluded that I could do this with the rig up (and in the water, not on the hard), unlike the approach taken by most others. In fact, I didn't know anyone else had done it this way until afterward. I figured with the standing rigging loose, the mast couldn't weight more than about 500 lb, and I could deal with that. So the next step was to loosen off the rig. Not sloppy loose, just not tight. Then I used a 4x4 with a bottle jack and 2x4s at each end to spread the load, and gently jacked the coachroof up. After every little bit I jacked, I went above and checked the tension in the shrouds, loosening it a little if need be. I had to lift it nearly 1/2" before I could get the post out. The picture to the right is with the post loose for the first time.

Later, once I started cutting into the beam, I used a second jack on the starboard side to support the beam on both sides since I was weakening it in themiddle.

With the post removed, I started cutting into the transverse beam.

I was quite surprised at how sound the wood was inside. There was no sign of rot. The wood had simply crushed.

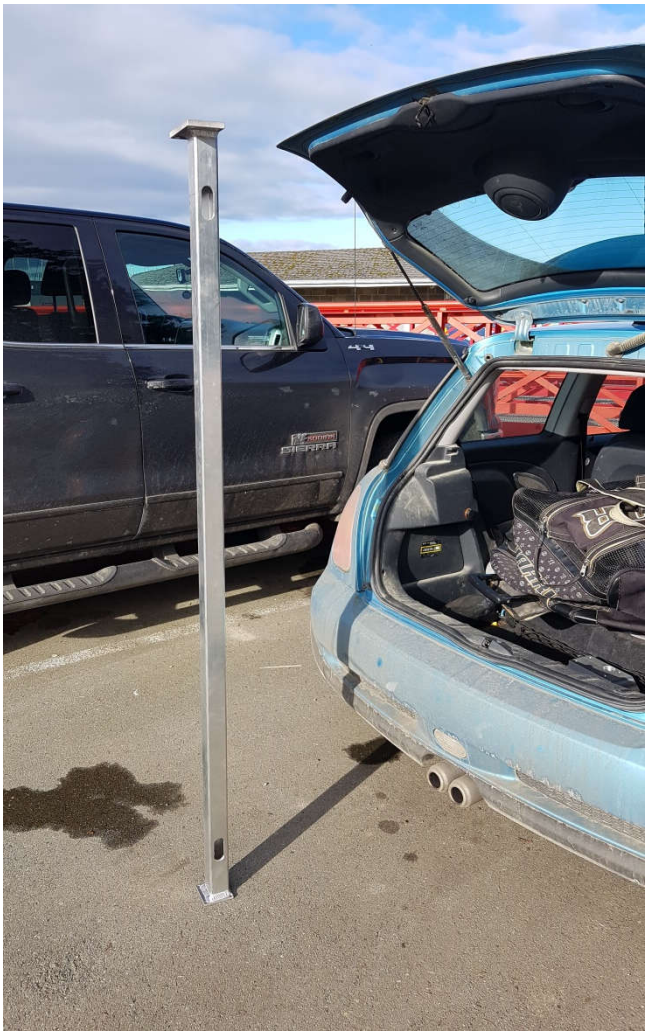
The mast wiring passed through a 1-1/4" PVC pipe completely through the wood and out the bottom of the beam, and all the masthead wiring went straight down through the bottom of the mast. This is different from several other photos I've seen where some of the wiring split off and went port or starboard through the beam. Any water leaking down with the masthead wiring went through the PVC pipe and bypassed the beam completely, but then ended up going down onto and through the compression post. The wiring consisted of two wires each for the masthead and steaming lights, coax for the radio antenna, a shielded four-conductor cable for the masthead instruments, and a heavy ground wire.

I looked at the yield strength of douglas fir perpendicular to the grain, and have seen numbers ranging from 340 psi to 625. The post only bears on 3.5 x 3.5 = 12.25 in^2, so even at 625 psi the wood will only support about 7,600 lb (and that's to failure, not design). That is not nearly strong enough to take the compressive force of this boat.

I continued to use a chisel, Dremel, oscillating tool, and anything else I could find to dig out enough wood that my planned aluminum header would fit in. This took a really long time, and was the most difficult part of the job. I couldn't finish the design of the post until I had the wood out, because I needed to measure the length the new post would need to be exactly.

When the opening was big enough, I made a wood mock-up of the header I intended to use (since I didn't have the real thing yet) and dry-fit it into the hole. This made it possible to make the hole just big enough, but no bigger. I kept the original post in place next to the hole to support the coachroof when the bottle jacks leaked down, which they did every night. Because the post had to stay on the boat, I couldn't take it home to work on it until the new post was in place.

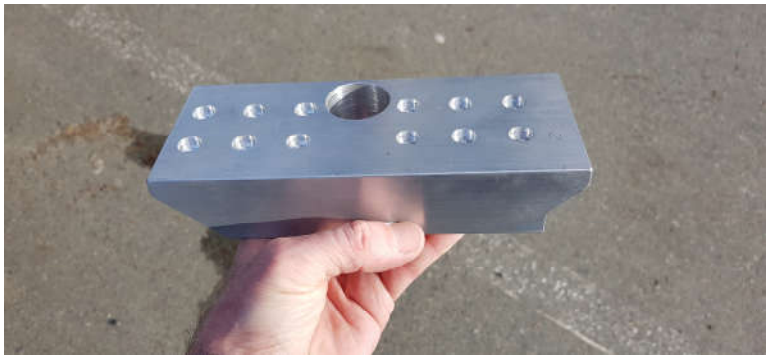
After a lot of careful measuring, I finalized the design of a new post and header to go from the floor beam up to directly under the mast step. The post itself is a 2x2x1/4" square 6061 aluminum square tube with plates welded top and bottom. The header is a chunk of aluminum 3" wide by 7-1/2" long by 1-1/2" deep. Fabrication of these two parts cost CAD$800 at a local shop. I will happily make the fabrication drawings available to anyone who wants them. The header is attached to the post with 3/8" UNC stainless hex head capscrews. When I installed it I used blue threadlocker on the screws so they won't vibrate out.



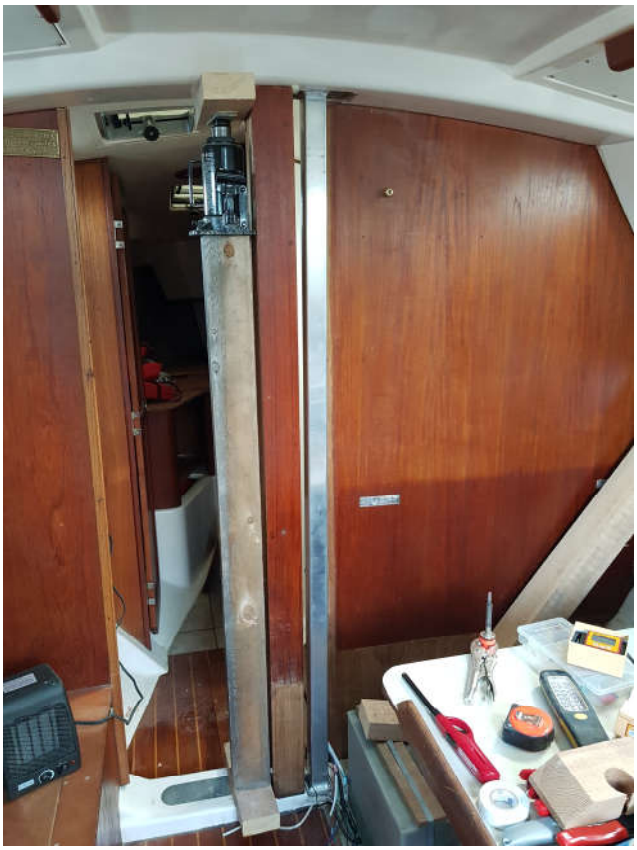
Here is the post newly retrieved from the fab shop. The hole in the side at the bottom is the exit for the masthead wiring; the hole at the top is a screw-up by the shop, because they originally made the hole there instead of the bottom (they misread the drawing). This has minimal effect on the strength, and even with the holes the post can handle just under 35,000 lb before failure, which is more than enough. That's a safety factor of roughly 3, and nearly five times as strong as the wood in the beam was.

The top of the post is to the right. The oblong hole is the pass-through for the wiring.

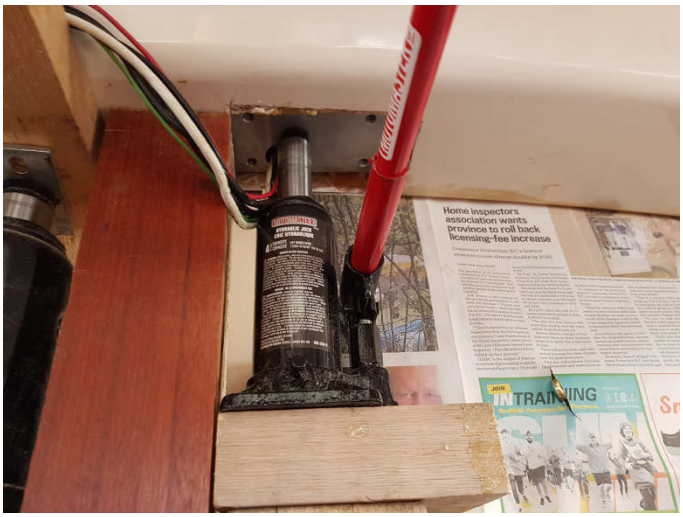
The header is below. The big hole is for the wiring. The smaller holes are 1/4" deep blind holes to key the epoxy I mounted it with. The epoxy is partly to secure it in place, and partly to distribute the load evenly. I left a bit of the PVC pipe in place, and it sticks into the hole in the header. Any water that comes through with the mast wiring will now go through the header, down through the inside of the new post, out a drain hole I put in the bottom of the post and into the bilge. It won't touch any wood on the way.



The aluminum post in position but not yet secured:



The header was placed with gobs of epoxy on top, and held in place with one of my bottle jacks to set. It was not easy getting it square and level, and in the end I had to do a bit of shimming between the header and the post to support it evenly. The newspaper is to keep any epoxy from dripping on the teak bulkhead.



The wiring coming out the bottom of the post after snaking and before remaking the connections. The white electrical tape was just to keep it all together for snaking, and came off afterward. All the connections were crimped and covered with heat shrink tubing except the coax, which used a special (and stupidly expensive) connector, and the four conductor cable, which had the individual tiny wires and shielding soldered. The latter were individually covered in the smallest heat shrink tubing you can buy (it can actually shrink down to nothing).

Although I put four holes in the bottom plate, I ended up putting a single in one corner. I wanted to make sure it couldn't ever move, but I didn't want to disturb the integrity of the floor beam any more than I had to.

The new post in place and supporting the mast for the first time.

After a bunch more careful measuring, I slotted the original post on a table saw to just fit over the aluminum post, and in the right location so that the head door jamb would be in the right place. I did this extremely carefully, because the wood post would be exactly located by the dimensions of the slot, and it had to end up in the right place for the door jamb, and to fit against the bulkhead. Be careful with the screws on the sides of the wood post; you don't want to hit them with the saw. I cut the screws with an oscillating tool just wider than the slot would be, and then cut V-shaped notches to remove a chunk of wood and that part of the screw with it. Note also the material removed at the bottom to clear the plate at the bottom of the new post.

Since the front face and the jamb on the other side were both off I was able to run all four sides through a planer to make it square and clean. I also ran the front face and the jamb through to get clean surfaces on them as well. When it all went back together, everything fit beautifully.

Next I make a notch to allow the wood post to slip over the wiring exiting the bottom of the aluminum post.

I cut the holes with a Forstner bit and finished it with a jigsaw.

I put three shallow countersinks in the front face with the Forstner bit to allow me to use some big stainless washers and machine screws to attach the wood post to the aluminum one. The holes were located in the centre of four of the original screws (which are now just dummy wood plugs) for symmetry. With these holes in the wood post, I took it back to the boat and put it in place. That way I could drill and tap the holes in the aluminum post in exactly the right places.

Now I could glue the front face back on, and need only a wood plug for access to the screws, leaving the washers buried inside. If the post ever needed to come out it could be removed by just taking out those three screws. Any future owner had better have a copy of my maintenance log, or they're going to have a pretty tough time trying to figure out how to get that post out if they ever had to…

Here is the top screw in its newly tapped hole. Note that it isn't in the centre of the aluminum post; I located the new aluminum post slightly closer to the centreline of the boat than the original post was.

Below is the wood post with the face glued back on, and the washers captive inside. I had planed a tiny bit off all the visible sides, so it was now clean wood ready for oiling. A couple of the wood plugs came out when I planed it and had to be replaced.

And finally, it's finished.