

Mast Step Replacement – 1983 Mark I Catalina 36
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My 1983 boat has had a problem with mast step compressing since I bought it in 2009. Basically I was down to about the last 5 threads on the upper shroud turnbuckles right from day 1.

This summer, we had 5 days in a row of heavy wind (25ish knots) upwind sailing in steep waves to get home. Foolishly I carried my 135% genoa for much of this, and a single reef. The boat took a beating.

By the time we finished, the top edge of the main bulkhead had sheared off its fasteners - admittedly these appeared to be #10 self tapping screws - shifted a good 3/8" or more to the right, and I had taken up the last few turns on the turnbuckles to keep the rig tight. Additionally, stress cracks opened in the floor all around the mast step. All this movement allowed the boat to flex rather a lot, and we found that by the third day most of the handrail attachment points were leaking in the cabin top, as well as a few other fittings including EVERY chainplate. Time to do something about it.

I started by pulling the rig, which in the PNW is harder to arrange than you might think. But we got it out with the help of the Granville Island Boat Yard which I highly recommend if you are in Vancouver.



Then I cut out the floor pan around the mast step. This was easy with an oscillating multi tool like a knockoff Fein Multimaster. Great tool by the way.



I was expecting to find a stack of rotten plywood, based on a C30 I looked at a while ago. Instead, I found a block of totally rotten and wet red cedar. It mostly came out like that mulch stuff that people put in their gardens.



I filled two ice cream buckets with mulch and splinters, and then was able to just grab the block and pull it out. No glue, no fuss. All the wood was soaking wet.



What I believe precipitated this is that the drain paths out the bottom of the mast are TINY and were totally plugged with dirt, lint, dust, etc. Water would stand inside the step, and the step was held in place with four 5/16" lag screws through the floor and into the cedar block, so water would wick down these screws and enter the wood easily that way. Of course, the cedar block was not treated or sealed in any way so it was only a matter of time.

Anyhow, the cedar block was sitting on top of what looked like a fiberglass covered chunk of wood spanning the keel sump, and that looked OK so I was hopeful the demolition stage was over already.



Then I made the mistake of probing a bit at the lower timbers - and the 'fiberglass' layer on top popped right off. It appears to be what my boatbuilder friend calls "bear shit" - leftover polyester resin thickened with leftover sawdust, and often used in boat building to fill gaps. This chipped right off and the timber underneath were exposed.



What I found is three very thick hardwood beams spanning the keel box and bedded in polyester goop. These were wet also, I would assume they wick water up from the bilge if there is more than 1/2" of water in the bilge. However they did not seem rotten except for one soft spot in one corner which I removed. I called a couple guys who would

know better and let them talk me out of removing these timbers, so I 'glassed over them after removing any soft spots. The platform formed by these timbers is 12" wide and 11" long.



At this stage I figured out how I was going to build a new step and started laminating pieces of wood together in the garage. Although I was working with a footprint of 12" x 11", some testing showed that the biggest single piece I could fit through the floor cutouts was more like 6" x 11" x 2" so there was going to be some assembly.

I went through options from metal (expensive and my tools were inadequate), hardwood (possible) or really high grade plywood. I leaned toward hardwood but received a lot of advice to go plywood, and that is easier to work with so I did that. In the end I planned out to assemble a block matching the 11 x 12 footprint and 3" thick (assembled in 4 pieces) and then top it with a block matching the shape of the floor cutout I made, and about 2.5" thick. I cut these out and took 3 days to epoxy saturate them as much as possible. In the meantime I went to work on the loose bulkhead.

The bulkhead is formed in two major pieces - the bulkhead itself, and the corner post which goes around the mast and forms the corner of the head enclosure. The corner post is made from two solid wood planks glued together.

The bulkhead is held in place by the chainplate bolts on the side, six 3/8 bolts (really machine screws) along the bottom into the liner, and 4 #10 self tapping screws along the top. It fits into a dado groove in the corner post at the right hand side.

The corner post is just held in place with 6 self tapping screws, 3 top and 3 bottom. In my boat this was all rubbing and flexing everywhere, making horrible groaning noises, and not doing any structural work.

Once the corner post was out, the bulkhead slid to the right and popped right out of its groove. No evidence of any adhesives was found anywhere.



I reinstalled the bulkhead in two steps.

After all the mating surfaces were cleaned and sanded, I slid the bulkhead back into place. I used a hydraulic jack to push the bulkhead up and to the left, mating the outer and upper edges as tightly as possible, and drilled 3/8" holes to through bolt this connection. Then I pulled it back out and applied West epoxy to all the mating surfaces. I think if I was doing it again I would use 3M 5200 as it fills gaps better, but I already had the epoxy.

One thing to keep in mind is that the front face of the bulkhead is covered in arborite, which doesn't stick well to anything. I couldn't remove it without damaging the plywood, so I scored the surface with X's using my cutting tool.

I jacked the bulkhead back into place with the glue in place and bolted the top in. I had to cut some 'flats' into the front flange face for the nuts to push on. I used the same multitool with a plunge cutting blade for this.

When the top was bolted in, I looked at the bottom holes and they were misaligned by about a half inch! I used the deck stay turnbuckle from the cabin top, tied a low stretch line through the mast-wire hole in the settee, and pulled the turnbuckle tight to bring the cabin top and floor closer together. A lot of turns, but I got the holes to line up.

I replaced the six 3/8" bolts in the lower edge of the bulkhead, and added an aluminum flat bar backing plate to spread the pressure out. In all cases, I used bolts with long un-threaded shanks so that they wouldn't saw on the wood bulkhead, and I used hex-head bolts so that I could actually torque them up a bit. The factory used flat-head machine screws, fully threaded, and acorn nuts which could not be tightened enough.

Once the chainplate was reinstalled, all the mating surfaces were basically 'clamped' by the through bolts so I think I will get some decent bonding. The top three holes in the port upper chainplate had become quite oval in shape as the bulkhead moved around, but I over drilled the holes and filled them with thickened epoxy, then re-drilled when everything was lined up right. Hopefully that will be good enough.

End result: main bulkhead is epoxied in place everywhere possible. It has:

- Three 3/8" through bolts along the deck
- Six 3/8" through bolts along the bottom plus improved backing plate arrangement
- No threads meeting wood along the chainplate bolting interface (reduced 'sawing' if it does move)

The corner post got roughly the same treatment. I was only able to add one through bolt at the top for geometric reasons, and the lower bolts had to be carriage bolts to clear the mast. However, I epoxied the top and bottom faces, and epoxied the whole groove that mates to the bulkhead. I think this will make it much stronger. The one self-tapping screw that I couldn't replace with a through bolt got instead a 1/4" square-drive self tapper so it is much stronger than before.

If you go back up to the picture I attached earlier in the first post of this thread, you can see the gap at the bottom of the corner post. This gap is GONE - the whole assembly fits tight in place now.



By now I was done woodworking in the garage too. The new platform is pictured in the back of my truck. I was not able to make any very complicated joins in these pieces again due to the problem of fitting them into the bilge. For the side-side alignment I pegged the pieces together with dowels, and for the stacking arrangement I countersunk some screws into the pieces as I was stacking them. All this had to be done in the bilge.



The whole mess was put together by sliding each layer into the bilge, coating the mating surfaces in epoxy, and sliding them together, then doing the same with the next layer and then screwing them down onto each other. The screws were buried in epoxy and always placed so that the piece going on top would hide the heads anyways. I don't expect to get any water into the wood.

The whole stack went in on top of a bed of short strand polyester filler. Have to be careful as many polyester products will not cure in the presence of curing epoxy, but I have tested this particular combo before and it does work.



The top of the stack comes right through the floor and I will not be attaching them together, I don't believe the floor adds much strength to the system and I do believe the floor/hull clearances are prone to moving, this way I don't anticipate any new cracks being formed.



The final step of the day was bore four 5/8" holes down into the stack, fill them with epoxy, and stick 5/16 bolts into them upside down. These will form the studs to mount the mast step itself, and doing it this way I hope to prevent water travelling down the studs and into the wood, which as mentioned I think caused a lot of my problem to begin with.