Replacing Frameless Windows on a 1989 C&C 34/36R

By Chuck Scheaffer, 8-25-2021

My old windows were heavily crazed and cracked in five places. For many years, I used 3M clear Heavy Duty Shipping Tape to stop water from getting through the cracks. The tape worked well to keep water out and lasted about six months before UV's made the tape brittle.

Old



New



Templates: I taped shelf paper onto the old windows, tracing the edge of each

pane with the side of a pencil lead. The original C&C design had two window panes on each side, but three panes were suggested by the window maker as it allowed for more bend and flexibility. I used the paper patterns to cut templates from 1/4" thick PVC sheet and checked that they matched

my old windows. I gave the PVC templates to a plastic company, Annapolis Marine Plastics, who cut my new window panes. They made all six windows for \$1000 which is

probably a little high. I chose the darkest, "limousine black" windows with rounded and polished edges. The original window material was ¼" thick. My new windows are cast acrylic and slightly thinner at 6mm thick and a little more more flexible than original.

The picture to the right shows my PVC templates arranged so all six window panes can be cut from a single one 48" x 48" sheet of cast acrylic. If you decide to duplicate the two pane window, you will need longer material.

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Removing the old window panes: I tried to remove the old windows using a

multi-tool, but found a better result using a very thin metal putty knife and a rubber mallet. I used the mallet to drive the putty knife between the plastic and the fiberglass and then prop that seam open with plastic putty knives and paint sticks. I held the putty knife in the gap and smacked it on the

side with the rubber mallet to work it along the whole joint moving the paint sticks and plastic props until the pane fell out. I worked from the inside with a tarp in place to keep out the rain. I later covered the window openings from inside using 7mil plastic sheeting and "rough surface" green painter's tape. This stayed in place for several months as I repaired the fiberglass window flange, faired and painted the window flange and other areas on the deck.

Some of the old window panes came out whole, some in pieces. The white pieces on the window pane edges, shown below, are chunks of fiberglass laminate that broke away from the window flange.

Fixing the damaged fiberglass window flange:

In some places, the original Plexus adhesive was stronger than the Lexan. In others, it was stronger than the fiberglass and tore out small areas of the fiberglass flange with it. The old dark grey mastic could have been left on, but I removed it using a heat gun and putty knife which was slow tedious work. I believe a contractor would leave this old hard adhesive and fair the flange to it, saving much time and labor. I also carefully ground out any loose fiberglass. I added 1708 cloth using West System epoxy resin to damaged areas. Each place where the old lexan windows were cracked, the fiberglass flange was cracked underneath, about halfway through the 1/8" thickness of fiberglass flange. I ground these cracks down using a dremel and filled with Total Flex Thixo, a flexible reinforced epoxy. I faired everything using Total Boat Total Fair (green). I used small 1" square and ½" square wooden blocks the length of sand paper to fit into the flange. I used Total Boat Dewaxer and Surface Prep to clean fiberglass repairs, and wipe sanding dust before epoxy and fairing work.

Prime and paint: My choice to use Brightside one part polyurethane required using their Interlux 333 thinner/solvent. After the first coat of Interlux Pre-Kote, a primer, I faired low spots and sanded, primed again and sanded and wiped with 333. I filled any low spots with more Total Fair. Sanded that flush w 120 grit on sanding blocks, wiped off the dust, and primed a third coat. That coat seemed good enough for paint. I sanded it first w 220 grit, wiped with 333 and painted a coat of Interlux Brightside "Off White". Sanded that with 320 and painted a second coat. Before applying the VHB tape, I scuff sanded the flange w 220 grit and changed to 50/50 mix alcohol and water, to wipe up the sanding dust, as recommended by 3M for VHB tape. Any other solvent might be too strong and reduce the strength of the VHB adhesive.

Replacement Method: I followed the YouTube video by Andy of BoatworksToday.com to replace my boat's windows. I've thanked him for his great advice and recommend watching his videos and following his method. <u>https://www.youtube.com/watch?v=MQyjxVUskd8</u>

Some people including Andy of BoatworksToday, bevel the back edge of the acrylic window panes to create a larger bonding surface. Others leave the panel flat. My strategy was to have the acrylic extend 1/8" to ¹/₄" past the VHB tape so the Dow 795 had a little more acrylic surface to adhere to. I believe the tape is actually bonding the window to the fiberglass cabin side and the 795 adds some adhesion but it's primary purpose is making the joint waterproof. Both should remain flexible. I applied VHB tape (black) to the edge of each window opening. Used ³/₄" wide tape on the ends of the window openings and ¹/₂" wide VHB tape on the top and bottom edges and wherever the flange was too narrow for 3/4". I cut pieces of tape to fill any gaps such as in the corners. The VHB tape was laid along the inside edge of the window opening and forms a nice barrier that prevented the sticky black 795 from oozing it's way inside the cabin.

I dry fitted the new windows one by one and used blue painter's tape to keep them in position. I then made alignment marks on the blue tape with a sharpie for reference at the sharp corners and along the top and cut the tape along the joint so my marks were on both the cabin and the window pane. I trimmed any blue tape off the acrylic window edge so later caulking could adhere to it.

Back bevel sketch.

This method was used by Dave Godwin on his C&C 37, Ronin, which has a design that forms a pocket for the window pane. The outer surface of the pane is almost level with the cabin sides and the joint can be filled with caulk and smoothed level with both surfaces.

Flat back sketch:

I left the back edge flat and used the method shown on the left to provide as much surface area as possible for the $\frac{1}{2}$ " wide VHB tape. My windows sit in a recess with a raised molding around the flange. The flange is about 5/8" so that left a little overhang and space for the Dow 795 to squeeze in and form a watertight gasket. If I had beveled the back edge, the VHB would have had less surface area for bonding. The sketch shows how the cabintop and deck

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are cored and how the inner and outer fiberglass laminate join to form the vertical sides of the cabin.

Applying new acrylic panes:

Tip 1: mix a cup of alcohol and water to wipe acrylic clean. And keep a small can of mineral spirits handy to wipe up any Dow 795 caulk.

Tip 2: setup a small trash can with a liner bag to receive all the nasty, sticky paper and blue tape that will have sticky caulk on it. The liner bag makes cleanup quick and easy. I removed the protective paper from the cabin side of the acrylic pane and stuffed the paper into a small trash can. Wiped off the acrylic pane w 50/50 mixture of alcohol and water and paper towels and set aside.

I removed all the red 3M protective film from VHB tape of <u>one window flange at</u> <u>a time</u>. Wiped the inner surface of the pane a second time w 50/50 alcohol/water. Carefully picked up the window pane by the edges and oriented the piece while holding it a few inches away from the VHB tape and aligned the marks. Then I said a prayer, held my breath, and keeping the piece curved between my hands, I placed the extreme corners on their marks and pressed the piece against the VHB tape. The tape is activated by pressure so I then

placed my knee and all my weight onto the pane, at six inch intervals holding my weight there for about 15 seconds. I followed that up with a generous rolling using a tile roller hand tool. I placed all three windows on each side, onto their VHB tape before taping and caulking anything.

Red film on VHB tape

Window panes mounted

Taping: This is the most important step to get a professional finish: I used blue painter's tape around all the windows and kept it about 1/8" away from the window pane to allow for Dow Corning 795. I didn't get pictures of taping. This step is the most important because the black caulk line formed when you remove the tape will determine the overall outline shape of the windows and the look you want. This step will make or break the project. If you want the windows to look aligned, then tape the tops and bottoms of the three windows as one unit and get those edges in line. The top window edges form a straight line and the bottom edges form another line. These two lines converge at the stem of the boat. Sight it from various angles and redo it till you're happy with the look. It's easy to change the tape now and get the line right. It's impossible to redo the caulk after it's hardened, so take your time on taping. I also used a sharp razor knife to cut nice round corners in the tape. If your knife rips the tape, change the blade.

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Caulking: I caulked <u>one pane at a time</u>, taking special effort to pump the adhesive fully into the gap, keeping the tip against the joint and maintaining steady pressure on the trigger. I set the caulk gun down onto some scrap cardboard, with a paper towel over the end. I finger tooled the caulk joint, wiping the excess caulk from my finger onto the window paper. I usually could get a nice consistent smooth shape with one swipe. But I always went back and double checked and if something looked wrong, I made a second lighter sweep with my finger along the joint. I wiped the excess caulk from my finger onto the paper protecting the acrylic panel. I later cleaned my finger and hands and any 795 smudges from the deck with mineral spirits. Within about two minutes after tooling, while the caulk was still pliable, I first pulled the paper off the acrylic pane, rolling it from one end, and placed into the trashcan. Then pulled the blue painter's tape off being careful to keep the sticky stuff away from the deck until it could be stuffed into the trashcan. The tape left behind a nice sharp line of black caulk. Pulling the tape is the final step. I didn't touch the caulk after removing the tape. The caulk never changed; never lifted, never sagged. "Wow! It looks so professional." I did one window at a time this way, caulked, tooled, remove the window paper and blue tape, until they were all done.

Dow says after about three hours, the caulk will be tack free. Full cure takes a week to two weeks and full adhesion takes three weeks. It was 90 degrees and sunny the day I did this and the caulk on the tape was tack free after two hours. Since I had the tarp on deck, I placed a tarp over the windows to prevent too much direct sunlight or heat on the assembly.

Materials Used: I used about three quarters of a tube of Dow Corning 795 on the port side. I started a new tube for the starboard side and used about the same on that side. I had a third tube for backup I didn't use. Be careful ordering Dow 795 as it has a limited shelf life and my first batch expired before I got a chance to use it. In my case, the date on the tube was only a month too old, but I didn't want to risk trying it, because preparations were so extensive. I ordered new product and have no regrets.

Mineral spirits cleaned up the wet 795 caulk very easily and worked to clean my hands too.

3M VHB 5952 tape in $\frac{1}{2}$ " and $\frac{3}{4}$ ". The tape achieves 50% of it's ultimate strength after 20 minutes, 90% after 24 hours and 100% after 72 hours. I wound up using almost three rolls of $\frac{1}{2}$ " VHB tape, each 15 feet long. I used

about seven feet of ³/₄" wide VHB tape from a 5 yard long roll so I have a bunch left over.

Total Boat Dewaxer and Surface Prep worked better than acetone or xylene.

Total Boat Total Fair is a wonderful waterproof fairing compound. You mix blue and yellow and the mix turns green. Sands easily without pinholes and can be used above or below the waterline.

Total Boat Thixo Flex is a flexible epoxy that comes in a caulk gun tube. It takes a stronger type caulk gun available at Home Depot or Lowes. Extra mixing tips make this work easy. I used it to fill all the holes from my deck hardware, before painting the deck. Kept out the rain and sealed the core too as I overdrilled those holes first. Remember to countersink a dimple into the deck to mark these holes for future.

50/50 mix of water and ispropal alchohol for windows and prepping flange for VHB tape.

Windows are done, July 2021.

