

## **2002, 24 foot Hi-Lo Camper Window, Wall and Beam Restoration**

**Summary:** Last summer (2013) we were on a camping trip and raised the day-night shades when we arrived at the campground. Unfortunately, one of the screws for the restrainer cords that holds the shade down, pulled out of the trim cap above the upper section beam and we discovered that the beam was rotted. Turns out the manufacturer over-cut the opening for the windows in the walls and they leaked and rotted both the lower section of the walls below the windows and the perimeter wood beam below. Twelve and a half feet of beam was rotted on one side and five feet on the other side. The window under the awning was just as improperly installed but the awning protected it from the rain. The window manufacturer says the minimum required overlap between the window and wall is 3/8". Unfortunately, there were places around the window which had less than 1/8" overlap. The windows looked great from the outside and inside but they were not installed correctly. The windows were installed using putty tape between the frame and the wall and with so little overlap; the putty squeezed out and allowed water to enter. For five weeks my wife and I worked on the camper almost every day (I am retired) either finding materials, cutting and prefabricating parts, tearing out rotted wood, separating the upper and lower sections of the camper, removing windows, or building back walls, beams, wall finishes and reinstalling windows and a new bulb seal. We are now finished and the final product looks great, although nothing is ever perfect. No one got hurt, which was a blessing, but there were some times of concern while the top and bottom of the camper were separated. (I pushed the tongue jack off a 6x6 block of wood while trying to force something into place and the whole camper shifted about a foot which gave us both some concern since the top and bottom were separated at the time.) I learned a lot and if I had it to do over again, I would do things a little differently. I am pretty handy with tools so I will say this project is not for the complete novice, although it can be done with time, hard work, perseverance and a dry place to work. A long time ago while on the web, I read that the windows in a Hi-Lo should be taken out and resealed. I thought that was ridiculous. If the windows are installed properly, they should not have to be resealed ever. So I did not remove them and reseal them a long time ago. If I had, I would have realized the windows were in fact not installed correctly in the first place and I would have saved myself a HUGE amount of restoration work to have caught the problem before the leaking windows rotted out the walls and beams. I will share a word to the wise. If you have a Hi-Lo and have never removed the windows and/or resealed them, you should read the complete description of my project and perhaps at least take one of your windows out to inspect to see if it was installed correctly before your camper suffers the same fate as mine. I hope all you Hi-Lo owners can benefit from our experiences. We love the concept, we love the camper. If we were to lose this camper, we would probably buy another Hi-Lo, even knowing all the potential problems.

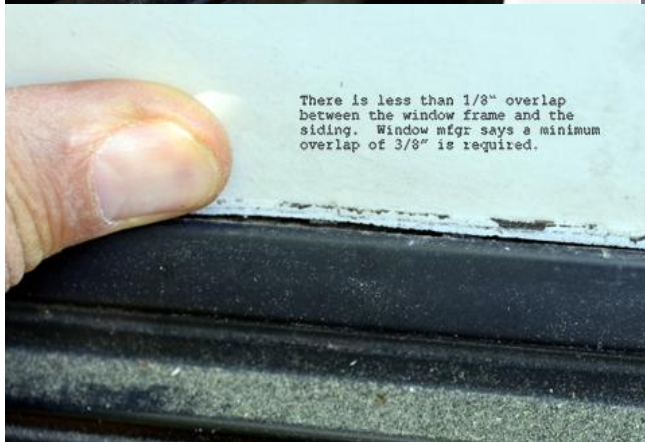
Happy Camping and Blessings to Y'all.

Beach Papa

## The Problem:

### 1. My 24' - 2002 Hi-Lo

### Images of putty squeezed out around windows



The last photo above on the right is showing the top and bottom halves of the camper separated and the aluminum covered beam at the bottom of the upper half. The lift cable cut through the aluminum beam cover because the beam was rotted and weak.

**This is what the leaking caused:** The photos below are looking down at the rotted beam and wall intersection between the upper wall and the lower wall where the beam was covered by a trim cap.



Not only is the beam shown above rotted, but the entire wall below the window was also rotted behind the vinyl wall covering.



You can see in the photos above that the composite camper wall, consisting of 1/16" fiberglass outside skin, 1/8" plywood, 1" of foam, and 3/16" plywood inner wall was rotted and delaminated below the windows. The photo on right is looking down into the wall where a window was removed, with the rotted wood beam and portions of the wall also removed. The remainder of the 1" foam insulation below the window opening in the photo will be removed to rebuild the wall.

In order to accomplish replacement of the wall, beam and bulb seal, the upper and lower sections of the camper must be separated. Follow the procedure below to **separate the top and bottom halves**:

1. My 24' Hi-Lo has a wood pocket wall separating the bathroom from the rest of the camper, I just let the walls slip out of the pocket, but it is essential to pay attention when they are about to go back into the pocket while you are putting the two halves back together or you could jamb them and break them if they are not lined up properly. You may need to or want to remove screws holding the upper section of the pocket wall, remove the walls and reattach them after you put the camper halves back together.





2. Unscrew the sewer vent pipe at the top and cap the pipe with tape to keep sewer gas out of the camper while you are working.
3. Depending on how much you separate the camper halves, you will either need to remove just the electrical tape from the wiring bundle inside the cloth cover adjacent to the vent pipe or mark pairs of matching wires and remove the wire nuts to take the wiring bundle apart. I did not separate the camper enough to access the beam behind the refrigerator, but if I had, I would have had to remove the wire nuts on the electrical wires or they would have pulled apart as I separated the halves of the camper.
4. Remove all trim cap boards on top of the lower wall. (I did not and caused damage as I separated)
5. Remove all guide rails. (I did not and caused damage as I separated the halves.)
6. Lower the tongue to the lowest possible position and cut and place 2x4 braces under the rear outer wall structure of the upper section (not under the beam) on both sides of the camper.
7. Raise the tongue to the highest possible position. (Since the rear top section of the camper is stationary on the 2x4 braces and the tongue is going up and the rear going down, you are separating the top and bottom sections at the rear) This theoretically should be enough separation to slip an 8'-2x4 from one side of the camper to the other between the top and bottom halves at the rear. (If you do not get enough separation to put the 2x4 in place, you could let air out of the tires to get more separation.) I was told by J&R that the aluminum structure within the wall on my year model camper was strong enough to hold the weight of the upper section even with a rotted and non-functional wood beam. However, I had two problems, one was that I did not have enough separation to fit a 2x4 and the second was that I have a wardrobe in the bath at the rear that keeps you from placing the 2x4 from one side to the other. I choose to just leave the rear of the camper sit on the 2x4 braces and proceed to step 8. If you are able to put a 2x4 between the upper and lower sections when you lower the tongue to work on the front, the rear vertical 2x4 braces will fall away. (Mark these vertical braces for their position and keep them for reversing the process and putting the camper halves back together.)
8. Now with the tongue at its highest position, cut and place 2x4 braces under the front outer wall structure of the upper section (not under the beam) on each side of the camper.
9. Lower the tongue to its lowest position and place an 8' 2x4 from one side to the other between the upper and lower sections, but not in a place that would block full access to any guide rail blocks.
10. Raise the tongue and the front vertical 2x4 braces will fall away. (Mark these vertical braces for their position and keep them for reversing the process and putting the camper back together.)

At this point, the top and bottom halves of the camper should be separated and sitting on 2x4s that go through the camper in the front and rear. (I found the lift cables getting taunt while separating and hit the "Lower" button on the Raise / Lower switch, for just a moment, which put slack back into the cables.

**Problem:** With the top half in the rear only supported on the vertical braces rather than a 2x4 that ran thorough the camper, I was able to work on the beam and wall repair from the refrigerator forward. However, without the camper fully separated by a 2x4, I was not able to get my staple gun between the wardrobe and top of the beam to reinstall a new bulb seal. I ultimately had to let air out of the tires with the rear top half supported on the vertical 2x4 braces to be able to separate the halves enough to replace the entire bulb seal. This also lowered the camper enough that I could have put a 2x4 between the top and bottom halves in the rear, although this support could not have been from side to side (because of the wardrobe), but rather from side to rear. (This technique initially seems a little shaky, but I think it could have worked with the rear support as close to the wardrobe as possible and perhaps another support in the middle of the camper that went from side to side in the camper.)

**Problem:** The refrigerator is the highest thing in the camper. I could not access the beam behind the refrigerator because I did not separate the halves enough. That section of beam was not as severely damaged by moisture as the areas directly under the windows and although I would like to have replaced it, we decided to fix what we could and move on. In retrospect, if we had let air out of the tires at this point rather than at the end when we were unable to put the bulb seal all the way around, we would have realized that it was possible to get the top of the camper high enough to access behind the refrigerator. What we would have had to do was once the camper was separated (by letting air out of the tires) and securely resting on 2x4s front and rear going from side to side in the camper, just keep repeating the steps 6 thru 10, placing additional pieces of wood between the top and bottom sections of the camper until we had it separated enough. **However, a word of caution, you would need something wider than a stack of 2x4s between the two halves since a stack of 2x4s high enough to access behind the refrigerator would be unstable and likely the top half would come crashing down at a very inconvenient time likely causing damage and/or injury.**

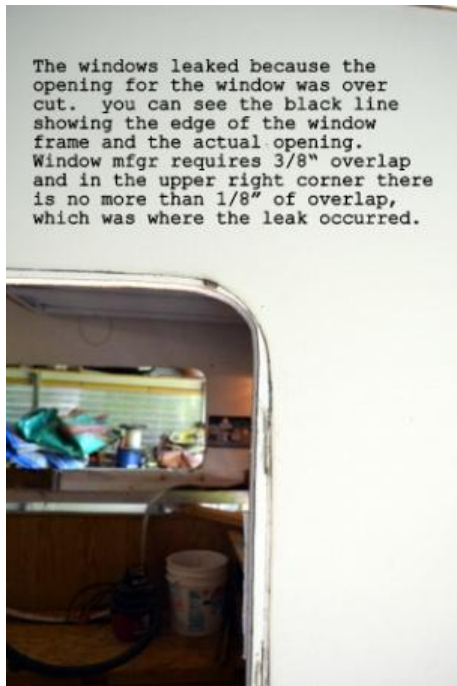
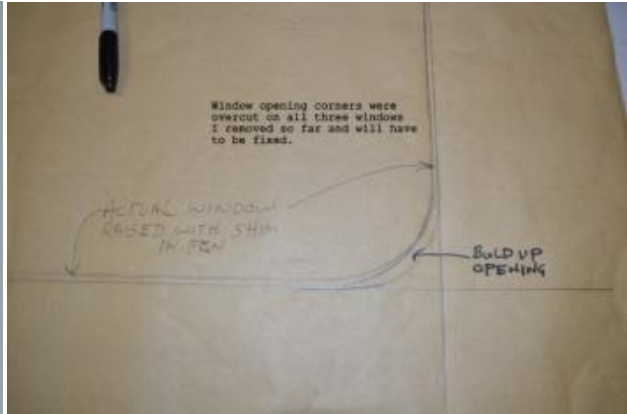
**Some issues shown below:** Photos 1&2 show 2x4 vertical brace in place for separating top and bottom halves. Photos 2 & 3 discuss use of a 2x4 corner support rather than 2x4s from side to side, note the corner support in photo 3 and the guide block which I could not access with a screw driver to remove. Photo 4 is a guide rail, all of which must be removed. Photos 5, 6 & 7 show the damage that can happen if you DON'T remove ALL the trim cap from the bottom wall and ALL the guide rails. The guide rails will hold the guide block flush against the wall and when the two halves separate, the guide block will tear up the seal trim and the lower wall trim cap. ( I was unable to access the top screw on one of the guide rails and though it would be okay to leave it in..... NOT) If I had it to do over again, I would have jacked that corner of the camper up with a car jack if necessary to remove that last screw.





**Window issues:** The original window openings in the wall were overcut, both in the corners as well as top to bottom and side to side dimension. The window manufacturer requires a minimum overlap of the frame and wall of 3/8" and there were places where there was less than 1/8" overlap. I cut a 6" diameter circle to match the window corner curve to help determine where the corners should have been cut to. I then drew the actual window opening by taping a piece of paper against the camper wall on the outside without the window in place and drawing the opening from the inside. I then laid the window on the drawing and outlined the window to determine where and how much I needed to reduce the opening to achieve a minimum 3/8" frame overlap all the way around but still have sufficient clearance to install the window. (You don't need much clearance; the opening just has to be cut accurately.) I cleaned up the window opening on one side to make it accurately match the window requirement and then I made a 1" thick Pressure treated wood insert to match the required corner curves, height and width for the opening and dug out the foam insulation on one side of the window opening to the necessary depth in order to insert the pressure treated closure piece into the wall. I then built up the top to bottom dimension by adding pieces of wood at the bottom of the opening as necessary. Since the inserts did not come out flush with the wall of the camper and to make the seal water tight, I put Bondo over the inserts to bring them flush with the camper wall for a tight seal.





### Other Issues:

Because the camper had moist walls from rotting wood, there was always a musty smell in the camper. We thought it had to do with the fact that we live along the coast and it is very humid here, but now we think it was the rotting moist wood that was causing the mold and musty smell. So we took all the cushions out, took them apart and washed the covers and tried to treat the musty smell in the foam with baking soda and then vinegar. This procedure helped a lot, but the cushions for the dinette obviously has something spilled on them and we could neither get the stain or the odor to abate. We figured we would have to replace the foam anyway and had nothing to lose by trying to immerse them completely in the tub to see if that would clean them. I did the grape dance with warm water and laundry soap and it did the trick. The washing got them clean and odor free. It did however; take several weeks in the sun and breezy fresh air plus squeezing the cushion between towels to get them dry again.



As the beam rotted in the aluminum housing, tannic acid from the wood leached out and attacked the aluminum. The photos below are looking into the aluminum beam cover with the rotted wood beam removed. We cleaned the stains off the aluminum with Goof Off and Awesome. In doing so we realize the aluminum had pin holes where the acid had eaten through the aluminum. Holes in the aluminum were also evident where the manufacturer had used galvanized staples through the aluminum into the beam. We decided to use Proflex RV sealant and bed a fiberglass cloth into the sealant to give the finished product strength and watertightness. It seems to have worked well, although I did need to modify my replacement beam to compensate for the new material I added to the beam space within the aluminum cover.







Where the beam rotted, the stress from the lifting cables cut through the aluminum cover into the weakened beam (photo below). It was a bad design to wrap the cable around the aluminum covered beam without any additional means to distribute the load on the beam. On my friend's 2005 28' Classic Hi-Lo he actually has a rounded bracket mounted on the beam at the cable to take the stress from the cable. I guess Hi-Lo figured out it was a problem after they built my camper. So I got a piece of 1-1/2" x 1-1/2" stock aluminum angle and cut it into 4" sections. I then took a piece of chrome plated copper tubing and split it length wise. I filled the copper tubing half rounds with marine epoxy putty and fitted them onto the corner of the angle. I attached them centered on the cable. The rounded corner makes it easier for the cable to turn the 90 degree corner without excessive stress on the cable and the aluminum angle spreads the load out over the beam. Works great.





### **Getting the camper back together:**

It took a bit of dry fitting things together before we began the process of gluing the walls up. I was concerned about using moisture cured urethane glue (Gorilla Glue) which only allows 15 minutes before the glue sets up and you better have it clamped or you might end up with an unforgiving mess on your hands. Manufacturers who make Structural Insulated Panels, (SIP Panels) use urethane glue all the time, and that is what Hi-Lo used in the factory to make the walls which consist of a 1/16" fiberglass panel, 1/8" plywood, 1" of EPS foam and finally a 3/16" plywood panel all glued together. Dow chemical makes a broad range of urethane adhesives for SIP manufacturing that have a working time of from 15 minutes up to 2 hours depending on the SIP manufacturer's requirements and set up. I contacted them to try to purchase a small quantity for my project and they were not helpful. J&R was also not able to assist. I was forced to use Gorilla Glue with only a 15 minute working time limit. We altered how we would put the pieces together in stages that we could stop and clamp up one section within the time limit and not interfere with follow on sections that we would have to begin after the first section was clamped up. We tried some test pieces to see how close the clamps needed to be to get good pressure on the assembly. We could not find a clamp that would reach 14" in from the throat of the clamp in order to reach the wall section forward of the window opening. Where there was a window on both sides and we could clamp on both ends of a board, we figured we would be okay, but we needed something to extend 14" into the wall from the window opening. So I built the "Clamp-a-Saurus". It is a scissors clamp with jaws that will extend more than 14" beyond the pivot point and the jaws are compressed with a bar clamp on the other end. You can see on the next page, the array of clamps we used to put pressure on the entire wall length.









The clamps are off and we are putting on the new wall finishes with new coastal shell boarder.



The two photos below tell the story as to why you need to protect your countertop and appliances. The glue and whole removal and reinstallation process is very messy and unforgiving.



One thing we noticed was that the guide block closest to the door swung in as we separated the top and bottom halves. When we lowered the halves back together at the end we had to put wedges along portions of the walls to keep them in alignment. If we had lowered the top section with the guide block sitting on the lower wall, it would have broken perhaps both the guide block as well as the lower wall.



My friend told me to check my vent for the refrigerator. On his 2005-28' Hi-Lo Classic the rain deflector behind his vent cover was installed backward, which caused rain that entered the vent to go into the wall and rear of the refrigerator rather than back out of the camper. The first photo below is what I found when I removed the vent cover. The deflector was installed backward in my 2002 camper as well. The second photo below shows the deflector properly re-installed and sealed to direct rainwater out not into the camper. I hate to say it, but you should probably check yours to see if it is installed correctly. The gray plastic should be sealed around the perimeter and should be installed in such a manner as to act as a dam that directs water out of the camper rather than into the camper.



### Other unrelated camper modifications:

While I am posting, I thought I would share a few improvement we have made to our Hi-Lo over the years.

Our 24' camper is set up with 2 facing couches in the front with a drop down table between them. The couches come together to form a king size bed. The way the couches come together is by sliding two opposing pieces of plywood, sitting on top of the seats, together to form a continuous platform for the cushions. However, the front lip of the plywood has several legs that are now sitting in the middle of the walkway between the two couches, blocking access to the storage below the seats as well as possible use of the walkway below the bed. (We also have an overhead bunk above the king bed.) Since we have a lack of storage and there is no place to put the bedding when the bed is made into two couches, we just leave the couches made up as a bed and sit at the dinette. I solved the "legs in the way" problem by removing the legs, and cut 4 pieces of 2x4 to go between the couch seats. I notched the front lip of the sliding plywood panel to accept the 2x4s. On the end of the 2x4s I put a Z shaped bracket made from scrap stainless steel screwed to the bottom of the 2x4 with a lip that sits on the seat. We put the 2x4s in place, slide the plywood panels over the 2x4s and you now have a fully supported platform for the bed without legs to get in the way of access to storage under the seats. We also keep a rolling plastic clothes container and a laundry basket in the walkway under the bed. I use the awning rod to retrieve the rolling clothes container if it is too far under to reach. Storage is so limited in these campers and it is a waste of valuable space to have legs where you could have storage.





The wardrobe was extremely impractical. All we had for clothes was a small hanging rod. Okay, I got a place for shirts, but what about socks, pants and underwear? We needed more drawer space, even with my modification to provide accessible storage under the bed. So I took some space from the wardrobe and built 3 large drawers. Now we have hanging space and drawers. I added a child safety latch to the bottom drawer and a brass rod that goes through the handles of the upper two drawers to keep them in place while we are traveling.



This last photo shows a pair of towel bars I added to the bathroom. There was no place to hang a towel to dry. I cut a 6"x6" piece of cherry as a mounting plate and used construction adhesive. I think I put one screw each through the cherry under the towel bar bracket. They work great!! Hope this gives you some good ideas for your own modifications to make your camping experience more enjoyable and convenient and your Hi-Lo more usable.

