

Bonding Canopies to Metal Frames

George Balmer has kindly supplied the following tutorial on how to bond a canopy to an RV-8 frame. The techniques are similar for all metal frame aircraft.

Bonding a canopy to an RV-8 frame

Courtesy George Balmer:

Gert and I have both done this and found it suitable.

First, the "watch out for's";

- * - the canopy latch handle needs every bit of length to get through the added thickness, but it will go if your careful.
- * - the stuff becomes tacky in about 15 minutes
- * - you will need a competent helper or two for the skirts at least.
- * - read SIKA instructions carefully

Now the steps I used to bond the canopy to the frame;

- * - You need the SIKA U295 adhesive. The primer, and the cleaner. You could use white, I used black. I used 2 tubes of adhesive to do the whole job.
- * - After final fitting the canopy, windshield and skirts in place you are ready to begin

Tip - In order to keep location I put two index clecos in the canopy / frame about 1/3 the way from the rear, one on each side. I drilled two holes in the canopy using plexi-drilling techniques of course.

- * - I took a large cardboard box and cut big "V"s out of the ends to make a safe stand for the canopy when it is off.
- * - Mask, Rough up and clean the plexiglass. I used about a 2 inch strip (1/8 inch above the skirt on each side)
- * - Apply the primer.
- * - The primer needs to dry a long while Gert cautions.
- * - Mask the tube (I masked ½ the tube circumference)
- * - Roughen, clean with their cleaner and apply the primer. (The primer preps and it blocks the UV from the sun so you need it.)

Tip-Use good Masking tape, the cheap stuff can be a bear to remove.

- * - I placed the frame in the canopy, in the stand.
- * - Gert and I both used popsicle sticks to shim 1/8 to 3/16 inch gap. It will vary along the length but never got to ¼ inch. I put my stick spacers in about every 16 inches. (The thickness of the adhesive is where the expansion or contraction due to temperature fluctuation is accomidated.)
- * - I used a second layer of masking tape on top the first to get a good final edge (you will see why below).
- * - Gloves, cloths, good caulking gun in hand, some soapy water in a squirt bottle

at the ready, I needed no help here.

- * - start wherever you feel good and fill the gap, leaving clearance at each popsickle stick spacer so you can get them out.

- * - smooth gently top and bottom with soapy finger when you have enough in (be a little thrifty in application)

- * - Remove the first layer of masking tape from the top (visible side) soon (she sets up quick.) I found pulling it back over itself at a sharp angle caused any stringy bits to break and fall back in place.

- * - Soapy finger again and then the second tape is removed

- * - let her harden 24 hours.

- * - Remove the two clecos

- * - Remove the sticks, re-tape (twice), and fill the gaps with adhesive, smooth with the soapy finger etc.

It should look pretty good

Now for the skirts;

Someone cautioned to ensure the inside of your skirt is prepped....good advice, paint it but ensure compatibility of paint and SIKA primer.

I decided to bond only along the skirt/canopy seam and to use 8 Riv-nuts with flush screws and Tinnerman washers on each side to fasten the skirts to the steel frame.

I drilled out 4 rivets on the fuselage, on each side, that would be under the skirt lower edge. (They were replaced later) These were match drilled in the skirt and used to keep skirt clecoed in place.

The Riv-Nuts were spaced out, drilled in the steel frame and applied (Riv-Nuts are good deal....pretty easy to use too.) With the skirts clecoed in place the riv-nut holes were match drilled. The following is done with the canopy in place on the fuselage of course.

- # - check the skirt to canopy fit

- # - Mask the canopy again outside (twice)

Tip-When masking leave a little space for the bead of adhesive, don't be too close to the final edges.

- * - Mask the top skirt edge

- * - remove the skirt, roughen, clean and prime both canopy and skirt

- * - let dry

- * - With the skirt in place I went all around it and marked the tape with a pen, with the gap I wanted to fill. This time the thickness of adhesive is much thinner (reasoning the expansion/contraction difference of Plexi and Fiberglass are much closer than Plexi and Steel) It was almost always less than 1/8 inch except at the very back it is almost double that for a few inches.

- * - This time I applied a layer of SIKA adhesive on both the canopy and the skirt and leveled it with a spatula. (I used the gap measurement to estimate the thickness of the layer to use, don't want any air gaps).

- * - With help the skirt is placed and clecos and # 8 screws are gently placed in the skirts and brought up barely snug so no distortion takes place.

- * - Any gaps or spaces between skirt and canopy are filled with SIKA
- * - The soapy finger smooths, the first layer of tape removed and then smoothed again.
- * - Remove the last layer of masking tape and admire.
- * - Leave it alone for a few days. (This was tough....I had this urge to open the canopy but the clecos prevented any stupidity.)

Thanks to George Balmer for providing this information

More Info

FWIW, before gluing the canopy and windscreen (and skirts) on my 7A frame and fuselage with Sikaflex, I bought some black Sikaflex295UV and did a few Dr. Destruction pull tests using scrap pieces of plexi and pieces of both powder coated steel and aluminum. Thickness of the adhesive beads was controlled with rubber hose washers at 3/16ths inch per the product data sheet manuals. On one pull test, I tore the aluminum sheet (.032) and the Sika joint never failed. In all my other tests, the plexi failed. The Sika joints never failed.

I can only presume the product that failed was out of date (either the primer, the wash or the adhesive or all) or there was some other contaminant present at the point of adhesion. This product has been sold as an adhesive for polycarbonate and plexiglass for years. It is recognized as an industry standard for the application we are using it for. I suppose time will tell, but there are installations in RV's out there now with over 5 years on them. If anyone knows of any other failures, I'd sure like to hear the details about them. I can only speak about my installation, which shows no sign of being anything but solid. I did return some tubes of Sikaflex which were out of date when I received them. I'd suggest looking at those dates closely.

One thing I've learned from using Sikaflex 295 is that it will absolutely not stick to a surface that has not been properly prepped (both surfaces sanded w/60 grit, washed, primed). Also note there are time limits ...wait 20 minutes after the wash coat before priming. Adhesive must be applied within 2 hrs of priming. I used to freak out if I got some Sikaflex on the canopy outside my masked bead area...later I just left it on until it cured, because it would peel off as easy as rivet tape if it was not applied over a properly prepped area.

Thanks to Bob and Karen Brown for providing this information