Boat repair and fibreglass stuff

How to

Who am I

I am a teacher of technology at Rototuna Senior High School.

I build boats for a hobby and what I am going to share is from my experience.

I have built A Goat Island Skiff, a strip plank canoe and a strip plank dinghy, I have restored a Joker 6.7, Cherry 16, and Ross 780, I am part way through an extensive rebuild of another Ross 780.

I have also done numerous repairs on my other boats and the boats of others. These repairs have been tested (including a hole repair on this years TY40 winner at the Gulf Classic).

What we will cover

Types of resin

Types of glass cloth

Adhesives and fairing

West systems products

Fix a hole in a glass over ply boat (or any other glass over core structure)

Remember that we encourage everyone to share their experience. If you see me doing something different to how you do it, please share. Often there are many different techniques that suit different peoples work style.

Laminating epoxy

I use West systems products

105 Resin

205(fast) or 206(slow) hardener (depending on time of year)

The ratio is 5:1 by volume of 5.1:1 by weight

You can also buy pump dispensers

Correct ratio is super important you want to be as close as possible.

Don't thin it with any solvents. If you want it thinner, heat it up.

Polyester resin

Whatever you do, avoid fibreglass repair kits from various hardware stores.

They are expensive for what you get and they use polyester resin which isn't as good as epoxy (particularly for repairs).

If you do use polyester there are some things to know:

- More hardener makes it go off faster
- It stinks
- It cures quickly (particularly in the absence of air)

Types of cloth

- Woven cloth (often called surfboard cloth)
- Double biax cloth
- Chopped strand cloth
- Uni-directional
- Mixtures
- Carbon
- Kevlar

Weights are in grams per square metre (gsm) or ounces per square foot (american)

Where to buy glass

Glass cloth:

Resincraft (online store based in Hamilton)

NZFibreglass (Mt Wellington)

Burnsco and Smart Marine

Adhesive Technologies (Auckland)

Where to buy epoxy

All of these places stock West Systems products:

- Resin Craft, NZ Fibreglass, Adhesive Technologies
- Bursco when it's on special
- Smart Marine (with VIP card)

Handling cloth and resin

Try and avoid as much contact with the cloth as you can to avoid getting oils on to it. I keep it inside to avoid getting it dirty.

When working with epoxy:

Always where gloves and it is a good idea to where a respirator

Dont mix up too much. It is an exothermic reaction so will go off very quickly if you have lots mixed up in a cup

Additives

I use three west systems powders for different purposes:

- 406 (Colloidal silica). Holds its shape well and is used for making fillets
- 410 (Microlight fairing). Smooth and easy to sand
- 413 (Adhesive blend). Very hard and strong. Used for gluing things together

Sometimes I use a mixture of 406 and 410 when fairing vertical surfaces

Wear a respirator or be in a well ventilated space when adding additives (particularly 406).

Tools

Chip brushes (Bunnings are best for this)

Grout squeegee (Bunnings)

Paint rollers (thinner the better)

Fin rollers

Scales (if measuring by weight)

Scaled cups (if measuring by volume)

Paper cups

Stirring sticks

Acetone (for clean up, not thinning)

Fixing a hole

Part 1. Removed the damaged area. Any splintered glass or plywood needs to be removed.

Part 2. Grind a bevel in the remaining timber.

Tips for grinding a bevel

Use the layers of the plywood. You should be able to see about the same amount of each layer and the lines should be straight.

To grind a bevel I use an angle grinder with a 36 grit disc

Accuracy is good. But don't stress. You will be filling the gap with Epoxy and 413 adhesive filler which is stronger than the wood anyway. In fact Epoxy actually works best when there is a bit of a gap.

Make a patch

Cut a piece of plywood that matches out outside edge of the bevel

There is some debate about what type of plywood to use.

Use a grinder to grind a bevel in the patch to match the hole

Glue in the patch

Dry fit the patch using screws to hold it down (these screw holes will be useful later when trying to line everything up. I also draw pencil lines across the joint to help when lining up later.

Once you are happy it's time to glue.

Mix up some epoxy and use a paint brush to apply it to all surfaces that will be glued.

Glue in the patch

Now add adhesive filler to the epoxy. Keep adding small amounts and stirring until it looks like peanut butter

Apply liberally and screw the patch into place. You want to ensure there is squeeze out all around the joint.

Glass

Wait a minimum of 24hrs

Using a coarse grit on a random orbital or a belt sander to sand the patch down to make it mostly fair. Ensure you have sanded approximately 5cm around the edge of the repair down to the glass (but not through it if your can).

Cut out a piece of glass that overlaps the repair by about 5cm.

Wet it out and use the squeegee to ensure the glass is flat (not resin bubbles underneath). Once the cloth is translucent you are done.

And Fair

Using the wet on wet technique

Wait for approximately an hour (times will vary depending on temperature, and what hardener you have used).

Do the cotton bud test.

If satisfied mix up a new batch of resin and add 410 filler to get it to a suitable consistency (this will vary depending on situation)

Cover the repair with this fairing mixture

Allow 24hrs to cure

Sanding

Once the fairing is cured you can sand it smooth and fair using an 80, followed by a 120 sandpaper. The choice of tool will depend of the size and shape.

Sometimes you will notice some imperfections. This can be corrected with either an automotive “bog” filler or another coat of slightly thickened epoxy.

Painting

There are lots of options. My two favourites are:

Resene super gloss enamel, with a smooth surface primer (not always needed). This can be applied using the roll and tip method.

Or a high build 2k primer, wet sanded with 400g. Then followed up with a 2k industrial or automotive top coat. This should be applied with a spray gun. This is much more complicated but leaves a better and more durable finish.

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INDUSTRIAL MIX

Fillets and rounding

It is also important to be aware that glass cloth doesnt conform to sharp edges very well. For an internal corner you should make a thickened mixture of epoxy using 406 filler. You would then pipe this in to the corner (similar to how you ice a cake).

To make it a uniform roundness you use a large tongue depressor held at a 45 degree angle.

For external corners you could use a roundover bit on a router or carefully grind it to shape

Peel ply and vacuum bagging

Peel ply is a polyester fabric that you can apply as the last stage of fibreglassing. Once the epoxy cures you can then peel it off leaving a clean surface that can have more glass or epoxy applied over it.

Vacuum bagging is for another day.