

GLULAM REPAIR PROTOCOL.

INTRODUCTION:

All timber products move with changes in weather conditions, the most notable being changes in humidity. When timber products are subjected to stark changes, such as movements from a high to low humidity, as wood is hygroscopic, it will let off and take on moisture. Continual wetting and drying will have the same effect. When this occurs, there will be changes in dimensions and the scope of this movement is dependent on the specie. Some species will move more than others. The orientation of the growth rings (the method of cutting the wood) will also influence the movement.

It is generally this movement which sets up the stresses within the gluelines of the Glulam which can result in minor fissures appearing at the extremities of the gluelines. In most occasions the resultant fissure is not deep and the integrity of the glueline is not affected. It can be sometimes evident at the ends of Glulam members where egress and ingress of moisture is easier than the face of the member.

The second repair which may be necessary is caused by a localized EMC (Equilibrium Moisture Content) variation between adjacent lamella in Glulam. This occurs when there is a large variation between the individual boards (shooks) which are adjacent in the Glulam assembly. When this occurs, the fissure can extend through the entire glueline but is localized to the glueline jointing the shooks with the large variations in MC. The extent of the fissure can be measured by forcing an engineer's feeler gauge into the void. A credit card or a business card will also suffice if the fissure is wide enough.

Glueline stress fractures which are more severe than the localized fissures should be referred to the manufacturer.

RECOMMENDED RECTIFICATION:

Generally speaking, when a glueline stress fracture appears, it is best to wait until most movement has taken place before rectification is undertaken.

The method of rectification is to inject or force high strength epoxy into the fissure, allow to set and sand off excess. There are a range of epoxies available however the easiest to use to effect rectifications in-situ, is one which is thixotropic with a viscosity of a paste and low shear qualities. We recommend TECHNIGLUE which is readily available at most woodworking supply stores. This is a two pack adhesive with a resin and a hardener, mixed in a ratio of 2:1.

Equipment Required:

- Epoxy Resin system, material safety data sheets and instructions.
- Concrete coloured oxide to match colour of wood. This material is available from most concrete supply outlets.
- Disposable latex gloves.
- Measuring equipment. Containers should be used to measure out two portions of the resin and one of the hardener.
- Mixing spatula and mixing tub.
- Adjustable F clamps; size to suit the Glulam member.
- Roll of duct tape.
- 30 to 50 mm Putty knife.
- Small hand sander with 80 and 150 grit sanding pads.

Procedure:

1. Clean all dust away from the area to be injected. Blow out the fissure with compressed air if possible.
2. If the fissure is wider than 1.5mm, no further preparation is necessary.
3. Mix the epoxy in accordance with the manufacturer's instructions. Use gloves when handling epoxy. Refer to the MSDS for all safe handling instructions.
4. Use a concrete oxide to colour the epoxy to match the timber colour. This material will not interfere with the epoxy's bonding qualities or its ultimate strength.
5. Starting from one end of the fissure, force the epoxy into the opening by using the putty knife.
6. When the injection is complete, clean off the excess epoxy with the putty knife and allow to cure.
7. If it is possible to apply pressure to the glueline, use the "F" clamps to close up the fissure.
8. When the epoxy has cured, remove the clamps, the duct tape and sand the area to a suitable finish.

NB: if the fissure is minor, the above procedure is not necessary and a matching woodstop putty can be used as if it is a minor drying check found frequently in timber.

In the case where the fissure is extended through the entire glueline, it will be necessary to inject a different type of epoxy resin, one which has a different viscosity (not thixotropic).

Additional Equipment required:

- Epoxy resin system with suitable viscosity. Kinetix Resin R240 and hardener H159 from ATL Composites is recommended.
- 50 ml syringes and 14g needles. These are obtained from veterinary clinics (and are used for administering injections to large animals).
- Portable hand drill and drill bits.
- Construction filler (may be necessary to stop leaking of the injected epoxy.)

Procedure:

1. Clean all dust away from the area to be injected. Blow out the fissure with compressed air if possible.
2. Drill holes of a dimension suitable for the syringe being used at 80mm centres along the fissure.
3. Mix the epoxy in accordance with the manufacturer's instructions and place in syringe. Please use gloves when handling epoxy. Refer to the MSDS.
4. Use a concrete oxide to colour the epoxy to match the timber colour. This material will not interfere with the epoxy's bonding qualities or its ultimate strength.
5. Starting from one end of the fissure, inject the epoxy into the opening or use the drilled holes. Inject until the epoxy is extruded from the face of the Glulam and then moved to the next hole or open space in the fissure.
6. When the injection is complete, clean off the excess epoxy with the putty knife and allow to cure.
7. Use the duct tape to seal the opposite side of the fissure if it extends through the entire glueline. Sometimes it is necessary to add more epoxy if some of the injected epoxy is allowed to leak out before it is cured.
8. The glueline can be sealed either with duct tape or a construction filler.
9. If it is possible to apply pressure to the glueline, use the "F" clamps to close up the fissure.
10. When the epoxy has cured, remove the clamps, the duct tape and/or construction filler and sand the area to a suitable finish.

Additional notes:

- If the rectification is to be carried out on a Glulam member which has been installed, it will be necessary to seal the glueline to stop the epoxy leaking out, therefore the entry point for the injection may not be practical directly into the glueline at the face of the member. In the case of a horizontal rectification, an entry point can be created by drilling the entry hole in the laminae above the glueline into the void to be filled.
- In the case of a vertical repair, the injection can be started from the lower part to be filled and the injection holes plugged as the injection is progressed upwards.