FIBREGLASS (GRP) REPAIR KIT MANUAL

User Guide and Manual

Version 1.1 • November 2020

Introduction

Why choose a Fibreglass (GRP) Repair Kit?

The versatility of fibreglass means it can be applied to a range of surfaces and shapes to provide strong, durable protection. Furthermore, it can be sanded back to become almost identical to the underlying structure.

Fibreglass itself is a composite, so it is a blend of two or more components – in this case polyester resin and glass fibre matting. Initially wet, the composite is malleable and will begin a transition to a solid structure upon curing – a process accelerated by a catalyst (hardener) over a period of several hours.

Note: this process applies to a repair to a low cosmetic laminate surface, such as water storage tank, the inside of a boat hull.

Installation Guide

In advance, make sure all the materials are at hand and in adequate quantities; stopping and starting work can lead to a sub-quality repair.

The following section contains instructions on how to repair a surface using fibreglass (GRP).

Note: fibreglassing is an art as much as it is a science. We recommend that you practice in small areas using small quantities in advance if you are new or inexperienced with laminating. Resin Library is not liable for any outcome.

Note: use of material in applications not specified or not described in this manual, may result in improper function, personal injury, or damage of the product or material.

Planning & Preparation

Health & Safety

Please familiarise yourself with the Material Safety Data Sheets (MSDS) before starting.

Personal protective equipment (PPE) should be worn at all times. Recommended PPE includes safety goggles, gloves and overalls. A suitable mask is advised if work is being performed indoors.

For product or technical support, please email (sales@resinlibrary.com) or telephone us on 0333 567 0822.

Use of the products in applications not specified or not described in this manual, may result in improper function, personal injury, or damage of the product or material.

Tools & Materials

A fibreglass pond lining kit should come with appropriate quantities of materials (and tools if selected) according to the surface area of the pond.

Materials

- Polyester Resin
- 600 g glass fibre chopped strand mat (CSM)
- MEKP Catalyst/Hardener
- Primer*
- Acetone*

Tools

- Paint brush
- Polyester roller
- Paddle roller
- Latex gloves
- Mixing sticks
- Plastic Bucket

* denotes optional materials purchased separately

Note: a polyester roller or paint brush should be used to apply resin. Do not use a foam roller; this will dissolve in the resin and ruin the laminate.

Suitable Conditions

Repairs using fibreglass should be performed in a clean, dry area away from other persons and instruments. This means:

- *Avoid water*: good resin curing, and bonding requires dry conditions – that is surface should be dried out and rain avoided by checking the weather forecast. Be sure to plan ahead and check the weather in advance for any rainfall.
- *Temperature*: any work with resin should be done at warm temperatures ideally around 20ºC, as this ensures the resin will cure correctly. Resin will not cure adequately below 15°C and may require catalyst concentration adjustment. Temperatures above 30ºC may see curing that is too fast.
- *Dust and grease*: any impurities present on the surface (e.g., dust, grease, rust, etc.) – or in the surrounding atmosphere should be reduced as much as possible. Resin bonding and curing is greatly affected by impurities.

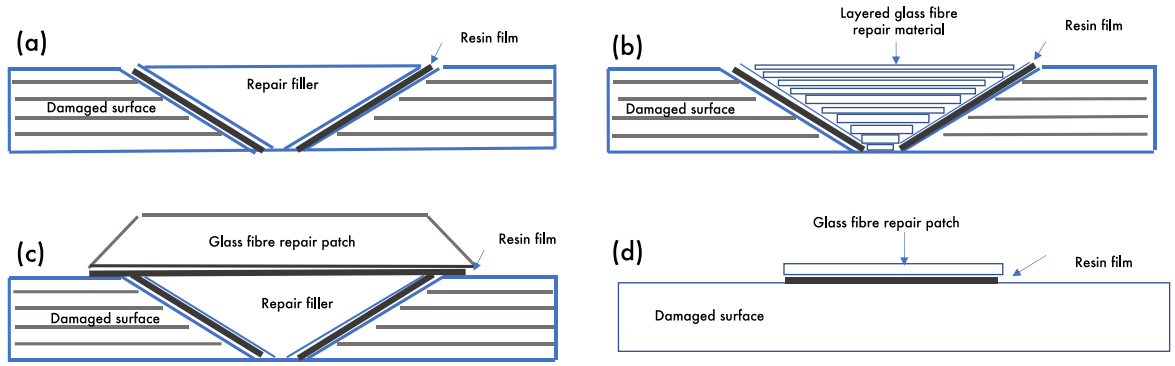
Assuming you have all materials needed, have a clear idea about the health and safety risks involved and that the weather forecast is clear, you can now start to build your pond lining.

Designing an effective repair

Whilst fibreglass (GRP) repairs have a high strength-to-weight ratio and excellent durability, some reinforcement may be required to fibreglass application. There is no one-size-fits all approach, but if the surface is expecting impact, abrasion or other physical stress and the structure underneath is hollow, then underlying reinforcement is strongly recommended to provide a support structure.

These types of patch repairs are generally very effective for water storage tanks and superficial damage or wear and tear. However, this manual does not specify repair fillers and users should seek materials in line with the underlying structure. For instance, flat roofs may require the removal of underlying timber and insulation prior to repair and so a suitable filler may be required there. Other types might be less complex, simply relying on chopped strand matting fragments or layered matting.

The purpose of this manual is not to recommend a filler type but to detail the application of a lining or coating made from fibreglass as a means of repair. That said, Figure 1 below details several types of fibreglass repair options as adapted from the aerospace industry. The schematic presents an angled section that enables a more consistent section for repair.



Type of composite repair bonded joints: (a) scarf repair, (b) stepped scarf repair, (c) scarf doubler bonded repair, (d) patch repair.

Figure 1. Fibreglass repair types.

More detail on repair feasibility and anticipated repair times is outlined in Figure 2 and 3 in the Appendix.

Fibreglass (GRP) Repair Kit Instructions

The following section assumes adequate precautions have been taken to ensure a safe working environment. It also assumes users have the correct tools and materials available and have taken adequate care to prepare the underlying pond structure and surface.

1. Identify the damaged area(s): when the problem area or areas have been identified, ensure it has been drained of any liquid and is dry.

Note: moisture, chemical contaminants and other impurities like dust and grease interfere with the resin binding process and weaken the repair.

Note: if necessary, a moisture monitor can be purchased to quantify the moisture content inside the surface.

2. Remove loose debris: if there is excess debris on the surface, it may be more practical to remove that first, prior to drying it out.

3. Perform surface abrasion: sandblasting, shot blasting or any other form of abrasion can be used to scale back damaged aspects of the surface. This is very specific to the surface being repaired.

Note: if you are re-lining a larger region of the surface, it is advisable to remove the existing lining by sanding back the existing surface. Depending on the application, the level of abrasion required could range from sandblasting to grit blasting if the existing layer is bound strongly to the underlying substrate.

Note: preferably, you want to have a rendered finish here with a slight texture. This is to ensure the surface is fairly flat and smooth to allow the glass fibre matting to be laminated onto.

Note: safety is a large consideration here. Care should be taken to avoid exposure to dust and debris via inhalation (use a dust mask), eyes (wear safety goggles) and skin (sharp debris can penetrate the skin).

4. Create a uniform repair section: damaged regions are likely to have jagged edges with an irregular surface. To assist in repairs, the user might want to consider creating a more uniform section out of the repair. This can be created by cutting out the inside edge of the damaged section. A uniform (square or rectangular surface) is desirable and a 45^{o} angle is preferrable as this will promote a more consistent 'layered' laminate.

Note: larger repair sections without any underlying structure should consider a support structure. In such instance, applicators may wish to use a back mould to support the laminate prior to curing and prevent it from warping.

5. Remove excess dust and debris: once surface preparation has been performed, there is likely to be a degree of dust and debris. This should be removed to create a clean surface amenable to resin adhesion. Excess dust will interfere with laminate adhesion to the surface.

6. Reinforce underlying substrate: Add reinforcement to the damaged area in line with the structural requirements. Examples are displayed in Figure 1.

Note: fibreglass is malleable until the resin has cured. As such, some repair sections may require a back mould to support the laminate until it has cured.

7. Mask off area: Once reinforcement has been added, mask off the area with a suitable tape slightly extending the masking tape by approximately 1 inch all around the crack.

8. Cut the glass fibre mat (CSM): measure the dimensions and cut to size using a Stanley knife or equivalent.

Note: cut and size the CSM in advance of resin application to pre-defined, square meter sections. In such cases, the size should be around 10% larger than needed to ensure complete coverage of the target surface.

Note: when preparing an overlap between two sections of CSM, ensure that the overlap is around 5 cm. this will ensure a seamless barrier once cured.

9. Apply a resin primer (optional): a thin layer of G4 resin primer is recommended to increase adhesion between the underlying substrate and the laminate. This should be applied immediately before laminating.

10. Prepare polyester resin: In a clean bucket, measure out a workable amount of polyester resin. An MEKP catalyst needs to be added to the polyester resin prior to application to facilitate curing. This is added in a 1 – 4 % weighted ratio to that of the resin. Amounts added outside of this range will lead to sub-optimal curing and laminate failure.

Note: most applicators prepare around 0.5 – 2 kg of catalysed resin – enough to cover 0.5 – 2 square meters of glass fibre matting.

Note: the amount of catalysed polyester resin to add per square meter of glass fibre is around 1.5 – 1.7 kg. Typical amounts of catalyst additions are presented below for 600 g CSM.

Glass Fibre CSM	Amount of Catalysed Resin	Layers of Glass Fibre
600 grams per m^2	1.5 – 1.7 kg per m^2	1

How much catalyst should be added?

MEKP should be added at 1 – 4 % of the resin weight. Amounts of catalyst outside of this range are not recommended as they will lead to sub-optimal curing and premature laminate failure.

- Lower concentrations of catalyst (1 – 2 %) will deliver slower curing rates. A preference for a slower curing rate is desirable when temperatures are higher (e.g. summer). This is because the resin will harden quicker, so users have less time before the resin cures

- Higher concentrations of catalyst (3 – 4 %) will deliver faster curing rates. A preference for a faster cure rate is desirable for when temperatures are lower (e.g. winter). This is because the resin will take more time to cure, meaning that users might want to speed things up a bit.

A more informative guide is outlined in Table 1 below.

Note: prepare workable amounts of catalysed resin as it takes time to prepare.

Table 1. Recommended catalyst volumes (mL) per weight of resin (kg).

Curing	Slower curing (Suited to warmer weather)		Faster curing (Suited to colder weather)	
Catalyst (%)	**1%**	**2%**	**3%**	**4%**
Note: relative quantities of MEKP catalyst to be added in mL per weight of resin (kg)				
Resin Amount	**Hardener Usage (mL)**			
1 kg	10 mL	20 mL	30 mL	40 mL
2 kg	20 mL	40 mL	60 mL	80 mL
3 kg	30 mL	60 mL	90 mL	120 mL
4 kg	40 mL	80 mL	120 mL	160 mL
5 kg	50 mL	100 mL	150 mL	200 mL
6 kg	60 mL	120 mL	180 mL	240 mL
7 kg	70 mL	140 mL	210 mL	280 mL
8 kg	80 mL	160 mL	240 mL	320 mL
9 kg	90 mL	180 mL	270 mL	360 mL
10 kg	100 mL	200 mL	300 mL	400 mL
11 kg	110 mL	220 mL	330 mL	440 mL
12 kg	120 mL	240 mL	360 mL	480 mL
13 kg	130 mL	260 mL	390 mL	520 mL
14 kg	140 mL	280 mL	420 mL	560 mL
15 kg	150 mL	300 mL	450 mL	600 mL
16 kg	160 mL	320 mL	480 mL	640 mL
17 kg	170 mL	340 mL	510 mL	680 mL
18 kg	180 mL	360 mL	540 mL	720 mL
19 kg	190 mL	380 mL	570 mL	760 mL
20 kg	200 mL	400 mL	600 mL	800 mL

Note: mL = millilitres; kg = kilogram

11. Apply the catalysed resin to the glass fibre mat: Once the glass fibre has been fitted in place, a polyester roller should be used to disperse and drive the resin into the mat, applying moderate pressure.

Note: again, this should be performed when the weather is dry; water and even low levels of moisture interfere with the curing process and weaken the laminate. If in doubt, it is better to wait until there is a dry spell to perform this work.

Note: as mentioned earlier, typical amounts of catalysed resin to use for glass fibre (600 g CSM) is approximately 1.5 – 1.7 kg per square metre. Once the catalyst has been added, mix with a clean paddle until there is a minor colour change.

12. Use a paddle roller to consolidate laminate: immediately after the polyester roller has saturated resin in the glass fibre matting region, use a paddle roller to refine the laminated surface. Moderately roll the paddle roller across the laminate surface. If the surface is non-uniform, consider using another instrument to ensure a consistent finish.

Note: the aim here is to drive air and bubbles out, whilst also ensuring a more consistent resin-to-glass fibre ratio.

13. Allow time to cure: once the laminate has been consolidated, allow it to harden or 'cure'. This allows time for the resin to 'crosslink' and create a strong, seamless structure.

Note: Recommended curing time = 24 hours (winter) and 12 hours (summer).

Note: if this step has been performed at an earlier point or has been exposed to dust, please take care to remove dust and excess debris from the surface by wiping with a clean acetone-soaked cloth. Impurities like dust and dirt will interfere with the bonding process of an outer layer.

14. Sand back laminate: once the laminate has cured and is not tacky to the touch lightly sand back the surface using 180-grit sandpaper and remove any dust. Acetone may be needed to fully clean surface.

15. Prepare resin topcoat or preferred paint: once the laminate has hardened and has a mildly sticky texture to touch, prepare the topcoat or paint.

Note: this step is highly variable and will be project-dependent (based on colour, texture and surface finish). If a specific colour is required, please contact us for a bespoke solution.

16. Remove marking tape: once the topcoat has cured, remove the masking tape to reveal the full repair.

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Appendix

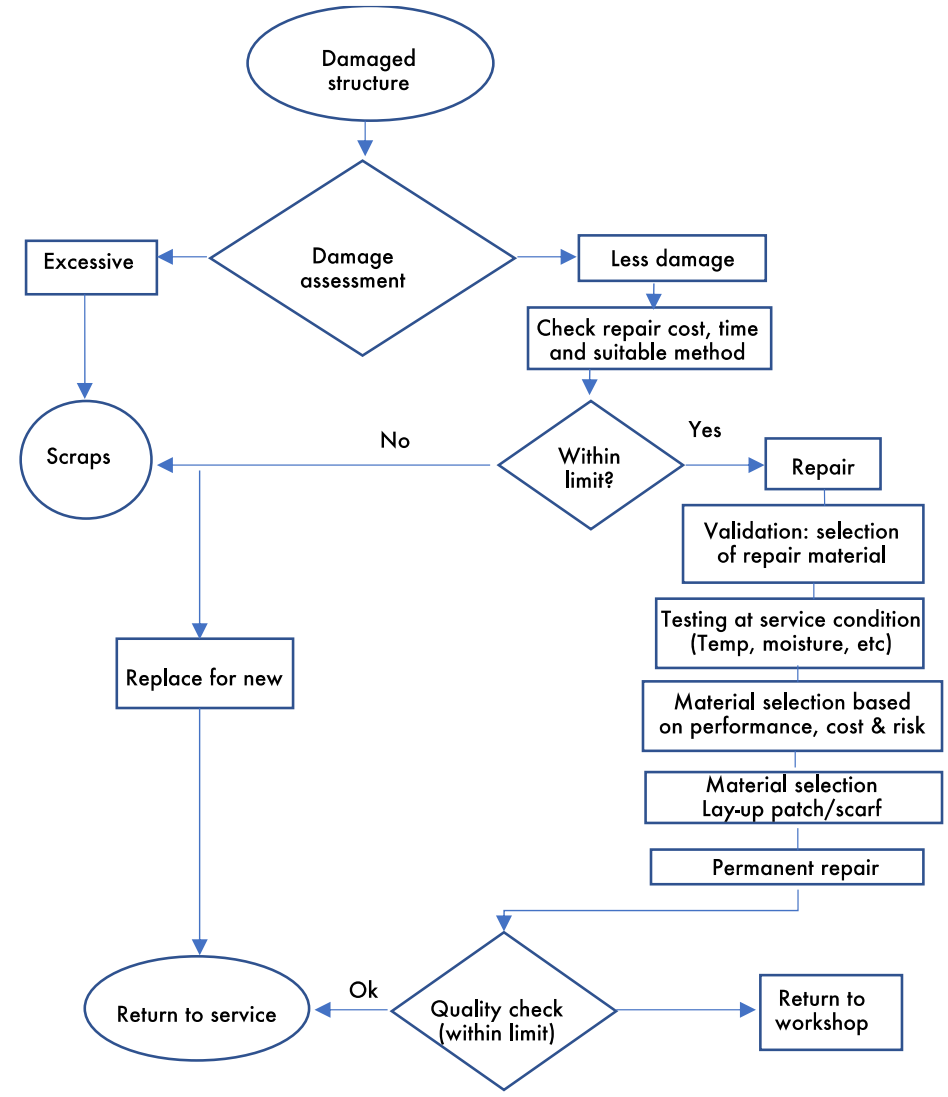

Figure 2. Decision tree adapted from the aerospace industry can be used to evaluate a damaged structure for repair

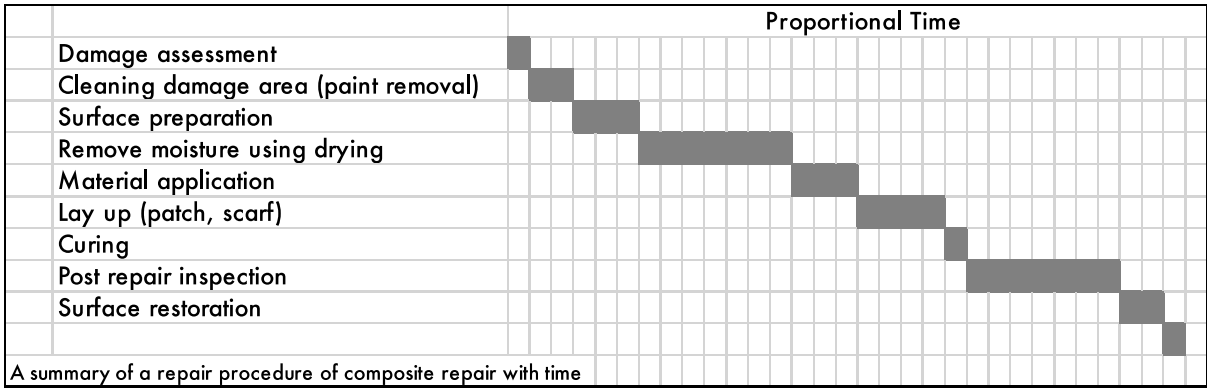

Figure 3. Summary of repair procedure of composite repair with time.