

CARBON FIBRE 3D PRINTED MOULD LAMINATING KIT MANUAL

User Guide and Manual

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Introduction

DIY Carbon Fibre Laminating of 3D-Printed Moulds

This guide provides a generic overview for how to create carbon fibre parts using 3D printed moulds.

Be advised that the quality of a carbon fibre laminate can vary depending on the procedures used. Mechanical and other performance attributes may vary; such work is taken at the users own risk and ideally professional assistance should be sought. It can however be used to provide cosmetic and waterproofing restoration to objects such as canoes, paddles and other objects.

Also note that this guide is suitable for use without specialist equipment such as vacuum pumps or autoclaves. The resin is fast-curing and designed to cure quickly. For structural projects, consult a professional.

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 component.

This guide does not advise on the 3D printed mould itself, but rather the carbon fibre laminating aspects. Users are responsible for the design, construction and assembly for any 3D-printed components. Such components may be constructed from a PETG filament or equivalent.

Note: 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.

Damaged carbon fibre is potentially hazardous. Please be careful when dealing with broken areas; exposed fibres are extremely sharp.

Risks associated with epoxy resin exposure should be considered in advance. Please consult the SDS sheet and plan accordingly. Epoxy has a range of health hazards which must be accounted for before use.

Perform work in a well-ventilated area or with a suitable mask. Wear protective gloves when dealing with sharp edges or tools.

The addition of hardener to the epoxy should be done carefully; the reaction is exothermic (generates heat).

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 carbon fibre laminating kit for 3D printed parts should come with appropriate quantities of materials (and tools if selected) according to the surface area of the pond.

Materials

- Epoxy Resin
- Epoxy Resin Hardener
- Carbon fibre 2/2 twill (200 gram)
- Release Film
- Peel Ply
- PVA mould release agent
- Black polishing compound

Tools

- Laminating brushes
- Mixing sticks
- Latex gloves
- Mixing pot
- Alcohol Wipe
- Sand paper

Suitable Conditions

Laminating work using carbon fibre 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 20°C, as this ensures the resin will cure correctly. Resin will not cure adequately below 15°C and may require catalyst

concentration adjustment. Temperatures above 30°C 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.

Carbon Fibre Laminating 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. Workplace preparation

Set up in a well-ventilated area with a stable, flat surface. Lay down a plastic sheet to catch drips and keep things tidy. Have all materials and tools within reach to avoid interruptions once you start mixing resin.

Note: it is important to plan the laminating process carefully. For higher-end parts that require greater structural demands, more specialist advice and procedures should be used.

2. Mould Preparation

Clean the mould thoroughly with solvent wipes to remove dust, grease, or residue. Apply a thin, even layer of PVA mould release agent using a brush or spray bottle. Ensure full coverage, especially in corners or detailed areas. Let the PVA dry completely (about 30 minutes at room temperature) until it forms a clear, tack-free film. This ensures the laminate will not stick to the mould.

Note: wax can be used as an alternative, but it is usually more difficult to offer the same level of release.

4. Cutting & Sizing Carbon Fibre

Cut the carbon fibre fabric to size before preparing the resin; this will minimise downtime. The carbon fibre should be large enough to cover the mould area with 10 % extra (or 5 - 10 cm) depending on size. When cutting the fabric, start with an area that is greater than what is required and trim back if needed. Take care to avoid dislodging the carbon fibres. These can be held in position with tape during cutting if necessary.

Note: multiple layers of carbon fibre reinforcement can be applied if necessary to achieve a thicker laminate.

5. Resin Mix Preparation and Quantities

When mixing the epoxy with hardener, it is advisable to have everything else in place; the pot life is 10 minutes. After this period the epoxy mixture will start to cure and will limit the saturation of fibres in resin and therefore the quality of the laminate:

The epoxy resin-hardener ratio should be prepared carefully and in a specific quantity. Add 100 parts epoxy resin to 25 parts of hardener. This means for every 100 grams of epoxy, add 25 grams of hardener, totalling 125 grams.

Note: it is advisable that an accurate scale is used to measure correct quantities. The epoxy resin and hardener are supplied in an excess for the fabric.

Recommended quantities have been detailed in the table below. It should be noted that these are the minimum amounts of epoxy laminating mixture to prepare for the corresponding surface area of carbon fibre. Users may wish to prepare larger amounts provided the mixture can be used in the given timeframe (note the pot life is 10 minutes).

An excess amount of resin-hardener mixture is included in this kit.

The carbon fibre reinforcement weighs 200 gram per square meter. As a rule of thumb, aim to use 200 gram of epoxy resin-hardener mix. Note that additional resin is included in the kit to coat the base substrate and to account for additional requirements.

The final ratio of epoxy resin and hardener mix to carbon reinforcement may vary somewhat on a case-by-case basis and depending on the laminating technique.

Table 1. Minimum Quantities of Epoxy Resin and Hardener per Unit Area of Carbon Fibre

Carbon Fibre		Epoxy	Hardener	Total
Surface Area (m ²)	Weight (grams)	Minimum Weight (grams)		
0.1	20	16	4	20
0.2	40	32	8	40
0.4	80	80	20	100
1	200	160	40	200

Note: these are the minimum quantities required to achieve sufficient saturation of the carbon fibre fabric. In reality it is advisable to increase the quantities by approximately 25 – 50 % to account for surface wetting and insufficient laminating.

Note: to be accurate, it is advisable to use a digital weighing scale accurate to +/- 0.1 gram. Quantities inside the containers will not be accurate for individual projects.

Example: 0.2 m² of 200-gram carbon fibre fabric is approximately 40 grams. For a single layer, this would require 40 grams of epoxy-hardener mix.

Note: be advised that too much resin will create a brittle composite and too little will make it more fragile and permeable.

Place a clean paper mixing cup onto a calibrated digital weighing scale. Add in the resin and hardener, then carefully mix using a clean mixing tool. Take care to mix the corners of the cup and to avoid introducing air bubbles into the mixture via vigorous mixing.

7. Apply epoxy-resin mixture to the mould

Brush a thin layer of mixed epoxy onto the mould surface where the laminate will go. This “wetting” layer helps the fabric adhere and reduces air bubbles. Work quickly but evenly, covering the entire area.

8. Wetting out the Carbon Fibre Cloth

Place the cut carbon fibre fabric onto the wet resin in the mould. Gently press it down with your fingers or the brush to ensure it contacts the resin fully. Start from the centre and work outward to push out air pockets. For thicker laminates, add additional layers one at a time (see Step 7).

Using a clean brush, carefully apply the epoxy mix to the fabric. The aim should be to saturate the fibres and drive out air bubbles without using excessive quantities of resin.

Brush more epoxy resin over the top of the fabric, working it into the fibres until fully saturated. The fabric should turn glossy and dark, with no dry spots. Use the brush to stipple (dab rather than stroke) the resin in, minimizing weave distortion. If adding more layers, apply resin to the first layer, lay the next piece of fabric, and repeat. Aim for a 1:1 fibre-to-resin ratio by weight for a strong, lightweight laminate.

9. Remove excess resin and air

Use the brush or a gloved finger to gently smooth out excess resin and press out trapped air. Avoid over-saturating—too much resin adds weight without strength. Check for dry patches and add small amounts of resin if needed.

10. Allow laminate to cure

Let the laminate cure at room temperature (18-23°C is ideal) for 12-24 hours for an initial cure. Keep it undisturbed and away from dust or moisture.

Note: do not leave excess mixed resin in the cup deeper than 5mm—it can overheat and cure too fast.

Note: the carbon fabric fibres should be delicately handled. It is important to ensure they are not dislodged as this will create voids in the laminate and reduce the strength.

Note: if multiple layers of reinforcement are required, apply them successively and when wet. It is generally advisable to only apply 2 – 3 layers of resin-saturated fabric at a time as this will avoid overheating and warping the laminate, since the epoxy-hardener reaction is exothermic.

9. Saturate the carbon fabric in epoxy-hardener mixture

Once fully cured (test by tapping—it should feel hard and solid), gently flex or tap the mould to release the laminate.

The PVA should make this easier. If it resists, soak the mould in warm water for a few minutes to dissolve the PVA, then try again. Peel off any residual PVA film from the laminate—it washes off easily with water.

10. Trim and finish

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Trim excess fabric from the edges with scissors or a rotary tool for a clean outline. Sand the surface with progressively finer grits (start at 120, finish at 800) to smooth rough spots or imperfections.

For a glossy finish, apply a final thin layer of epoxy resin with the brush and let it cure, or use a clear coat if desired. A painted layer with pigmentation can also be applied at this point. A polishing compound can be used to create a glossy surface if the contours of the carbon part are relatively flat.

Note: a final layer of resin may be applied for cosmetic and protective purposes. Epoxy resin is not UV resistant and at best offers limited resistance.

13. Dispose of waste

Make sure to dispose of all waste in accordance with local regulations. Epoxy resin waste is hazardous and must be disposed of in the appropriate manner.

Additional tips for success

- **Work Efficiently:** Once mixed, epoxy starts curing, so plan your steps and move steadily.
- **Avoid Contamination:** Keep the mould and fabric free of dust or oils for a strong bond.
- **Test First:** If new to this, practice on a small scrap piece to get the feel of wetting out the fabric.
- **Safety First:** Wear gloves and work in a ventilated space—epoxy fumes can be strong.

This method, is free from vacuums and autoclaves, allowing users the ability to make carbon fibre laminates quickly and efficiently.