

Fibreglass Pools and Pond Lining

Given the correct materials and the proper preparation and advice glass fibre and polyester resin (glass reinforced plastic = GRP) is as easy to apply as wall paper. Should you have the pond professionally built and GRP lined ensure that the firm carrying out the work has wide experience of pond construction as opposed to general glass fibre work. At the very least they must be fully aware of the toxic effects of solvents and chemicals on fish and therefore the absolute necessity of proper curing (hardening) of the laminate and topcoat system.



GRP:

Glass fibre is an excellent and very suitable material for use in lining fish ponds. It is resistant to weathering and temperature variations and provides a water tight, smooth and easy to clean surface. These instructions are primarily concerned with the materials that should be used and the application of the glass fibre.

Type of structure:

It is important that the structure, which is to be lined with GRP, is capable of withstanding the soil and water pressure in its own right. Whilst the glass fibre will naturally add to the strength and rigidity it is not, in this case, being used for this purpose. Normally the pool is constructed from brick, lightweight block or concrete block. With the exception of brick built ponds, it is necessary for a cement render to be applied and for sufficient time to be allowed for it to dry. Bear in mind that a half inch cement render should be kept damp for 3 days. A further 10 days should be allowed, at reasonable temperatures and dry conditions, before it will be possible to apply the G4 primer coat.

Polyester Resin:

There are many formulations of polyester resin but all contain around 35% styrene monomer which can, unless the laminate is properly cured or hardened, have a toxic effect on fish. However the fact that there are many GRP lined ponds, including the ready made ones, means that providing the correct materials and methods are followed a GRP lining is non toxic to fish. There are two types of polyester resin that are used. One is a general purpose - pre-accelerated resin with a slight thixotropy to enable it to "hold up" on vertical surfaces and the other a highly thixotropic resin - referred to as a Gelcoat - both of which, as stated earlier, contain styrene monomer. Most general purpose resins contain some amine - 0.1 to 0.2% (by weight) but this is required for the proper curing of the resin, although it is considered toxic

to fish.

Gel Coat- Topcoat:

A high quality Lloyds approved isothallic & thixotropic gel coat resin with excellent weather resistance also known as "Resin B". Gel coat forms the smooth outer surface of the finished laminate and therefore is usually applied to the prepared mould first but cannot be used to coat a finished laminate without the addition of wax solution which makes the gelcoat into flowcoat. Flowcoat is applied after the laminate, as in sheathing fish ponds but to use as a flow coat a wax solution must first be thoroughly stirred into the gel coat at 2% by weight (20ml per kilo) to eliminate surface tackiness. Activated by catalyst added to the gel coat at 2% by weight, minimum. Working time at 20°C is approximately 20 minutes. Supplied clear or white, pigment colour pastes can be added.

Pigments for GRP:

The usual colours for ponds, particularly Koi ponds, are either black or British Racing Green since Koi show up particularly well against dark colours. It is possible to pigment Topcoat in a wide range of colours. This is done by using polyester pigments specially made for polyester resins with a saturated resin that will not harden on its own. No more than 10% of pigment by weight should be added but in practice because dark colours have high opacity it is unnecessary to add this amount. British Racing Green does contain some lead, 4.6%, of which 0.4% is soluble lead. However since this is locked into the Topcoat system it is safe as water will not leach out the lead. To further dispel any concerns we know that British Racing Green has been used as a topcoat colour by several of the leading Koi stockists in the country.



How to do it:

There is no need to laminate the whole pond at one time, as some think, it can be done in stages providing each stage is left in the correct state for the next to be applied.

Order your materials:

Your supplier needs to know the surface area either in square feet or square metres that are to be coated. Everything required can be worked out from that figure. Should you wish to work it out for yourself then it is straight forward - all you have to know is:-The weight of the glass fibre that you will be using, normally 450gm per sq/m, and that the resin usage is 2.5 times the weight of the glass fibre.

For example a sq/m of 450gm glass fibre mat will use approximately 1.13kg of polyester

resin. (450gms x2.5 = 1.125kgs). It is unlikely that you will use less and depending on your expertise it might be a little more - allow say 5% for wastage. For the Topcoat a consumption of 400gms per sq/m can be used with a 10% maximum, by weight, addition of pigment. Apart from the catalyst and the G4 Primer Sealer, the only additional costs are for tools and cleaning materials. A typical list of materials is given at the end.

The GRP Laminate:

In our experience two layers of 450gm/sq metre glass fibre mat is the minimum. A two layer laminate will provide a thickness of around 2mm. Anything less is asking for problems! Under ideal laminating conditions one layer of glass fibre mat can provide a non-porous laminate but under practical conditions it is highly unlikely it will do so. This is due to the consideration that the glass fibre is being applied to rendered surfaces and with few exceptions there will be exposed aggregate or sharp particles of cement render projecting above the surface that can penetrate easily through a single layer causing a hole and possible leak. The other consideration is that with one layer it is also possible to have "dry areas" or areas that are not sufficiently saturated "wetted out" with resin. By using two layers this risk is reduced by 200% since the second layer is consolidated into the first and the risk of voids is substantially reduced. Three layers is the optimum but normally two are satisfactory.

Working temperatures/ Curing times:

There are two principal influences on the working and curing times of polyester resins - the quantity of catalyst added and the ambient temperature. The more catalyst added the shorter the working time and the quicker the cure "hardening". Polyester resins do not cure properly (unless specially treated) at low temperatures (below 10°C) or high humidity. More of a potential disaster is rain as this can spoil a laminate, while still wet, so it is necessary to watch the weather and if at all suspect make provision for protecting the laminate during the early stages of its cure. It is not advised that GRP work is carried out below 15°C although the preferred temperature would be 18°C. Conversely too high a temperature 25°C will cause problems with the too shorter working times of the resin.

Working times of resin:

General purpose resins are mostly pre-accelerated, requiring only the addition of the M.E.K.P. (Methyl Ethyl Ketone Peroxide) catalyst or hardener. The normal addition is between 1 and 2% by weight. Therefore for every 1000gms of resin 1% addition means adding 10 grams. This can be measured by using a catalyst dispenser, It is not advised that more than 2KGs is mixed up at a time until you have experience of the working times. The amount of catalyst can then be adjusted to suit the size of mix/working time/ambient temperature, typical catalyst addition and working times are shown below:-

Catalyst Gel Time M.E.K.P

Peroxide 50%	at 20°C	at 15°C
0.75% by weight	40 mins	60 mins
1.00% by weight	25 mins	40 mins
2.00% by weight	15 mins	30 mins

Curing times - Resin:

The same considerations apply as to temperature but it is more difficult to be as definite since it is dependant on the ambient temperature. The higher the ambient temperature the more rapid the cure rate and it is considered that at 15°C to 18°C a reasonable cure time is three weeks. At higher consistent temperatures 18°C to 24°C two weeks would be sufficient. Once cured the pond must be thoroughly flushed, preferably with hot water and drained. The pond should then be filled, left several days and then drained.

G4 Pond Seal:

G4 is being used, in this instance, not only to seal the cement render but also to provide a bonding primer for the polyester resin. Its use as a sealer is to prevent any residual moisture in the cement render, from affecting the polyester resin, which reacts unfavourably to moisture. Polyester resins are not adhesives, in the accepted sense, and whilst they do (or do not) bond to many substrates G4 increases the adhesion due to its chemical similarity. It is important that the instructions are adhered to with the catalysed polyester resin being applied as soon as the G4 is "finger tacky" (like sellotape) and it must be applied within four hours. Being a moisture cured material the G4, in practice, will be finger tacky in some 45 - 60 minutes (depending on humidity) but no longer than 4 hours should elapse before polyester resin is applied. Therefore do not apply G4 over a larger area than you are likely to laminate within the four hour period. Should this, for some reason, be impossible simply apply a coat of catalysed polyester resin to the G4 and this will enable the laminate to be continued at a later time. If the G4 has been left to harden this surface must be abraded before laminating.

The Method:

At the beginning the process was likened to hanging wall paper. The difference between the two systems is that with wall paper you paste it first then hang it whereas with glass fibre you "impregnate" it after it has been laid into position. However as with wallpapering, material preparation is of paramount importance. The glass fibre should be cut to the required lengths and the edges to be overlapped frayed out (see later section). Initially the resin should be measured out and the catalyst addition decided and tools should be to hand. It sounds simple and it is but by carrying out these preparations you will find that the laminating work is made easier because you are able to pick up the correct length and shape of glass fibre rather than cut and tear halfway through the operation. If you have not worked with GRP before carry out a trial, on an old piece of board, so as to get some practical experience. It is suggested that the walls are coated first starting at a corner. Therefore cut the glass fibre mat to the correct length allowing for say a 6" to 8" overlap at both the top and bottom of the wall. When you are designing or building a pond do remember that it is difficult to laminate into or around right angled corners and therefore both the internal and external corners, where possible, should be radiused. The glass fibre - two or three layers - must be applied "wet on wet". This means that while the first layer of glass fibre can be the full width 36 inches (92.5cm) the second should be cut to 30 inches to allow for an overlap for the next section when laid. If three layers are being applied then of course the third layer should be cut to 24 inches again to allow for an overlap. When cutting glass fibre where there are to be joints always fray out the edges since when overlapped the frayed edges will allow an almost undetectable joint to be made. Glass fibre can be cut with a Stanley knife, scissors or with a little practice torn

which "builds in" the frayed edges. If cut, tease or tear the edge to fray it.

Pipework and fittings:

Fittings for ponds are usually in stainless steel, PVC or UPVC (unplasticized PVC). Normally UPVC is used for groundwork pipes and polyester resin will bond to it although the adhesion will only be reasonably strong. With stainless steel adhesion of the polyester resin presents a problem as does PVC. G4 will improve the adhesion on both stainless steel and UPVC. In this case the G4 is applied, allowed to become finger tacky and then the resin and mat applied. With PVC, G4 does not have much effect in improving the adhesion, even if the PVC is roughly keyed. There is a PVC primer available (against special order) and this is effective. As a general rule it is sensible when laminating into rebates, for instance drainage sumps, to take the glass fibre down into the rebate so that there is no possibility of water penetrating beneath the laminate. A good edge is provided so that fittings can be bedded down firmly and if necessary either sealed into position with a suitable mastic or bolted down. Provisions must therefore be made for the aperture to be oversize to allow for the GRP laminate. With PVC pipework (if primer is not being used) ensure that firstly it is thoroughly keyed and secondly that a generous "collar" is allowed round the pipe where it emerges from the wall or bottom of the pond. Once cured it is recommended that a mastic sealant, which adheres to PVC, is applied round the joint between PVC and GRP to ensure a watertight seal.

Applying the Laminate:

With the G4 at the finger tacky stage mix a quantity of resin with the catalyst, mixing it in thoroughly. (See section on catalyst addition) Until you have experience do not mix up too much resin at a time certainly no more than 2kgs, enough for between 1 and 1.5% sq/m of glass fibre. For large flat areas it is quicker and easier to apply the resin using a medium pile roller. Roll on a coat of catalysed resin to the G4 and then lay on the first section of glass fibre, apply more resin to "wet out" (saturate) the glass fibre. As the binder holding the glass fibre dissolves it will become translucent. Then apply the next layer (30 inches wide in this case) and again apply more resin. Once the glass fibre has been "wetted out", it is necessary to consolidate the two layers of glass fibre and this is done using a metal roller. The roller can either be of the aluminium ridged variety or a metal washer roller but used vigorously it not only forces the two layers of glass fibre together but it removes any trapped air, this appears in a laminate as a whitish blister, and care must be taken to ensure that this is done. If a third layer is being applied the procedure is the same although the width of the glass fibre is only 24 inches to allow for an overlap. Having completed this section move on to the next and with the overlap built in full widths can be used. Unless the corners are radiused do not attempt to take the glass around the corner since it is difficult to "persuade" glass fibre to lie into right angled bends, start again with a built in overlap. Since there will be a butt joint at the corner it is then recommended that a strip of fibre glass some 8 inches is cut with the edges frayed out and then applied as a tape would into the corner. You will find that this is easier since the glass can be bent into shape. Once the glass fibre has been "wetted out" it is easier to "work" into corners and around more complicated and compound shapes. For this purpose a brush is used with a stippling action and if required the glass fibre can be pre-wetted out on a flat board before being stippled into position. The base of the pond is usually done last.

The Topcoat:

The Topcoat can be applied at a later time, but is best applied as soon as the laminate is hard or can be walked upon. The pigment, no more than 10% by weight, should be well stirred

into the Topcoat and then the catalyst added. It is necessary to add 2% of catalyst by weight and the minimum application temperature should be 15°C although it is preferable to work at 18°C. The working time will be limited, a maximum of 20 minutes, so do not mix up more Topcoat than you can use within this time. Topcoat can only be applied once because it contains wax (which would act as a release barrier) therefore apply it evenly and with the recommended coverage.

Cleaning:

Once the catalyst is added to the resin the curing process begins and cannot be halted. Tools will need to be kept workable between applications - mixing up batches of resin - and this is best done by immersing the tools in a cleaner such as acetone. At the end of the work again clean the tools in acetone and then wash them out in strong detergent and hot water and allow to dry. Do not work with water wet rollers or brushes.

Materials Checklist:

- G4 Primer - Sealer
- Glass Fibre 450gms sq/m
- Polyester Resin
- GelcoatWax Solution
- Polyester Pigment
- MEKP Catalyst (Hardener) and Catalyst Dispenser
- Laminating Brushes
- Mixing Buckets
- Medium Pile Roller Refills 6"
- Short Pile Roller Refills
- Aluminium Roller
- Acetone

