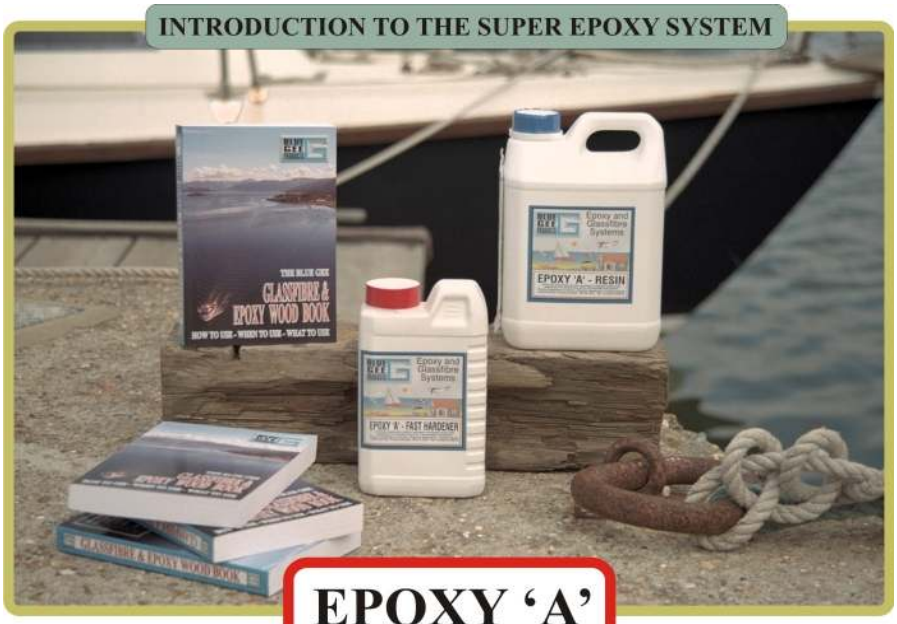
INTRODUCTION TO THE SUPER EPOXY SYSTEM



EPOXY 'A'

What is an 'Epoxy'? An 'Epoxy' or 'Epoxy System' is usually made up of two liquids, one being a resin, and the other a hardener. When the hardener is added to the resin, a chemical reaction takes place between the two liquids, which causes them to solidify into an extremely tough solid: if the mixed liquid is painted onto surfaces, it will set to a very powerful glue to bond surfaces together; and it will also act as a very high integrity sealer of the surface. It may also be used to 'wet out' a fabric, commonly glass or carbon fibre, to produce a rigid sheet or moulding, to make a very strong and light product. Epoxy resins and hardeners must be mixed to the proportions set by the particular system. Some mix ratios are more difficult to control than others - two parts resin to one part hardener has been found to be ideal.

When to use an Epoxy: Some epoxy systems may be used for a very wide variety of jobs. The only materials which may cause gluing problems are certain plastics, but in the main, if a job needs fixing, Epoxy 'A' will almost certainly be able to provide an answer. There are photographs following which justify the claim that Epoxy 'A' may be used to repair a toilet handle, build a 40 foot strip planked boat, hard coat an emulsion painted shelf or mend a brick. An unbelievably wide variety of work may be carried out using this material - the cost effectiveness of the material when used for many jobs is almost without competition. A little Epoxy 'A' goes a long way!

Why Epoxy 'A': Some ten years ago, we decided that there was a large market for an epoxy system to be available to the public, based upon a high specification Marine Product, which was simple to use, overcame the various problems associated with some of the systems currently available and would meet the requirements of a Super Epoxy System.

With the assistance of one of the largest industrial laboratories in the UK researching epoxy systems and using our own resources, we developed our own Super Epoxy system over the next two years: hence Epoxy 'A' - which has been used for an incredibly wide variety of work in the Aero, Industrial, Domestic, Auto and Marine Industries.

INTRODUCTION TO THE SUPER EPOXY 'A' SYSTEM (Contd.)

What are the weaknesses of Epoxy Systems? In general, epoxy systems do not have good resistance to direct sunlight (i.e. ultra violet radiation).They can be brittle if very fast systems are used. Many will develop a 'waxy by-product' on the surface when used as a coating, which not only spoils the gloss, but will interfere with any overcoating system if it is not removed. Epoxy systems work well with badly fitting joints, providing a little filler (e.g. Blue Gee filler 'D') is used to bulk out the mix, they ***do not*** like close fitting woodwork, or over clamping of joints, which can squeeze out the epoxy adhesive. Because of the relatively high viscosity of the material, it may not penetrate a porous surface. There are systems where volatile thinners are added to the epoxy to achieve penetration of (say) timber, but it must be noted that the evaporation of surface material and the subsequent more rapid setting of residual epoxy, does lead to solvent entrapment. Some epoxy systems have over accelerated hardeners, which make them less suitable for laminating work, or jobs requiring reasonably long working sessions. In general, it has to be said that epoxy systems have few disadvantages when compared with many other gluing, laminating or coating systems, and most of those can be overcome by Super Epoxy systems.

☛***A Super Epoxy*** *is developed to avoid any significant waxy by-product. It must have a simple mix ratio. There must be a very slow hardener available which may be mixed with the fast hardener. There must also be a separate diluent useable for penetrative coatings on wood or other porous materials. The Blue Gee Epoxy 'A' system is a Super Epoxy and available in a range of pack sizes, all measured in Litres, because the simple two to one mix ratio is measured by volume.*

As an approximation, the weight of the packs in Kilograms, is approximately 10% greater, than the volume in Litres, i.e. the specific gravity of the mixed product is about 1.1. Pack sizes range from 1/8th Litre to 300 Litre packs. Thus a 1 Litre pack of Epoxy 'A' weighs about 1.1 Kilograms.

Epoxy 'A' is unusual in that all the components, Resin, Fast Hardener, (very)Slow Hardener and Diluent are available as 'separates'. In addition, Blue Gee offers a wide range of associated fillers and fabrics for use with the Epoxy. As will be seen in the following pages, this material has such an incredibly wide range of uses that it should be part of every handyman's material kit. Whereas it may appear to be very 'hi-tech' (and it is indeed a very powerful material) it is - in reality - very very easy to use,and capable of effecting very good work in the most inexperienced of hands!

The two containers below show typical examples of 'separates' available for the Blue Gee Epoxy 'A' system. The **Yellow** cap on the bottle on the left identifies it as a Slow Hardener. The **Green** cap, identifies the other bottle as one containing **'Diluent'** (an epoxy mix thinning product - ***not a solvent but a special epoxy reactive material*** - unique to this system for penetrative coating use).

All resin bottles have **Blue** container caps, whilst **Red** caps (*see previous page*) indicate that the contents are the Fast Hardener for the system. Fast and slow hardeners are mixable to vary setting times. It is worth noting that this design of container has a unique built in measuring system - visible just under the coloured cap. Please note that every complete Epoxy 'A' resin and hardener pack contains a very comprehensive instruction sheet.

EPOXY 'A' - USED ON NELSON POWER CRAFT

This craft - built by one of the most respected boatbuilders in the UK, Rossiter Yachts Ltd., of Christchurch, used Blue Gee Epoxy 'A' for the demanding adhesive tasks in fixing the teak aft deck, and for the cabin, side and foredeck coverings.

It is worth noting that the very wide variety of tasks that may be undertaken by Epoxy 'A' can already be seen to embrace many aspects of marine craft construction. Space precludes doing anything more than indicating a very small part of the work that may be carried out using this exceptional Super Epoxy.

TRANSATLANTIC ROWING BOAT CONSTRUCTION

Epoxy 'A' has also been used for somewhat smaller craft .....

Boatyard's pride at Atlantic coup

HEROINE'S WELCOME: Debra Veal arrives in Barbados after her single-handed Atlantic crossing

Two of the competing craft, built by Rossiter Yachts Ltd., for the autumn race from Tenerife to Barbados 2002, had Blue Gee Epoxy 'A' specified for the construction.

One of the craft was rowed for much of the distance by Debra Veal as a solo venture, achieving well deserved praise for the achievement. A second boat, rowed by Will Mason and Tim Thurnham, was launched from Baiter Point in Poole Harbour and achieved notable success in this tough competition. Epoxy 'A' materials were sponsored by Blue Gee Ltd. Construction for the craft was to a set design based on marine plywood, using a sealed internal box matrix supporting the outer plywood skin. The boat was apparently limited to 10 knots.

USE OF EPOXY 'A' IN CONSTRUCTION OF A 38' CRUISER/RACER

Epoxy 'A' was designed to fulfil the needs of the Marine Construction Engineer/Boatbuilder and one of the early applications was in the manufacture of a 38 foot cruiser/racer by RQC yachts, for bonding the cedar strip planking and for over laminating by woven glassfibre fabric.

As can be seen from the lines of the yacht, it is rather more of a competition boat than a cruiser, although we believe it was also intended for some leisure sailing, albeit in a rather quicker cruising style, hence the name of the builders, - RQC Yachts.

Construction was carried out using slave frames to support the strip planked construction, with the hull inverted - bonded with Epoxy 'A', thickened with colloidal silica. The need to rotate the assembly resulted in a somewhat interesting broach but then this must be expected without a keel.

The picture to the left shows how the slaved frames were used to support the construction of this craft. It can be seen from the pictures above that the structure had to have sufficient integrity, even with the slaved frame structure, to support its weight at maximum girth on a few points during this rotation. The white surface seen above on the underside of the hull, is the fairing filler, applied over the laminate, much of which was wetted out at low temperatures using a 900 gram per square metre glass composite.

EPOXY 'A' FOR OSMOSIS TREATMENT WORK

For many glassfibre leisure craft, it is probable that the hulls may suffer from 'osmosis' if they spend much of their lives on a mooring. This means that the ingress of moisture into the laminate will react with certain chemicals in the glassfibre, causing a degree of laminate damage.

It must be admitted that this particular phenomena has a greater scare value than it deserves but nevertheless, it should not be ignored. A synopsis of the treatment to correct and control this problem, after inspection by a qualified surveyor, is that the gelcoat on the hull should be removed by wet or dry grit blasting, or by peeling, the hull allowed to 'dry'.

The super epoxy characteristics of Epoxy 'A' are very well exploited in its use for treating marine hulls below the waterline, where protection from osmotic attack is required. It is always better to effect this protection before any significant laminate damage has occurred. The Sovereign 32 Ketch shown below displayed mild osmotic symptoms, and was treated using Epoxy 'A'. A major advantage of this super epoxy system is that it may be used for priming, as a base for any filling system, by the simple expedient of adding a powder filler such as glass bubbles (Blu Gee Filler 'B') and as the material fo the final protective coatings. The setting and curing times for any epoxy system is totally dependant upon the air and hull temperature, and it is totally unrealistic to quote overcoating times without reference to the temperature involved. For this reason, we recommend that a fast/slow hardener mix is used at the end of the day, to permit the next days work session to find sufficient tack, without any by-product, permitting a first coat application without any pre-treatment by abrading the whole of the hull. Most importantly, the coating with Epoxy 'A' provides a virgin epoxy finish, without any fillers or pigments which adversely affect the chemical performance of the product. It must be noted that more coats of this product are required because the viscosity of Epoxy 'A' is lower than some alternative systems; however the final result is worth the additional time spent on what is, after all, a valuable personal asset.

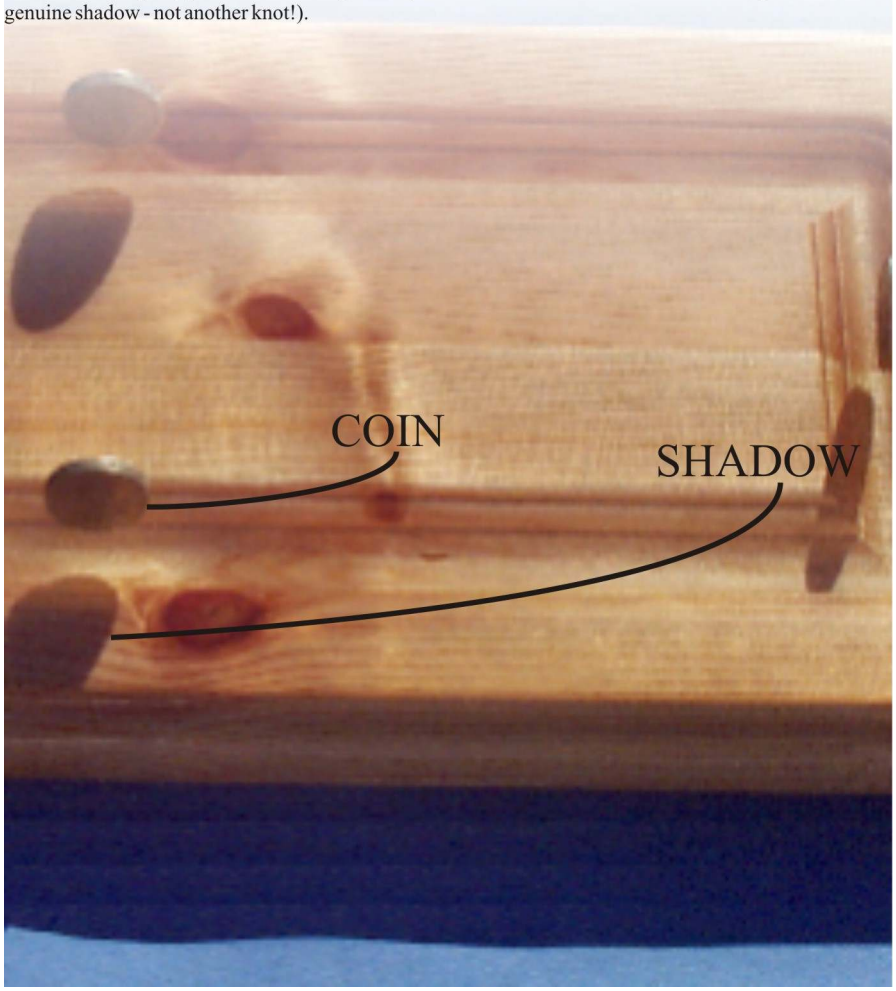
This particular process is one which usually has a direct effect upon the value of a yacht or power boat. An untreated boat may well have a few thousand pounds knocked off its resale value.

SUPER EPOXY COATING WOOD

This is simple and probably obvious application for Blue Gee Epoxy 'A'! Not exactly rocket science after the previous examples but it can be dramatic in effect, depending upon the profile or finish of the wood (or stone or concrete etc., - Epoxy 'A' will stick to most things except a few 'slippery' plastics). For deep coats, 50% Fast/50% Slow hardener mix may be advisable - this style of coating may only be possible using Blue Gee Epoxy 'A'. The way the material is used is virtually identical to that used for overcoating emulsion paint (see example in this booklet)..

Work out how much epoxy is needed, from the guidelines on coating included in the sheet on coating emulsion painted wood.. Apply the mix to the surface using a spreader or brush. If a deep coating is required the mix may be poured onto the surface, if it is horizontal and levelled but beware of too much material running off the sides - see again the relevant coating notes in the coating emulsion painted wood sheet.

The picture below shows a pine drawer front, coated with Epoxy 'A', and shows a pound coin balanced on a 20mm deep ***Epoxy filled*** decorative groove (see distance between coin and shadow; please note - a genuine shadow - not another knot!).



SUPER EPOXY COATING EMULSION PAINTED WOOD

This is probably one of the more simple and exceptionally useful, yet little known applications for Blue Gee Epoxy 'A'. It costs very little to prove the point, yet produces an outstanding finish probably not achievable by any other means and yes - it starts with emulsion paint.

Take any piece of wood or MDF, say a shelf, ensure that it is clean and grease free and apply two coats of an emulsion paint, lightly sanding after each coat.

Work out how much epoxy is needed. Briefly, if one litre of Epoxy is poured over one square metre, it will produce a coating thickness of one millimetre. One millimetre is actually quite a thick finish - but it does enhance the gloss! Obviously - half that coating depth covers twice the area. Apply the mix to the surface using a spreader or brush depending upon the relevant coating notes. The hardest part comes at the end - try not to touch the surface for a few days. This gives the surface a chance to 'cure' (a final chemical 'locking' process that takes place after the epoxy has set). It produces the hard and long lasting gloss - if the surface is touched within a few hours of the setting of the epoxy, it can easily be marked. Note: Epoxy 'A' is a plastic - it cannot withstand high temperatures - e.g. Hot Plates - do not coat surfaces liable to excessive heat.

The arrow above is to highlight the reflection indicating the high degree of gloss achieved with this type of finish. The cost of the finish - if the Epoxy 'A' is purchased in one of the larger sized packs, is probably no more than a full gloss paint finish - but it is so much harder wearing. What is also worth remembering, is that the Epoxy 'A' is useable for so many other purposes - consider trying to carry out some of the work shown in these pages with nothing more than a tin of gloss paint!

It must be emphasised that reasonable care should be used when working with Epoxy 'A'. The material has very high qualities in terms of adhesion and hardness, relative to most other substances. Removal of an epoxy coated surface is usually achieved by sanding or grinding the material off the substrate. It may be softened by the application of a ***little*** heat - but in general is totally impervious to paint strippers, solvents, or any other substances once it has set. Materials similar to Blue Gee Epoxy 'A' are used to coat the structural steel legs of the oil rigs sited insalt water and if the material was easy to remove - the North Sea would have it off in no time!

It is worth mentioning that the shelf shown above used Epoxy 'A' for bonding the uni-directionally grained plywood strip to the edge of the ply shelf. This particular item is sited immediately inside a front entrance door, is a cover for a cycle 'garage' entrance and golf club store; in consequence, it is subject to abrasion and knocks from general use, in addition to being in an area for hanging wet outdoor clothing.

COATING FURNITURE WITH EPOXY 'A'

A bench seat was designed for multi purpose use in a conservatory come kitchen diner annex, (and sometime work room when no-one was looking!). It was necessary to be able to store at least four folding chairs, plus clothes drying frames and sundry other items behind the seat and out of sight but more importantly, it had to have the ability to store four large tool boxes, together with power tool boxes within the structure itself.

The finish to the seat had to be particularly hard wearing, since it would be subject to knocks and some abrasion, when being used in its 'workroom' role. In addition, the seat should have a neat, easy clean, reasonably high gloss finish for its main role as a bench seat for two.

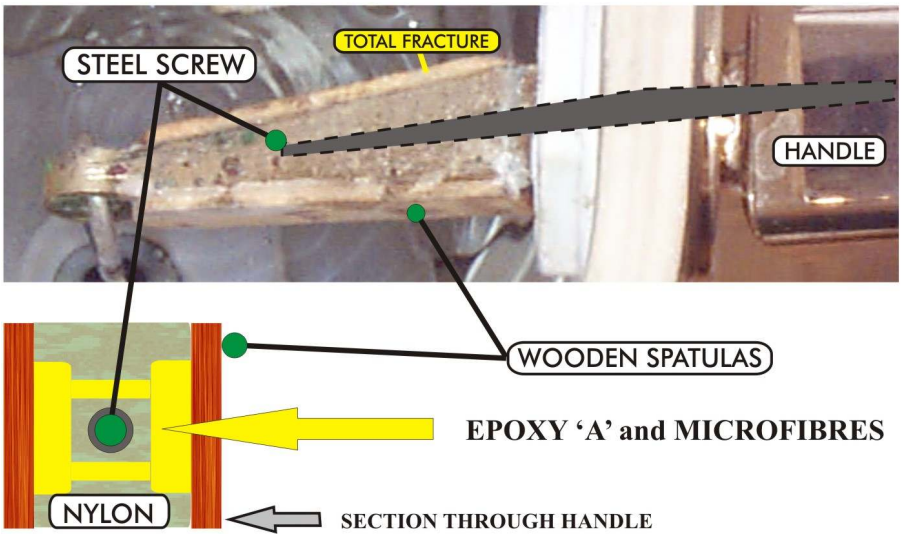
The photograph shows that there is a lift off hinged flap at the side and back to provide easy side access, together with a looped 'mat' (fitted with eyelets) which hooked onto fixings in the wall behind the seat. The inset picture shows how the mat cover is lifted back to reveal a removable loose fitting lid, which covers the compartment containing two large tool boxes per side. The main construction was of 8 mm and 15 mm MDF, of a screwed and Epoxy 'A' bonded construction. Screws were used to pin the construction whilst the epoxy system set.

The finish was carried out by painting with two coats of magnolia emulsion paint, lightly rubbing down between coats and then over-coating with Epoxy 'A'. For ease of application, the seat was turned on its base/side/ends etc., so that the mixed resin system could be easily poured onto the surface; edges were brush coated. The final result was an exceptionally high gloss hard coating capable of withstanding knocks in service, whilst retaining a very attractive easy-to-clean surface.

SUPER EPOXY 'A' - MENDING A LOO

An unusual application is this repair of a toilet flushing lever. In this case it was one of the least common types, with a rather expensive 'gold flashing' finish. A replacement was found to be eye wateringly expensive.

The lever was a nylon moulding, a material not given to bonding well with any epoxy system, so it was decided to try a 'secondary structure' using a cut down steel screw to mend the lever. The metal on its own would provide some strength but its main purpose was to hold the two pieces together whilst the wooden spatulas, with the mix of Blue Gee Epoxy 'A' and Microfibres set. The repair is still OK after 12 months use.



EPOXY 'A' FOR ULTRA DEEP COATING OF SECTION OF TREE

The picture shows a section of a tree trunk, with an Epoxy 'A' deep coating ranging from 1mm to 10mm thick on the surface, and 30mm deep for the star shake, shown at the 'twenty past' position on the table top. Although epoxies are not supposed to have much resistance to sunlight, this table was exposed to eighteen months in a garden, albeit in a shady area and showed minimal signs of yellowing. The top is a display item in our shop.

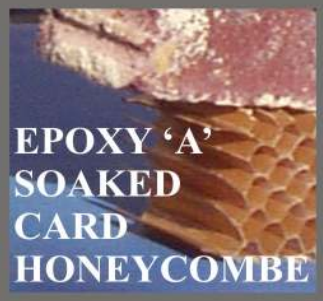
It is possible to carry out a deep coating in one pour using the slow hardener, or a mix of fast and slow hardeners. Largely because of the 30mm deep fill for the star shake, which needed a glassfibre tape laminate around the edge, to contain the 'cast in' epoxy, this coating was carried out in a number of pours. It was of course necessary to abrade the surface between pours - this did not leave any mark on the glass clear surface.

USE OF EPOXY 'A' FOR GARDEN GATE REPAIR

High tech or what ! ..... Epoxy systems are commonly regarded as very 'high tech', and the idea of using an epoxy for garden use might seem very wasteful - but it really is not and because it is such a very strong structural glue and filler, it will usually be the quickest and cheapest solution by far - the back garden gate shown below is a case in point. Severe rot attack at the base of the gate required surgery, and the simple bonding in of a new bar. The head of the gate was repairable by the simple means of a microfibre and epoxy mix to strengthen and stiffen the weakened wood. It is still 100% - two years after the repair. The whole of the repair of this gate, including the removal, repair, coating and refitting took no longer than 1½ hours, and about £10 worth of materials.

BRICKS, CASTINGS, HONEYCOMBS AND TUBES

Usages for this incredible material just go on and on ..... ! Normally for brickwork repair, cementitious mortar would be the first choice - BUT - with due respect to the universally accepted means of joining brickwork - there are times when something a)stronger and b) more water resistant would be a much better bet. The cost difference might be minimal and the end result with this super epoxy, infinitely better. The 'casting' shows the effect of swirling pigments into a super epoxy. Next - the effect of soaking card in Epoxy 'A', and then standing a brick upon it: true the card is formed into the form of a honeycomb, but the message is that this super plastic can turn a relatively weak material into a very strong structural component. There are occasions where a short length of tubing is required, either to join two glassfibre tanks together, to form a drain pipe, as a conduit for electrical items, a support for a platform, or a thousand and one other items. How to make? - easy - wrap tape, or woven fabric around something, soak in Epoxy 'A' and let dry. It must be remembered that the mandrel must be removeable.



Special purpose FRP tubes can be made in a number of ways. They may be filament wound on a lathe with a special mandrel, and a bobbin of fibres; however it may be much easier to use tape, saturated in a resin mix, and wind the tape helically onto a collapsible or dissolvable mandrel.

REPAIRING A CONCRETE POST

Severe damage to pre-cast concrete posts, is difficult if not impossible to repair easily by conventional means, particularly if the original strength is required. Often the fracture involves significant spalling away of the concrete, leaving the steel reinforcing rods exposed and bent. The normal route is to dig out the damaged stump and replace with a new post. This also requires the re-fitting of any wires or cable fencing lines.

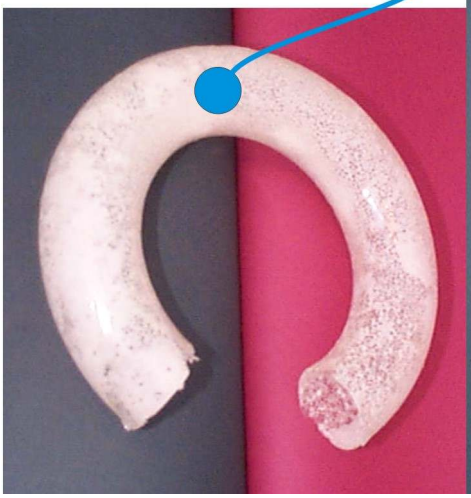
Briefly, why not bend the post upright? Mix up some Blue Gee Super Epoxy 'A' with our Filler 'D', paste into the damaged area, hold in place with a polythene sheet 'G' clamped to the post with two plywood strips and leave for a few hours to set. It will be tougher than the original and, what is more, cost about 5% of the conventional repair. Little effort was put into finishing the job off neatly - it was one of those emergency jobs that had to be completed quickly and was then forgotton ..... the repair took all of 20 minutes, it is 12 months old and many a hand has tried to break it !!!

EPOXY 'A' - MAKING 'IMPOSSIBLE SHAPES'

Note that the shape could be a made up model in polystyrene, of a building/house/boat, or anything ..... !

This technique may be particularly useful for aeromodelling, sculpture, or any pursuit involving the manufacture of complex hollow shapes.

This photograph of the final object shows the toroid with much of the core dissolved by the solvent. This example has been made without any reinforcement, which demonstrates the toughness of the epoxy system, particularly when it is remembered that it was made with only two thin coats, making a wall thickness of about one half of a millimetre.



Difficult shapes may be made by a special technique with Epoxy 'A'. For example - to produce a hollow ring - the picture shows a solid ring of polystyrene foam, coated with two coats of Epoxy 'A'. The reason for using polystyrene foam is that it dissolves readily when in contact with acetone, as will be seen in this exercise! If the 'core' or 'armature' for the desired hollow object is made from polystyrene, and is over-coated with Epoxy 'A', with or without glassfibre or other reinforcement and cured, the solid internal structure of polystyrene foam may be dissolved by the injection of a small amount of acetone. The external structure may be built up using any number of glassfibre or other layers, prior to dissolving the core, indeed it is quite conventional to remove the core, and then to continue building up the outer surface, which may - if required - cover any holes made for the removal of the core. When the core has set and cured, a hole (or holes) for the solvent injection is made in the armature, together with a drain hole or holes and the acetone (or other core material solvent) is injected into the cavity to dissolve the foam.

SUPER EPOXY FIXING ITEMS TO THE GROUND

The main 'drive' into our fair sized car park is used by heavy delivery lorries. 27 protective mild steel plates, 15mm thick, measuring 750mm x 250mm were placed over the drain covers running down the middle of the entrance driveway. The tarmacadam surface was primed with an Epoxy 'A' mix, prior to 'trowelling' some Epoxy 'A' and fine sand mix to secure the positions of the plates.

This use of Epoxy 'A' was a very cost effective means of achieving a very secure fix for the plates. A cementitious bond would not be tough enough and would have broken up on the relatively soft tarmac under the action of the heavy lorries and their tail lifts..

Used: a 4 Litre pack of Epoxy 'A' & 8 Litres of dry sand. The day temperature was about 20ºC. and the mix was split into two batches of 2 Litres of epoxy mix plus 4 litres of sand each, using equal proportions of fast and slow hardener, giving a useable pot life of over 40 minutes. The job took just under two hours and secured both sides of 27 plates over a running length of 2 x 20 = 40Metres: (the plates cost £10 each).

EARLY USE ON LIGHT AIRCRAFT

The pictures below show early use of Epoxy 'A' in the construction of an ultra-light aircraft. The material was used as an adhesive, coating and laminating material. Sharp eyes will notice that the containers carry the 'Poole Glassfibre Centre' logo which was the founding company for the later incorporated name of Blue Gee Ltd.

The inset shows the details of wing trailing edge, together with an aileron in course of construction.

SUPER EPOXY INSTRUMENT PROTECTIVE COATING

Many products, particularly instruments, have casings or covers manufactured from plastics which are vulnerable to attack by solvents. Commonly, such products carry warnings that they must only be cleaned with a damp cloth or similar agent. This is OK providing the instrument or device is not required to work in an environment where solvents are in use! The picture below shows an electronic weighing scale used for check weighing small acetone packs. Acetone would severely damage the casing and associated switches in seconds.

The left hand picture shows the instrument after it had been Epoxy 'A' over coated using 165g/Sq.M. Glassfibre Tape as a reinforcing substrate. Note the clarity of the display shown in the right hand picture ***(cleaned with acetone!)*** - after many years use.