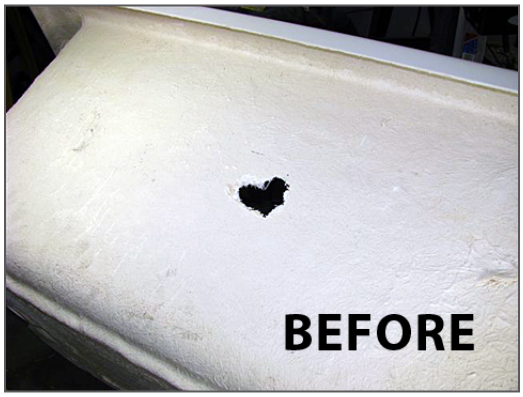
STRUCTURAL REINFORCEMENT REPAIR PROCEDURES



DESCRIPTION

Plastic (acrylic, gel coat, etc) spas and bathtubs and other parts are normally produced as a composite product containing layers of different materials. It will consist of a surface material to provide good aesthetics (sometimes as two layers) and a reinforcing material to provide the mechanical strength of the product. The most common type of reinforcement is a combination of polyester resin with fiberglass additive for strength.

Occasionally, the reinforced structure gets cracked or punctured so that the damage will extend through the entire sidewall, upper edge or floor. The damage will frequently compromise the ability to hold water. Mostly it must be repaired to prevent re-cracking and to provide adequate structure support and rigidity prior to renewing the surface with filler and color application.

These materials and procedures have been developed by Multi-Tech Products Corporation to rebuild and provide the required strength and support the structure at the repair zone giving a permanent repair to almost any type of composite part, structure or panel.

While there is no implied warranty, these materials and techniques are typically recommended to perform strong repairs. Success of the final repair lies with the experience and skill of the individual repair technician.

MATERIALS & TOOLS NEEDED FROM MULTI-TECH PRODUCTS

Multi-Tech Products offers a kit with the essential components for this repair. It contains the following parts:

1) Binding Resin (Bonds to Plastic, ABS and Fiber glass)
2) Catalyst for resin
3) Fiber glass mat

Plus the following tools, etc.

a) Mixing Cups
b) Stir Sticks
c) Latex Gloves
d) Razor Blades
e) Application Chip Brush

OTHER TOOLS AND MATERIALS NEEDED

- ½" diameter x 2" long bristle or alumnium laminating roller
- 2", 3", or 4" Resin Brushes (disposable)
- Pint or quart size mixing bucket for resin mixing
- 100 grit Wet/Dry Sandpaper
- Grinding and Sanding Tools; (e.g. 3" or 5" Disc Sander with 36 to 50 grit and a Die Grinder)
- Masking Tape
- Razor Blades, or Razor Knife and/or Scissors
- Fan or blower for ventilation of vapors
- Acetone, Isopropyl Alcohol, or Lacquer thinner
- Protective clothing, if necessary

SAFETY PRECAUTIONS

Polyester reinforced with fiberglass applications require personal contact with a variety of components, each having its own unique characteristics. When handling these materials, read and follow the safe handling procedures on the labels and the MSDS. During grinding, drilling, sanding, etc., eye and hand protection is required. Breathing resin vapors should be avoided - especially by individuals with a history of lung or breathing problems. A vapor/particulate respirator (NIOSH/MSHA TC-23C) is recommended. Keep away from heat, sparks and flame. Vapors may cause a flash fire. Close containers after each use. Dispose of properly.

PROCEDURE

	1) Prepare the damaged area, crack or break from the cosmetic surface side first. Grind out the cracks and damage to fit the repair area back to its original shaped form. This can be achieved by grinding the cracks with a disc set-up on a drill, dremel tool or by cutting with a utility knife or small saw if necessary.

	2) Be sure to prepare the finished side as to except the filler and ready for final cosmetic steps as much as possible prior to the back side repair. Observe that we have created a taper around the perimeter of the damage. See Cosmetic damage procedures at www.multitechproducts.com
	3) Once the cosmetic side is prepared, cover the surface of the repair with a good quality tape so resin will not come through to the surface. On small repairs, this will hold the applied reinforcement in place. For larger repairs, temporary wood or stiff material such as cardboard can provide the required strength on top of the tape for a smooth, final substrate.
	4) With the finished side ready and prepared with tape. Grind or sand the back side of the structure around the repair zone larger than the expected or estimated resin and reinforcement area. This will allow the resin to bond to the surface. The goal is to remove any gloss from the surface and rough up the finish. Use 100 grit sandpaper or a 36 to 50 grit sanding disc.
	5) Dispense the resin into an appropriate size mixing cup. Do not catalyze the resin, yet. Wait until the application step. These resins set up with heat. An extended amount of waiting time could cause the catalyzed resin to cure prematurely.

	6) Add pigment to the resin to make it opaque when necessary.
	7) Most structural repairs do not require color match. If an exact color match is desired, the resin can be matched using gel coat pigments prior to adding catalyst.
	8) For the best structural repair results it is recommend to tear the fiber glass mat with your hands rather than cutting, which yields a blunt edge. This facilitates creating a feathered edge for a smooth transition to the substrate from the repair zone. This yields a seamless appearance and professional results.
	9) Pre-size the pieces of fiberglass mat for application prior to catalyzing the resin. Most structural repairs will require at least three layers of fiberglass mat to get adequate structural strength. For severe damage, stitch mat is an ideal addition to the composite structure to provide extra reinforcement of the wall. Use stitch mat in combination with standard mat. In this application, one layer of stitch mat is adequate. This allows the standard mat to provide the smooth surface and transition quality. The stitch mat can only be cut with scissors, which precludes making the smooth transition at the edges.

10) Do not dump catalyst into resins, gel coat and pastes. For best working time, color, and resin quality; use precise measurements even when a hot mix is desired.

11) The orifice size of MTP's dropper bottles (3 cc, .5oz. and 1oz.) are precise for our catalyst ratio chart and mixing requirements for MTP resins.
For precise catalyst percentages, DO NOT measure catalyst with our large flip top dispensing lids provided on our 4oz., 8oz., pint and quart sized bottles.

Catalyst (MEPK) Ratios for Gelcoat and Resins

QUANTITY	Recommended Quantity of Catalyst (1.5%) @ 75°F	Maximum Quantity of Catalyst (3%) Hot mix
Gallon	64.5cc	129cc
Quart	15cc	30cc
Pint	7.5cc	15cc
8oz.	3.5cc	7cc
4oz	1.9cc	3.8cc
1oz	8 drops	16 drops

For larger volumes, starting at 4oz., we recommend the Catalyst dispenser.

The dispensing cup is graduated with cc markings.

12) Multi-Tech Products resins:

-GP Resin and Pastes
-Isophthalic Polyester Resin and Pastes
-Poly Paste
-Gel Coats, Clear and Opaque
-Binding Resin
-FRL Resin
-VE Resin

All resins use the same catalyst and mixing ratio, which is 1.5% at an ambient temperature of 76°F.

A "hot mix" ratio would be 3% with applied external heat.

	13) Most resins, at an ambient temperature of 75°F, will have a 15 to 20 minute working time before the resin reaches a gel condition precluding its use.
	14) Apply a generous amount of prepared resin (resin with catalyst) to the sanded repair zone to accept the dry mat. Use a disposable chip brush.
	15) Wearing gloves, apply the first smallest piece of mat to the wet applied resin. The wet resin will start to saturate through the mat.
	16) Use the same chip brush to apply more resin to the mat. Apply resin to the mat until the entire surface of the mat is wet. Use the brush to even out the resin, and work out any air pockets in the mat. A laminating roller works well for removing air pockets and creating a smooth mat surface.

	17) With the first application still wet, apply another layer of the mat and resin. Follow this with the third largest layer until all three layers are applied, and they are free of air pockets and there is a smooth, flat top surface. At any time more layers can be applied when necessary. Best applications are when the resin is still in liquid form. When the resin begins to set, it will enter a gel stage making subsequent applications not uniform. Note: The matting will swell and accept more resin. For a thicker application, apply more resin to the mat prior to the application cure time frame.
	18) For fast repair and quick cure time, apply plenty of heat to the repair zone to initiate and promote curing. However, too much heat can cause bubbling. With an optimum amount of heat, sufficient cure can be achieved to allow the cosmetic side repair to begin about 10 minutes after finishing the structural repair. These results will compete with the performance of epoxy resins, but provide a superior repair since it is repairing with like materials. Also, too much heat will cause the resin to burn, and change color or smoke. This will result in a brittle resin.
	19) The repair resin in this picture was toned with white pigment to make the structure opaque. If you desire the resin to be color matched to the viewable surface, match the resin color using gel coat pigment. To achieve a matte finish of the resin, add 10% by weight of talc to the resin. Catalyze and apply one more application over the work zone with a disposable brush. If areas are uneven and need filling, apply MTP's Poly-Filler or resin paste. Grind and sand for a smooth surface. A final, second layer can be applied for maximum aesthetics.
RESIN & TOOL CLEANUP	Use lacquer thinner to clean wet resin from product surfaces and tools. Be sure to harden any unused resin before discarding in trash. WARNING: Large amounts of catalyzed resin can smoke and ignite. Do not throw mixed resin directly into combustible trash. Allow resin mixture to cure in an open container, and cool before discarding.

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