Blister Repair with Binding Resin for Spas, Marine and Gel Coat Structures

MULTI-TECH® PRODUCTS CORPORATION

EXCELLENCE IN SURFACE REPAIR PRODUCTS

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Repair Procedures 2010

MATERIALS REQUIRED

- Binding Resin and MEKP Catalyst (**mix at standard 1.5 to 3% catalyst to resin ratio**). Each egg size blister will need 2 to 4 ounces of resin mixture.
- Fiberglass Mat (1 ½ oz. weight)

EQUIPMENT

- Industrial Heat Gun (Hair blow dryer is inadequate)
- A ⅜" Variable Speed Drill (electrical or pneumatic)
- A 3 inch rubber disc assembly for the drill (similar to the Roloc Disc pad)
- 3" Sanding Discs - 50, 36, or 24 grit. (50 grit is optimum.)
- Chip brush (1", 1 ½", or 2")
- Hammer and Chisel
- Scissors

Introduction

Blisters were first experienced in the marine industry on gel coat/FRP boats. Technology developed to solve the boat surface problem was adopted by acrylic spa manufacturers in the 1990's, and today blisters are a rare occurrence considering the 1000's of spas built each year. They occur due to the formation of fluid pressure in a void space behind the surface in the composite reinforcement. Although small voids are inherent to FRP manufactured structures, spas warranties cover blisters under their finish or cosmetic warranties. There are multiple potential causes of the larger voids and the fluid pressure. Most blisters, when opened, are found to contain a colored liquid (mostly water).

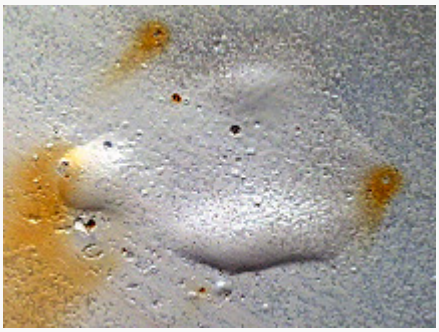
The prevailing belief on the cause of blister formation in acrylic/FRP products is that water reacts with the components of the polyester resin, and creates pressure that blows the bubble. There are multiple sources for water to enter the FRP structure. Permeation through the acrylic surface and entry via the spray equipment are two common causes. The fact that blisters are predominantly found below the water line in spas, and are rare in bathtubs, support the hypothesis that long exposure to hot water is probably a key requirement for blister formation. Although we know of no scientific testing to investigate the effects of different parameters have on blister formation, the prevailing opinion on the chemistry mechanism would indicate water chemistry (pH, etc.) might affect the rate of this phenomenon. The primary solutions to blisters caused by manufacturing issues are the use of non-corrosive vinyl ester resin as a skin coat, and the use of higher quality polyester resins while improving equipment and techniques for spraying and lamination. Multi-Tech Products repair systems can be utilized to repair blisters in acrylic surfaced spas reinforced with FRP. Since they usually contain a liquid, the blister repair preparation must include steps to seal or eliminate this moisture.

THIS PROCEDURE COVERS THE STEPS NEEDED TO PREPARE A BLISTER ON THE SURFACE OF A FRP REINFORCED SPA PRIOR TO THE ACRYLIC FILLER AND COLOR OF THE FINAL REPAIR.

These preparation steps are the same for Quick Glaze, MMA or Granite repair systems. The procedure explains the pre-application process for these systems, and is critical for sealing and eliminating wetness that causes future bleed through in the final repair. If this fluid is not eliminated, future fluid bleed through or a new blister may appear. After these preparation steps, it is ready for the final process consisting of application of the Acrylic Filler followed by spraying the solid or marble colors, and a clear topcoat. These procedures are also used for repairing granite colored spas prior to use of the Granite Filler. Refer to **Advanced Theory of Spa Blister Formation** on our website to learn about causes and characteristics of blisters. Although the fluid can cause wetness deeper within the laminate, which can cause laminate separation, these blisters are a different phenomenon from **general de-lamination** of the surface as well as a support plate de-lamination.

See Photos below:

TYPICAL BLISTER FLUID



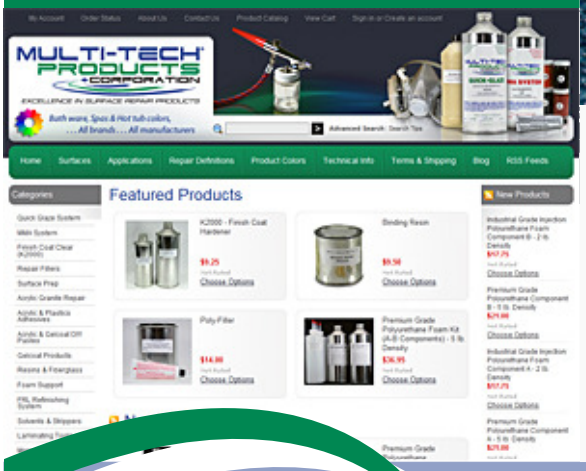
BLEED THROUGH AFTER AN IMPROPER REPAIR

SAFETY PRECAUTIONS

Spa shell repairs 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 applicable MSDS. During grinding, drilling, sanding, etc., eye and hand protection is required. Do not breathe vapors or mists. Individuals with a history of lung or breathing problems should not use or be exposed to this product. Keep away from heat, sparks and flame. Vapors may cause a flash fire. Close containers after each use. Dispose of properly.

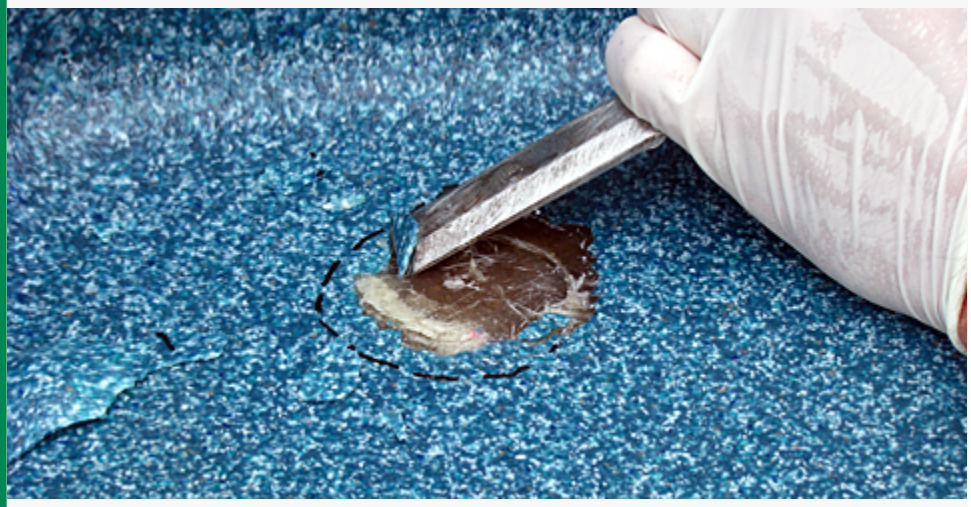
MATERIAL SAFETY DATA SHEETS (MSDS)

All Material Safety Data Sheets can be found on our corporate web site by clicking on the following link: http://www.multitechproducts.com/pages/Material-Safety-Data-Sheets-%28MSDS%29.html



Repair Procedure:

STEP 1:



Open the blister up at least ½ inch larger than the actual bulge in the acrylic using a chisel and hammer. At first, an area that is ½ inch larger than the actual blister should be created in order to determine the extent of wetness. The area should be expanded until the underlying surface is dry. If the wet area continues into a large area, a judgment has to be made on how large of a repair is practical. Very small blisters need to be opened enough to accommodate the heat gun nozzle. The blister fluid will clean up with water only. Don't use lacquer thinner to clean up the fluid.

STEP 2:

Grind the edge of the acrylic to an angle or taper, grind into the structure FRP to remove loose fibers and some of the wetness. Do not grind through the structure destroying the integrity of the FRP structure.

Note: The wetness will cause bleed through in the final repair, and if it is not removed, it can cause a new blister. The goal is to remove as much of the liquid (wetness) as possible. Since this method will assist in removing the wetness, and will help prevent bleed through, although not 100% effective, it will greatly reduce the chance of blisters reforming.

STEP 3:

Heat the structure (FRP) using a basic heat gun (paint stripper) until the structure gets hot enough to start popping and smoldering the FRP. The gun will be close enough to the surface to touch the surface but allow air flow from the gun. Be sure to watch the heat direction as to not melt back the acrylic around the edges of the prepared area. If the acrylic melts around the perimeter allow this up to ¼ of an inch and pull back the heat.

The ¼ inch melted acrylic edge can be ground back to a taper at the next grinding stage. It will take about 3 minutes for the structure to start getting hot and begin smoldering. It will also have a burnt appearance. Be sure to use caution and not cause the structure to ignite.

STEP 4:

Grind the heated and scorched area using a variable speed drill with a Roloc set up. A 3 inch disc is ideal for most blister work. Grind down through the scorched FRP area. Some areas may look lighter in color from the heat. Be sure not to grind through the structure. Any depth removed can be rebuilt with the next sealing application. The primary goal is to remove wetness in the previous heating stage. If you are still seeing wetness at this stage of grinding you may want to repeat the heating process. Be sure to finish this stage with grinding a taper onto the edge of the acrylic with a 30 degree angle as seen in the pictures.

STEP 5:

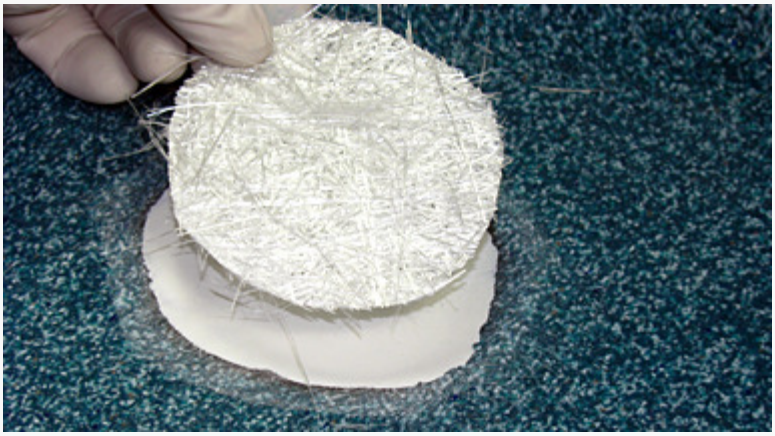
Cut the 1.5 oz. fiberglass mat to fit within the perimeter of the prepared blister area, the mat should be just smaller than the line where the acrylic and FRP meet in the ground area (approximately 1/8 inch smaller).

The mat will move outward and approach the acrylic as it is saturated with Binding resin in the next application.

STEP 6:

Apply mixed Binding resin to the prepared area to accept cut out mat piece using a chip brush. Be sure to saturate the entire FRP area getting all of the air pockets and frayed FRP areas filled with Binding resin. Allow enough resin for the mat to saturate when applied. See pictures above.

STEP 7:



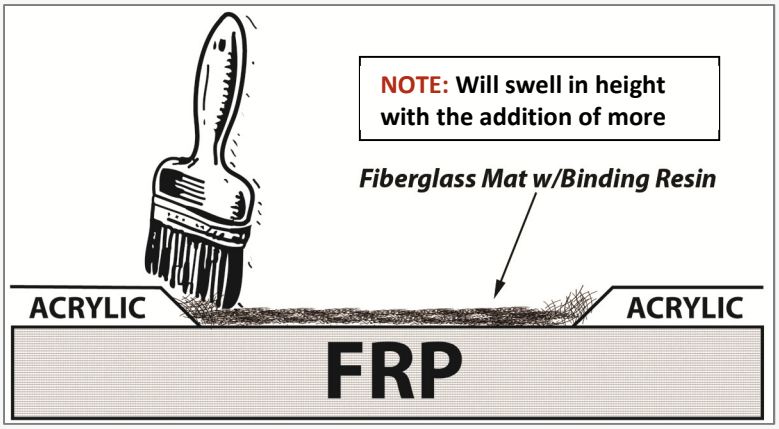
With the resin still wet, apply the mat piece cut out to the area. Depending on the temperature of the heated area, there should be at least a five minute working time to apply the mat to the resin before it is begins to cure.

Remove all the loose frayed glass around the perimeter of the mat piece to assure a clean edge at the juncture of the acrylic and the piece of mat. The edge of the wet mat will be laid on the acrylic taper to provide a seal at the juncture.

STEP 8:

Apply the mixed binding resin to the mat, making sure the resin saturates into the mat. Work out any air pockets in the mat with the chip brush. Try to achieve a relatively dry look to the mat and resin application. Now use the chip brush to dab the edges of the wet mat over to, and up the acrylic, about half way up the taper. This technique will move the mat, allowing the mat and resin to make an overlap from the FRP area to the acrylic surface.

STEP 8 *continued*:



Note: **As the mat accepts the wet resin it will expand and swell the fiberglass mat. Use this technique to build height to compensate for the depth created by the grinding preparation. Remember to leave enough of a depressed surface to accommodate the filler used in the surface repair (~ 50 mils).**

STEP 9:

Apply moderate heat to the surface around the prepared mat and resin to conduct enough heat into the resin to accelerate cure.

Note: Do not overheat the resin, since it will cause air pockets to form!

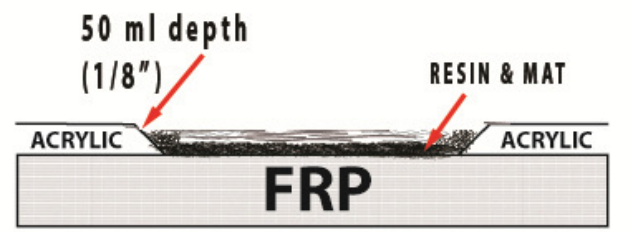
STEP 10:

After the resin has cured, but it is still warm; apply another generous layer of mixed binding resin over the area to smooth the surface. This will help provide a seal between the structure and the final surface filler/color repair job. Be sure to overlap the wet resin onto the tapered acrylic edge. This is referred to as the **NEAT** Layer of Resin.

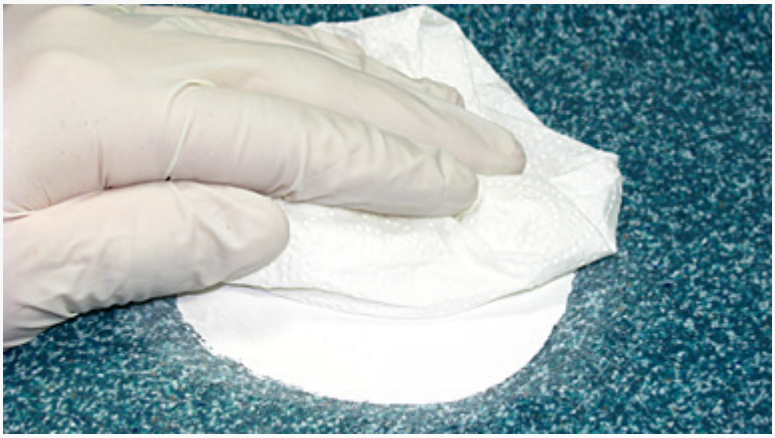
Moderate radiant heat can be applied to assure a speedy cure of the final binding resin application.

STEP 11:

Once the resin has cured, grind the resin surface to accept the Acrylic Filler or Granite paste required to renew the surface smoothness or contour. Be sure to allow a 50 mil depth to allow for the filler or paste. Take care not to grind through the Binding resin, especially at the acrylic edge, since the exposed structure can allow bleed through. Remember, the acrylic filler or Granite paste will be applied next in a 3 layer stage process, which eliminates pinholes in the filler. A pinhole-free filler and surface provides the best long-term performance and appearance of the repair.



STEP 12:



Remove grindings and residue using a solvent such as lacquer thinner on a clean rag before the next filling stage.

STEP 13: CHOOSE YOUR APPLICATION

The Blister pre-fill preparation is complete and ready to continue with the **Acrylic Filler** and/or **Granite** filler paste process. Gelcoat paste is only recommended when repairing gelcoat spas, boat hulls and when gelcoat will be sprayed as a coating.

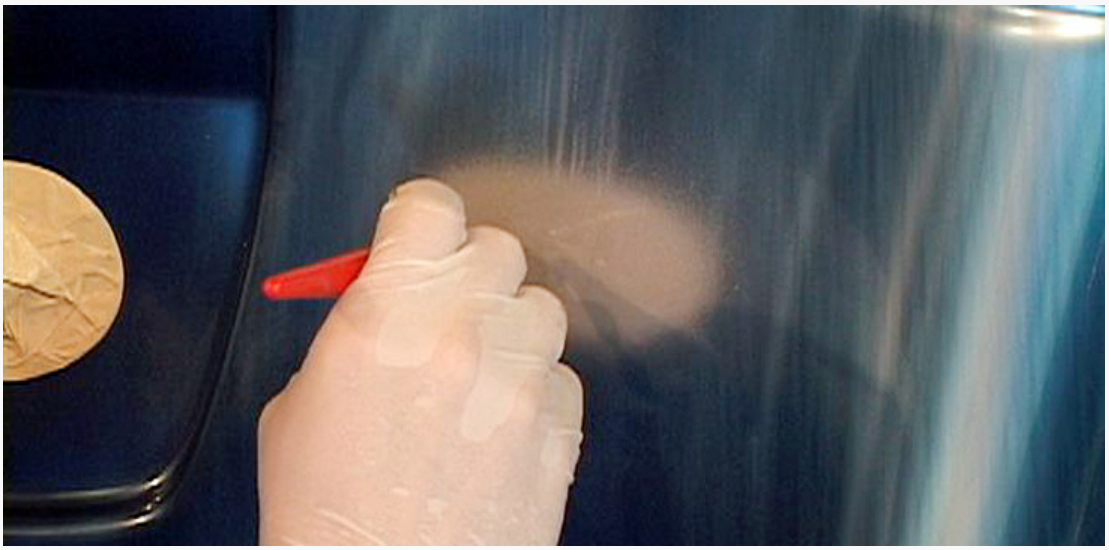
The acrylic filler process is complete, the final color and /or pattern will be applied with a spray application. Usually an airbrush or spot gun.

For acrylic solid color, pearl colors and marble colors, use: **Quick Glaze Spa** or **MMA System Spa**

For Gelcoat, use: **Gel Coat** or **Quick Glaze Spa**

PEARL OR SOLID FINISH

MARBLE FINISH



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While there is no implied warranty, the materials and techniques described in these procedures have been designed to withstand the normal operating conditions of spas. However, success of the final repair also is dependent on the experience and skill of the individual repair technician.

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