

## PROCEDURE FOR SPA ENVIRONMENT RESURFACING FRL System (Fiberglass Reinforced Lining)

Permanent resurfacing system for challenging environments where hot water and chemicals are present 24-7, 365 days for spas, hot tubs, baptisteries, pools, tanks, marine, industrial wet holding areas and reservoirs.

BEFORE



AFTER



### **DESCRIPTION**

After years of service and use, the original surface of a spa can become faded, damaged, crazed, delaminated, or defective. Mechanically, the spa can still be very functional and it may still be leak-free. Even with structural issues, the unit becomes a perfect candidate for resurfacing. The best choice may be to refurbish the entire surface, rather than purchasing a new replacement shell, especially when high demolition and replacement costs are economically prohibitive.

Most refinishing coatings on the market today are only a temporary remedy in this type of environment. Although high in quality, boat, marine, pool, and bathtub refinish coatings might seem to be a good solution, they provide less than three years of satisfactory performance. Typically, in less than a year, these products will lose their adhesion, oxidize, or simply peel due to the spa environment of constant hot water and chemicals. Common polyurethane, polyester, (even gel coat), and epoxy coatings cannot withstand exposure to these conditions without loss of adhesion over a short period of time.

Multi-Tech Products Corporation has developed materials and procedures that endure long term in these extreme conditions. It requires a specially formulated resin, which is reinforced with fiberglass mat -- the FRL System (Fiberglass Reinforced Lining). The addition of reinforcement with strong glass fibers into the proprietary FRL resin will provide a 15-year-plus life expectancy with good resistance to the wet environment. The reinforcement minimizes the expansion and contraction of the FRL resin, which allows the resin to maintain its mechanical bond to the substrate. Even when reinforced and repaired, a bonus benefit of the FRL system is the resin and fiberglass composite adds strength to the structure. A technician providing this process can safely offer a five or ten year warranty against peeling and adhesion loss for the finished product (five year is the norm).

The specially formulated FRL Resins (white in color) are formulated as a Modified Acrylic VE/ISO, giving advanced chemical bonding properties. This resin bonds well to gel coat, cross-linked acrylic, ABS, Loran®, Centrex®, Rovel®, polyurethane, concrete, plaster, Gunitex®, wood hot tubs, spas and pools. The initial FRL Resin is embedded with glass fibers in a mat construction, and adjustable catalyst levels provide various working times. However, the finish layer resin (FRL Final Resin) is formulated to yield quicker cure times, creating good hardness and final textured surface to create the desired orange-peel appearance.

Although the FRL Resin has superior bonding characteristics by itself, it is not recommended as a finish coating in these challenging conditions without the incorporation of fiberglass reinforcement. It has been specifically designed for the application covered in this procedure for ultimate long-term performance.

The use of any FRL system resin as a refinish coating (without reinforcement) is not recommended by MTP under these harsh, wet conditions. If an independent contractor chooses to use the resin without glass reinforcement for refinishing, the final suitability of the product is the responsibility of the applicator and not endorsed by Multi-Tech Products Corporation.

While there is no implied warranty, even for the intended application, these materials and techniques were designed to provide outstanding performance in typical spa environments. However, the final product longevity is very dependent upon the skill and knowledge of the applicator.

Due to the limits created by high pigment concentration, this system is produced in white color only. Light shading and toning is feasible. Darker colors and toning can fade and oxidize over time.



## **MATERIALS (FRL Kit Components)**

- FRL Resin Paste (white) for initial surface preparation and repairs
- FRL Resin (white) for main lay-up and pre-finish layers
- FRL Final Resin (white) for final finish layers and textures.
- Fiberglass Mat
- FRL Resin and Paste Catalyst
- Texturing Additive for final finish effect.
- Non-Skid Additive for seats, steps and foot well grip.

## **TOOLS & SUPPLIES (FRL Kit Components)**

- Tools (measuring cups, stir sticks, gloves, resin brushes, texturing roller frame and covers)

## OTHER MATERIALS & TOOLS NEEDED IN ADDITION TO THE FRL KIT

- Three tables for staging and set up of materials and tools.
- 1" diameter x 3" radius aluminum barrel laminating roller (LA155315A)
- 2" and 4" Resin (chip), brushes (disposable), usually provided in kit.
- 2 ½ quart paper buckets for resin mixing, usually provided in kit.
- 80 to 100 grit Wet/Dry Sandpaper
- Grinding and Sanding Tools; (e.g. 3"- 5" Disc Sander with 36 to 50 grit Discs and a Die Grinder)
- Masking Tape, duct, basic painters, and 3m 06338
- Razor Blades and/or Razor Knife
- Fan or blower for ventilation of vapors
- Acetone or Lacquer thinner (clean up bucket for laminating roller)
- Clean white cloths
- Old shoes spray mask, hood and coveralls.
- Wet dry vacuum
- 1 mil plastic for dust prevention and 4 mil plastic for floors and walk areas.
- Catalyst dispensing bottle (LADISP) or medicine cup for cc measurements.
- Personal protection: Half Respirator, full-face respirator, gloves, safety glasses.
- Plastic spreaders.
- PVA (polyvinyl alcohol) and sprayer for sealing the final finish.
- ½ inch and 2 inch chisel for trimming final clean up.
- Scrub brush
- High quality industrial grade scissors.
- See FRL Application Tools and Supplies list for other potential items.

## MIXING & RATIOS FOR RESIN AND PASTE

Resin is prepared in small batches until the total surface is covered. It is imperative to mix each batch at a specific volume throughout the process. Catalyst levels are adjusted to compensate for changes in ambient temperature and resin volume. Choose batch size from two options - 8 oz. (1/2 Pint) or 16 oz. (Pint) volumes. Mix in a 2 1/2 quart paper bucket. These batch sizes were chosen to accommodate a typical spa shell size of 6 to 14 feet. For efficiency, the bucket size should remain constant throughout the process. Larger applications like a swim spa, pool or tank will require larger volume methods of application. The maximum recommended quantity is a one-gallon mixture. Note: Higher resin volumes react faster in the bucket.

The recommended starting ratios are based on achieving a 20-30 minute resin gel time at 76° F ambient temperature. Catalyst volume will be adjusted based on desired working times and ambient temperature changes during application. Increases in catalyst will produce quicker cure times.

Extremes in temperature bring curing challenges. Colder conditions will require more catalyst. Heaters can be used to assist the curing process. Extreme hot temperatures will require less catalyst. Reference the **mixing ratio chart** for the estimated recipe. Treat the first resin batch as a "test batch," confirming the final result and adjusting catalyst level accordingly.

**-1/2 Pint (8 oz.)** resin or paste, add 4cc catalyst starting mixture. Increase or decrease at 1cc increments.

**-1 Pint (16 oz.)** resin or paste, add 7.5cc catalyst starting mixture. Increase or decrease at 2.5cc increments.

-1 Quart (32 oz.) resin or paste, add 15cc catalyst starting mixture. Increase or decrease at 5cc increments.

-32:1 for Non-Skid and Texturing Additive.

## **REFERENCES**

- See FRL Application Tools and Supplies list.
- See Resin ratio chart for mixture recommendations.
- See Structural repair instructions for pre repairs.
- See Blister repair instructions for osmotic blister and structural wetness.
- See Safety and Personal Protection instructions.
- See FRL Application Panel
- See FRL Consumer Doc

## **SAFETY PRECAUTIONS**

Polyester - fiberglass processes require personal contact with a variety of chemical components, each have their own unique characteristics. When handling these materials, read and follow the safe handling procedures provided on the label, and refer to their Material Safety Data Sheet. Wear an appropriate NIOSH/MSHA approved and properly fitted **full face** respirator during application and use of these products until vapors, mists and dusts are exhausted. Follow the respirator manufacturer's directions on proper use. Breathing chemical vapors should be avoided, especially by individuals with a history of lung or breathing problems.

During typical surface repair operations like grinding, drilling, and sanding, eye and hand protection is required.

**See safety and personal protection.**

*Keep materials away from heat, sparks and flames.* The chemical vapors from the products used in this process are flammable. Precaution should be used to prevent exposure to an ignition source. Good practice requires that chemical containers be closed after each use, and dispose the empty containers properly.

## **RECOMMENDATION**

Before starting the job, read these instructions completely from start to finish. This will help develop a good understanding of the process, work flow, and repair techniques that might be needed to complete a satisfactory outcome; for example, there are time constraints that must be followed with resin mixtures and application. Although thorough knowledge of the process should prevent errors, mistakes are correctable but should be avoided.

**A clean, organized work flow will yield the best final result!**

## PROCEDURE

### **Initial work area preparation:**

Prior to any work on the unit, prepare the area for an organized access to tools to facilitate proper handling of resins, to provide a clean work environment, and assure chemical safety.

Use 4-mil clear plastic sheeting taped to the floor walking path and work areas. Use high quality 3M tape 06338 to attach the film to the floor. Do not use paint masking or duct tape, especially outdoors. Duct tape will leave a glue residue. The plastic film should be anchored to the floor sufficiently to avoid becoming loose while it is being used as a walking surface. Also, try keeping shoe soles clean and free of sticky resins.

**See Safety and Personal Protection instructions.**

### **Utilize tables and decks as staging areas:**

- Table for tools
- Table for resin and bucket handling
- Table for mat preparation.



## VERY IMPORTANT!

**Be sure** all appliances, furnace and pilot flames are off when working indoors. Due to chemical odors ventilation should be utilized in indoor location, especially in medical or institutional facilities.





## Prepare the area for grinding dust, when necessary

For best results cover and/or remove everything from the immediate working area or room. 1-mil plastic film can be used on areas which will not be a walking surface. Be sure any walkways leading to the work area are covered with 4-mil plastic so dust and resins are not tracked onto carpet, wood decking, or finished floors.



## Jet Removal or Protection?

It is best to remove jets completely, especially when new jets will be installed or the finish laminate (top layer) is being removed from the structure. However, the FRL process can be applied with the jet housing installed. Most gel coat, acrylic and Gunite® spas can be resurfaced by covering and taping the external jetting and plumbing fixture. **See section below: Taping and trimming jets, controls, overflows, intakes and edges.**



If jets and other hardware are to be removed, it must be done at the beginning. After removal of jet assemblies, trim pieces and intake covers; grinding and surface preparation are started.

Be sure to drain the water from the jet and piping system. This can be done by opening a pipe or coupling in the jet system behind the spa shell or at the equipment. Water can also be extracted from the jet piping system with a wet/dry vacuum. For added assurance, rags can be placed inside the jet outlets prior to tape preparation capturing residual moisture left in the pipes.



## Surface Preparation:

### Surface laminate removal (Acrylic and Plastics):

Most spa, pool and baptistry FRL resurfacing will not require the removal of the entire laminate finish. Existing surfaces can be refinished directly over the cosmetic substrate if the total composite structure has solid integrity. However, if the surface is severely crazed, blistered, or delaminated entire removal of the laminate may be necessary.



Removal of the top laminate surface can be done with chisel and hammer, pry bar, grinding and or by peeling with force. ABS plastics will be flexible, where acrylic will appear to be brittle coming off by mostly chisel and some grinding.



### Preparing the surface for the FRL Bonding:

Exposed gel coat and fiberglass surfaces will need to be ground to remove gloss, oxidation and crazing. Grinding with a 36 to 50-grit disc is recommended. On gel coat, grind past the oxidation to the original color or to the fiber glass. Acrylic and other plastic surfaces can generally be solvent washed with acetone or low temperature lacquer thinner. Be careful when using acetone, since it can cause cracking in some plastic surfaces. Apply generous amounts of thinner to saturate the surface and scrub with a Scotchbrite® pad for best results. Where prior repair or modifications are present, remove the repair coating and fillers with a 36 to 50 grit disc grinder.





Stress cracks will require grinding and filling. Most micro crazing and light cracks in acrylic can be resurfaced by direct application of the FRL materials over the crazed area. When refinishing over well bonded Loran®/Centrex®/Rovel® materials, grind through any chemical oxidation to the ABS substrate for best adhesion results. When refinishing plaster, Gunitite® or concrete, etch with a concrete etching solvent, or grind into the skin layer to remove smoothness for good bonding. Grind away rotted or weathered wood to a solid substrate.

**Choose the correct tool** for the surface and contour. Speeds of 2500rpm or higher are best, even when using a drill with a Roloc® disc. 24, 36, and 50 grit grade discs are optimal for this stage. 5" and 7" disc grinder assemblies are ideal for larger flat areas.

## Repairs prior to FRL application:

Prepare air pockets, cracked, damaged, blistered or delaminated areas by grinding. Use proper surface and structural damage repairing and reinforcing techniques. Specific instructions can be found at:

[www.multitechproducts.com](http://www.multitechproducts.com)  
@ Technical/Procedures.

## Recommended reading:

- Blister repair procedures.
- Structural repair procedures.

## Modifications and structural repairs:

The advantage of polyurethane (PU) and fiberglass reinforced structures (FRP) are modifications and repairs can be made prior to the FRL application. Steps, access modifications, headrests, tile insets, seats, alterations, structural and equipment reinforcement can be fabricated into place permanently. At this stage in the FRL process, blisters should be repaired (ground, force dried and sealed). Also, weak floor bottoms or weak air channel cross-members should be repaired and reinforced with stitch mat, resin and paste.

## Don't forget personal safety and protection:

- Gloves (Latex and Nitrile)
- Solvent and Dust respirator (see **Main Area lay-up**)
- Goggles or safety glasses
- Overalls suit
- Dust extraction when necessary.

(See **Safety and Personal Protection instructions**)





When topical reinforcement is required, stitch mat will provide excellent results in rebuilding laminate strength. The goal is to build and shape well enough to provide strength and appearance with an acceptable finish. Finish detail is not as important as strength, shape and contours. The FRL lay-up process will hide much of the repair and modification imperfections. General shaping and filling will be required at this stage.



Blistered and delaminated areas that are highly saturated with moisture (water) will require removal of the top layer of the composite. Forced hot air heating and drying (with high temp heat gun) prior to repair is essential before repair and the FRL application (**see blister repair instructions for procedure**).



**For structures which have had the surface laminate removed:**

When visibly high moisture is present in the structure of the fiberglass, polyurethane, wood and plaster structures, it may be necessary to take a moisture reading. Marine hull fiber glass standards require a 25% or less moisture reading prior to repair or refinishing a yacht hull. This standard is a good reference for spa refinishing applications. Anything above 25% will require force drying with heat. This can be done with space heaters. After the wet areas have been ground, begin drying with a space heater. Direct the hot air to the wet surface. It should be dried for 24 hours and then another moisture reading taken.



**Solvent wipe** the surface to be repaired or resurfaced prior to any paste or resin application. This will assure that the surface is clean and free of grease and contaminants. Use a good quality clean cloth or rag with liberal amounts of acetone or lacquer thinner, and be sure all grit and debris are removed.

Wear an appropriate cartridge respirator, gloves and eyewear.



**WARNING:**

**Use only the FRL Resin paste as a filler paste:**

Do not use auto body fillers, epoxies, or alternative products to shape or mend the structure prior to the FRL application. These fillers will absorb and retain moisture, causing inner delamination of the repaired structure even with skim coats and light fills. Using only FRL system products throughout the process will assure longevity of the reinforced finish.



Prepared contours, radius and flat areas should be repaired and filled so they can't be seen through the lay-up of the FRL application. As a general rule, deep gouges, indentations and imperfections should not be deeper than 1/8." Excess filler or rugged filling areas should be ground so they are consistent with the relative shape of the surface. The FRL fiberglass matting will absorb resin and smooth out most minor imperfections. For example, heavy grinding marks from 24 – 36 grit shaping can be covered up during the final steps of the process.

Missed or imperfect areas can be fixed with FRL paste filling and skimming throughout the FRL laminate process. FRL paste can be applied over cured FRL resin. There is a 72-hour window prior to grinding and subsequent filling. A tacky repair or resin application can be bonded to without grinding.



## Final preparation prior to FRL application:

### Taping and trimming jets, controls, overflows, intakes and edges:

It is extremely important to use high-quality tape for protection against resin penetration on critical areas such as jets, intakes, overflow plastic, as well as deck trim edges. Lower quality tape can be used in areas where solvents, weather and resin protection is less important. Avoid blue painter's tape, green frog tape and lower grade masking tapes in these critical areas. 3M 06338 tape has proven to be the most reliable against solvent and resin bleed-through. Duct tape rejects solvent and resin bleed-through; however, it leaves a high concentration of tape residue and glue behind when removed.



If jets and other mechanical parts are removed, be sure to tape up the back side of the unit where they were removed. This will prevent resin from dripping and forming on the back of the unit. Duct tape is acceptable to use for this purpose.

Note: Caulking is used to fill in gaps at the tape. The caulk will be removed when the excess FRL finish is cut and trimmed at the end of the process.





Use 3M 06338 tape at the unit's edges as a border to facilitate trimming at job completion as the final step prior to resin and lay-up. Throughout grinding and surface preparation, this area is not taped. As shown in the picture, painter's tape can be used for general taping purposes when working indoors. When refinishing outside, use the 3M 06338 tape as much as possible. The 3M tape will be necessary to protect areas from resin overage and splash. Use general purpose tape only on non-critical areas.



## **Setup tables to facilitate organized handling of materials during application:**

**Set up a table for tearing, cutting, and prepping the fiberglass.** The table will remain in place throughout the lay-up application. Start by making several pieces to initiate the process. More glass pieces will be needed throughout the process.

*Having an assistant will greatly improve efficiency of procedures.*



**Have a table for resin and chemical preparation.** Items on this table should include:

- 2 ½ quart mixing buckets (10 or more)
- Mixing paddles (5)
- Quart of lacquer thinner with flip top (resin clean-up).
- FRL Resins in gallons or five gallon.
- FRL Resin Paste.
- Catalyst for resin and paste in dispensing bottle.
- Resin chart.
- Dipping and pouring resin transfer cup (8 oz./Qt)
- Box of latex gloves.
- Trash bucket (below table).
- Paper towels.





**Prepare a staging area next to the spa for mixed product:** (another table or decking) This is where mixed, catalyzed resin will be placed when ready for application. Other items should include:

- Paper towels.
- Lacquer thinner with flip-top lid.
- Gloves
- Application brushes.
- Trash bucket
- Acetone bucket and laminate rollers (see below).



**Prepare another staging area** next to the spa for the stacks of fiber glass mat pieces. This will give ease of access from inside the spa. A helper can hand these to the applicator for efficiency. Start with three different sizes 25-50 pieces each. The quantity needed of torn pieces can be estimated by measuring the length of the unit's straight edge (see mat preparation below).



## Mat Preparation:

Prepare the mat by tearing in one long tear. The goal is to create smooth, frayed edges. The majority of the pieces will lie on the surface and have no scissor-cut edges. Scissors are only used on pieces applied around trim, jets, lights, intakes and overflow fixtures.



All edges should be frayed. It is important to make these edges smooth for the very best feathering transition from one piece to next. When tearing, do not “bunch up” the edges. Bunching will be hard to roll out and difficult to create a seamless surface. Practice making the long tear. Bunching can be pulled from the edge with your fingers until the tearing technique is perfected.

Do not cut for the main application. The trim areas and straight edge areas will be cut straight with a torn edge combination of the fitted piece.

(See below for trimming edges)

## Prepare three different sizes of mat:

Choose three common size areas to make your stock pieces. The size in this picture is the smallest piece, approximately 3”X9”

Best application per piece is contour to contour. Try to tear the pieces to accommodate flat areas, stopping at the curves. It is easier to feather transition at the curves.

This piece is the medium piece, approximately 6” X 14”



**Size one**



**Size two**



Normally, the most common piece size is the larger piece, about 12" X 12" in this case.

Typically, these three standard sizes are sufficient for the majority of the surface. Custom sizing will be required during the application. However, do not tear mat within the space of the unit so torn fibers will not fall onto the working surface.

Sizes will vary due to the size and contours of the unit. Larger flat areas can accept larger pieces. It is recommended that the largest pieces be no more than 30" X 30" for ease of lay-up and resin roll-out.

Regardless of recommended sizes, map out your surface area and use the sizes that fit.

### **Preparing the trim and edge pieces:**

Tear long pieces approximately 6" x 48" or the length of the mat stock. Measure the length of the edges of the spa and estimate approximate coverage.

Cut the piece directly down the center of the frayed long piece leaving about a 3" wide piece with a very straight edge. Invest in a very high quality pair of large scissors for best results. High-quality scissors can yield a straight cut edge without having to draw a line.

The final piece will be trimmed of any leftover frays or hairs remaining on the straight cut edge. Not only will the high-quality scissors give a clean cut, they will also trim the excess strands with ease.

Since these pieces will be the first application of resin and mat, it is recommended to prepare these pieces first. They will be cut from the freshest pieces of glass.

Lay these out and store them in a safe place so they won't be disturbed through the remainder of the mat preparation.



**Size three**



## Resin Preparation:

Choose a preferred mixing volume, 8oz or 16oz. For this size (8 foot) spa, 8oz mixture is recommended for the trim pieces and 16 oz is best for the main lay-up.

Lineup (3 or 4) 2 1/2 quart buckets. Pour in a pre-measured amount of resin (with 8oz. or 16oz. dipping cup) into the multiple buckets on the table. Catalyze one bucket of resin at a time. Stir and immediately place that mixed resin bucket next to the unit on the designated "mixed product staging area." Keep only the mixed resin bucket on this staging table. This will help to avoid applying non-mixed resin to the surface. Resin working time is 20 minutes at normal ambient temperature. A 16" x 16" area will require approximately one pint (16oz.) of resin.

The best method to dispense catalyst into resin is using a dispensing bottle. Stir in calculated amounts based on application working temperatures and working area size. Place cleaned, used stir sticks in designated bucket for reuse.

Adjustment of catalyst will occur during the process. Start with recommended starting mixture; adjust as needed. (See mixing and ratios section near the top of the instructions).



## Mat and FRL Resin Application:

With the surface sanded, prepped, repaired, reinforced, solvent washed, cleaned dry and taped, it is ready for resin and mat application.

**Edge and trim lay-up application:** This first process will describe the general resin and mat application. Do not start on this part of the application (hands on) until reading the "Main area lay-up" application. The main area application will give details.





The lay-up process is started on the lip or outside edge of the spa. With a two-inch brush apply a generous amount of resin to the surface area, which is a little larger (a few inches) than the mat size to be used. The resin will be applied wet enough to prevent excessive running but have a good gloss.



**Stage One (apply resin)**

With the resin still wet, immediately apply the piece of mat over the resin allowing it to soak into the mat. Apply two feet sections each time. Be sure the straight cut edges are trimmed and do not have strands projecting from the edge. Align the edge to be even with the substrate's straight edge for uniformity.



**Stage Two (apply mat)**

With the same resin mixture and brush, apply more resin over the unsaturated mat.



**Stage Three (apply resin over mat)**

Continue applying mixed resin from the bucket to the top of the mat until it is thoroughly saturated. Throughout this process of resin application, apply resin and smooth the glass leaving no visible air pockets or lumps. Apply the resin in multiple directions to achieve a consistently saturated piece of mat.



While the FRL Resin is still wet (not cured), and using a barrel laminating roller, smooth out the saturated mat to a uniform appearance. If an air pocket is present, it will appear as a bubble. Work out the bubble by rolling back and forth and in different directions until the bubble has disappeared. If the bubble will not lie flat, add more resin with the brush. The purpose of the roll-out process is to remove any waves or deep ruggedness. There should be enough working time to achieve this result. The next layer or adjacent application can be applied immediately. Continue this process until the entire lip is completed.

The previous resin application will cure behind you as you proceed with each new piece of mat.



**Stage Four (roll-out)**

Next, using the same cut/torn style pieces, complete the same process up to the overflow and/or control panel areas that have a flat edge.

- Apply FRL Resin
- Apply Mat
- Apply FRL Resin over mat
- Roll out



## **Mat application around jets, intakes, lights and round fixtures:**

In order to be ready for all surface areas, it is best to prepare round area mat pieces for the holes at the same time as the trim pieces.

Tear a round piece of mat approximately three inches larger in size than the jets or fixtures. Using a cup bottom trace a round mark with a pencil in the center of the piece. Cut a hole using the guideline. The cut hole does not need to be the exact size of the jet. A hole size within a 1/4" of the jet diameter is adequate.

Tear this piece into four equal quadrant sections. Use the same uniform tearing method to prevent bunching the frayed sections. Keep the cut edges clean without strands. After tearing, it may be necessary to trim the clean edges with scissors again.

After the FRL Resin is applied to the surface, apply the first pie piece just up to the edge of the round fixture edge leaving about a 1/8" gap. Complete the pie application using the same method:

- Apply FRL Resin
- Apply Mat
- Apply FRL Resin over mat
- Roll out





Throughout the FRL Resin application, the mat can be moved over to the fixture's edge with the brush as resin is dabbed and saturates the mat. Be sure to bring the mat just to the edge. Do not overlap the mat as it is placed onto the fixture. Some resin will get onto the tape. This is acceptable.



Be sure to roll out the application directly to the edge of the fixture, leaving no air pockets or voids at the edge.



## Main area lay-up:

Now that the edge trim areas, jets, control panel areas, overflow and intakes have been completed, the main area of the unit can be laid up. At this point, a stack of prepared mat sections have been torn to three different sizes.

For these larger areas use the 3" or 4" brush for best resin application.

**Stage One:** Apply catalyzed FRL Resin on an area larger than the piece being applied.



Stage One (apply resin)



## Drips and runs:

Note: Throughout the process, when the resin drips from the brush onto the working surface, be sure to remove the drips while the resin is still wet.



Remove drips and runs

## Drips and runs:

Spread the drips before they begin to cure. It is not necessary to remove them by wiping with a solvent. Excess drips or build-up will have an adverse effect on the lay-up process, such as creating air pockets and bubbles.



Remove drips and runs

**Stage Two:** Apply the mat piece directly over the wet resin.

As a rule apply a piece that fits from the general radius of the area to the next radius.

**Do not overlap** contours or radii, since this might create air pockets and bubbles. Allow the torn mat edges to feather into the radius as a stopping point for the mat. The next adjacent piece will feather into the same radius, laying and feathering onto the adjacent piece. This provides a smooth transition from one piece to the next.



Stage Two (apply mat)

An area that has been wet out with resin can accept several adjacent pieces of mat to complete the lay-up for that area. Be sure to overlap the dry pieces where they meet at the flat surfaces. Do not allow bunching of the torn mat edges. A smooth transition from one piece to the next adjacent piece must be created for a seamless transition.

Apply smaller sections in restricted areas.



Apply several pieces of mat to resin area

**Stage Three:** With the initial application of resin still wet and the mat applied, complete the mat wet-out using the 3" or 4" brush. Do this with liberal amounts of resin from the bucket to the dry mat.

The goal is to apply resin without disturbing the smooth lay out of the mat application.

This will yield a seamless surface from one area to the next.



Stage Three (apply resin over mat)

Continue to apply resin liberally. The resin should be dripping from the brush. Do not try to brush off excess resin to the side of the bucket. The goal is to allow the excess resin to drip back into the bucket from the brush, or bring the resin to the mat.

Continue this process until the FRL Resin saturation is equal over the entire surface of each piece of mat.





Note: The mat will absorb large amounts of resin. The goal is wetness uniformity. If the mat is sufficiently saturated, it will allow the brush to spread to the mat evenly without bunching.

The next piece of mat can be started as the prior pieces are beginning to cure (gel). Be sure there are no missed areas and that the resin saturation is complete before continuing to next areas.

***Do not let the resin cure before roll-out!***

Watch your cure times and adjust catalyst levels appropriately.

**Stage four:** While the resin is still wet, roll out the lay-up to a smooth consistency and appearance. Air pockets might be visible. They can be rolled out by moving the tool back and forth over the area.

The laminate roller is the proper tool to roll the surface smooth. Maintaining a smooth surface during the wet lay out process will leave less work at the end. Waves, bumps and bunching can and should be rolled smooth as they occur. Additional resin may be required to achieve smoothness.

***Do not let the resin cure before roll-out!***

In contoured areas allow the roller to follow the radius. Firm pressure during rolling will eliminate air voids, making the contours smooth. Too much pressure on the roller can create waves and dents on the lay-up. Maintain firm pressure and uniformity to create flat roll-out.



**Stage Four (roll-out)**



Different size laminate rollers are available for varying radii. Two or three different radius tools are recommended for an efficient application.



**Keep roller clean!** Cleaning the laminate roller properly and often throughout the process is essential. Use a gallon bucket one-half filled with acetone. Proper cleaning can be accomplished by shaking the roller directly inside the bucket of acetone. Do not leave rollers in the acetone bucket overnight or for long periods of time. Remove rollers from acetone when storage will be longer than one hour. Periodically pour acetone onto the roller to remove residual resin film.

The bucket of acetone should be close to the technician throughout the lay-up process. This will be the resting place for the laminate roller. When tool is rested at bucket, shake and clean the tool in the solvent.



## Lay-up work flow:

Pre-plan the application and plan an exit from the unit at completion. The best lay-up procedure progression will go as follows:

1. The outer edges first (cut and torn pieces).
2. Flat trim areas around panels, overflow, and smaller edge areas (cut and torn pieces).
3. Jets and round fixtures (torn pieces with round cut out) Pie application.
4. Main lay-up (torn pieces, typically three sizes).

After all pieces are finished around the entire outer edge, the jets, intakes and skimmer have been prepared, it is time to start the main surface area. It is recommended to start at the top lip, going down the sides.

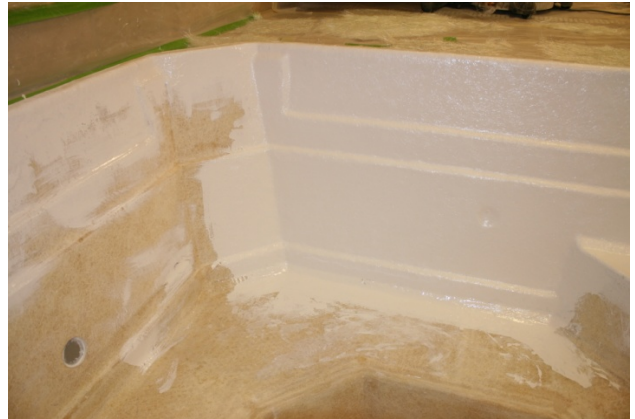




Note: On this illustration the jets have been removed with the holes taped up from behind the unit. The lay-up went over the jet and fixture holes. These areas will be trimmed at the end of the process (see Taping and Jet Removal section above).



Continue the application down the sides and around the unit before laying-up the foot well or bottom.



Concentrate on small workable segments (e.g. 3 ft. x 3 ft.) Mat size should be significantly smaller to complete the work area with several pieces. The working area is limited by the resin set-up time. Do not take on too much area so that resin cures before you can finish roll out. For each area, complete these application steps before continuing to the next 3 ft x 3 ft area:

- Wet the area with catalyzed resin.
- Lay-up mat over wet resin.
- Wet-out mat with the same mixed resin.
- Roll-out saturated mat while resin is still wet.



# REPAIR PROCEDURES

Plan for easy access to the working areas, while leaving the access steps for the end. This is the exit out of the unit and the conclusion of the lay-up application.

Note: The only thing inside the unit should be the technician holding the mixture of resin and a brush. The acetone container with the laminate roller(s) can be placed in the open area to be refinished.

The acetone container will be with the technician throughout the entire lay-up process.



After all side walls have been completed, apply the mat and resin to the floor of the foot well using the same procedures.

Note The main seat area is used for a technician position, and it provides a path to exit up the steps.

**Safety: The best protection from the chemical fumes and odor will be using a full face cartridge respirator. The odor at this level is extreme, and requires eye covering.**

*See safety instructions and MSDS for more information.*



With a helper, the lay-up process on this 8' x 8' unit should be completed in one work day. The goal is six hours. The fiber glass surface will have a dull gloss at the end of this stage. The next layers will be only resin layers to create the smoothness, texture and final finish.

Allow ample time for the next resin layers. Three to four hours should be enough time to complete the next stage. Unless work is scheduled though the night, this stage should be started the next morning.

However, as long as the previous applications are cured, the next applications can be applied.



## **FRL Resin application over lay-up:**

After the resin saturated mat (the lay-up) is cured, sand the surface to remove major roughness, bumps and imperfections using 80 or 100 grit wet/dry sandpaper.

The goal of the lay-up process was to yield a slightly rough surface that will require only minor treatment to create the desired surface texture.

(See FRL Application Panel)

At this stage the fiberglass surface will have a dry appearance.

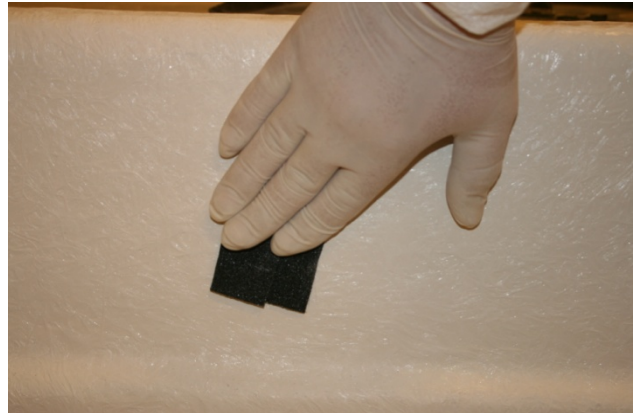
In a few areas grinding may be necessary, if the laminate is too rough or high. If an air pocket is present, it may be necessary to grind down to the original substrate; if so, it will require a patch using FRL resin and a piece(s) of mat. Make sure the patch area is smooth when completed.

After completing surface grinding, sanding and repair, check for the presence of dirt, sand paper grit, footprints and tool marks on the surfaces.

Vacuum any residual grinding and loose dirt.

Solvent wipe the surface prior to the next resin application.

*Wear appropriate respirator and gloves.*





## **Resin Application prior to final textures:**

With the surface cleaned and free of dirt, contamination, footprints and grindings, more layers of FRL Resin layers will be applied with a clean 4" brush. Be sure to remove any loose bristles from the brush.

Use 16 oz. quantities of resin to finish the surface. The process flow will be just like the lay-up steps. Start at the edge, work down the sides, and leave from the exit.

Allow the resin to cure one hour before applying another layer of resin. On hot days it will cure faster. This will also speed up the time between coatings.

Repairs can be performed at any stage between layers of (cured) resin or textures.

Use the FRL Resin Paste (white in color) to get best results and maintain an invisible repair.

The FRL Resin will hide most imperfections due to its applied thickness. However, areas that need to be filled or floated out may be visible. These can be hidden using the paste.

Catalyze the resin paste at the same ratios of the resin. 8oz. resin paste may be too much product. 4oz. resin paste may be a good starting point.

The goal is to hide the fiber glass appearance by applying heavy layers of resin. As layers are applied, use bi-directional brush strokes. This will fill pinholes, and the final surface will become smoother, glossier and pinhole free.

Texture is not intended at this stage in the process.

Brush any resin runs so they become smooth. The procedure will be like brushing enamel paint smooth.

As more resin layers are applied, the more the finish will become smooth and the fiber surface will disappear.



The FRL Resin Layer process will also need an exit plan.

Note: The sides and seats are smoothed out with this application. The foot well and steps will require less effort to create a smooth surface since they are left with a non-slip textured surface. Imperfections and roughness left in the surface will be difficult to see in these non-slip areas.

Cardboard or plastic film can be used to stand on. Be sure the resin is fully cured before placing the protective material, if not the cardboard will stick to the surface.

### **Foot well, seat and steps non-skid treatment:**

Using the FRL Final Resin, add the non-skid additive at a 32:1 ratio. This will be used to create a grip-enhanced area to the steps, seats and foot well where better slip resistance is desired. This can be done in two ways:

1. With a precise taped-off area. 3M tape is used for best results.
2. Simply roll out the product stopping at the radius while creating a clean edge with the brush.

Non-skid additive is available in heavy and medium grits. Medium is common and it is supplied in kits.

Note: The non-skid additive is medium in texture size where the texturing additive is fine in texture size. These are marked on the product label.

Apply prepared resin with non-skid additive using the white enamel 3" rollers to the desired non-slip areas. Do this prior to final texture coats on the main surface. Allow the catalyzed resin to cure.



### **Final Texturing procedure:**

The FRL Final Resin layers will be applied as the final two layers. This resin will use the same ratios used throughout the process, making corrections for ambient conditions. The recommended batch quantity is 16 oz. This procedure provides a consistent texture over the entire surface, which will appear as an orange-peel effect. It will greatly reduce visible imperfections in the surface and minimize the detail work required to achieve a perfect surface appearance.

Using a clean 4" brush, apply mixed FRL Final Resin with texturing additive to the surface in heavy coats. Apply it evenly to avoid sags and runs.



Use the texture roller to evenly roll the wet resin, which will create an even textured look. The wet resin (work area) can be as large as a quarter of the unit, or as much as is applied in 16 oz. batches.

The consistency of the orange peel will rely greatly on the selection and use of this specific texture roller cover. Although texturing additive will be mixed into the FRL final resin mixture, the proper use of the texture roller should yield a very consistent surface over the entire area. Alternate texture rollers may not give the desired effect and may deteriorate from resin attack.

Allow this application to cure. Even on warm days, allow a minimum of one hour before the final coat is applied.



**The final coat** will be applied over the textured coat. This will soften the texture while providing a resin-only coat as the final surface. It is applied by brush, using about the same resin coverage which was used for the textured coat. This final resin will not have texture additive. It will be only resin mixed at the same ratios without adjustment. Apply the final resin over the main un-textured surface up to the previously textured seats, foot well and steps. If desirable, it can be applied over those areas to soften that texture as well.

While the final coat is still wet, use the texture roller to adjust the final affect of the resin on the surface.



**Sealing the final coat:** Using PVA (polyvinyl alcohol) spray a light mist onto the surface to create a seal coat. The product should be sprayed on top of the final resin just as the final coat begins to cure. At this stage, the resin is in its gel stage. Correct timing can be determined by feeling the surface to confirm it has a gel feel with a slight tackiness. Generally, in normal ambient conditions, this will occur within an hour of application. Higher temperatures will cause it to cure much faster. The goal is to spray the PVA after the FRL resin starts to gel but prior to complete hardening. The PVA is a green color. It will cause the white surface to look light green. Try to spray without runs. It is water-soluble and will be washed from the surface with water leaving the resin sealed as the final coat.





## For best results;

Spray the PVA prior or at the peak heat of the day when working outdoors. This will optimize the advantage of the ambient heat. If working indoors, the temperature should be higher than 76°F to get the best cure.

## Force curing:

In colder temperatures force dry using space heater(s).

***Note the hazards of open flames. Be sure the resin is has gelled prior to placing space heater(s). Remove resin and flammable liquid solvents from the area. Do not use open flame space heaters on liquid resin!***



## PVA removal:

Allow the surface to cure for at least 24 hours prior to the removal of the PVA. The PVA will be removed with water. Sand with 320 grit sandpaper at the time of the PVA removal to eliminate any imperfections, small bumps and sand left in the refinish. As long as it was applied as a light mist, it can be removed simply with water and a wash cloth. A scrub brush may be necessary to remove high build up of the PVA.



## Safety Stripes:

With the surface clean and PVA removed, safety stripes can be applied with MTP K2000 color and clear coat. In this case, non-skid additive was added to the color coat to give extra grip for footing.

Tape the desired area with 3M tape. Sand with 220 grit wet/dry sandpaper, apply the textured K2000 base coat with a brush. Allow the base coat to reach a tacky state (10-15 minutes), and then apply K2000 clear coat over the textured base coat color for chemical protection.

Note: Dark color stripes will fade due to the high concentration of chemicals in a spa environment. Clear Coat is imperative for this protection.



## Removal of the tape on the fixtures and edge of the unit.

The unit's edge, jets and fixtures will have a high build up of resin left behind from multiple coats of resin and splash. The tape used to cover them will not be easy to remove by peeling. Use a chisel and tap the edge clean around the perimeter where the tape meets the surface. Once a clean line has been established, the tape will come free from the fixture.



The edge of the unit will require a larger chisel (2") to effectively tap a straight line at the edge of the unit and around the unit for tape removal.

This will give the cleanest edge prior to caulking with an appropriate sealant.

Tile and fixtures can be cleaned using lacquer thinner and a rag to remove any leftover tape residue or tack resin residue.



**Keeping the surface dry:** Allow the surface five to seven days before filling with water or allowing water to sit on the new surface. This process can be accelerated on hot days and/or forced heat cure. 72 hours would be the minimum.

See FRL consumer document for cleaning and usage.



## Other Tips and recommendations:

- a) For strait edges, mat should be cut and trimmed with sharp, sturdy, industrial-grade scissors.
- b) Do not overlap mat excessively (< 2").
- c) Before starting the job, if spa has air channel vents, make a template of the holes for re-drilling.
- d) Soak and clean brushes and rollers in a bucket of acetone between applications.
- e) Rotate resin mixing containers between applications to ensure gelled or half-cured resin does not contaminate next mixtures. Allow a few hours to pass before re-use of a resin bucket.
- f) A better quality 4" brush may be necessary for the final texture coats. Chip brushes give off hair strands; however, loose strands can be removed.
- g) To prevent contamination in the final coatings, it is recommended to use plastic sheet to stand and walk on during the process.
- h) If the surface is still tacky after a 48-hour cure and PVA removal, solvent wipe the surface with a generous amount of acetone and allow curing for an additional 24 hours.
- i) Do not allow the jets and intakes to leak water on to the uncured resin through the process.
- j) The best results are obtained when two people are available for the operation.
- k) A hand sprayer can be used to apply PVA. Be sure it sprays in a mist. When Spraying the PVA with a spray gun, spray at 55 plus psi.
- l) For an alternate to the catalyst dispensing bottle, use medicine cup for catalyst cc measurements.



m) **Work flow time frame on an 8 x 8 foot unit:**

**First day:** Prep and Set-up (Allow 4-6 hours)

- Stage and set up the work area.
- Grind and prep the surface.
- Prepare the pieces of glass fibers.

**Second day:** Lay-up the resin and fiber glass. (Allow 6-8 hours)

**Third day:** Resin coats and non-skid (2-3 hours)

**Forth day:** Final texture coat applied at or prior to peak heat of the day. Heat most important for best cure of this stage. (1 hour)

**Fifth day:** Remove PVA, trim and tape. Clean up. (Few hours)

**Quicker:** Work can be combined to achieve a non-stop process within less than two days. Utilize forced heat to accelerate cure times and complete the process within time constraints.

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