

Formglas® FRP is a fiberglass reinforced plastic composite made with polyester resin and multiple layers of chopped strand mat glass fiber. Formglas® FRP has been fire tested to the ASTM E84 Standard and is classified as a Class 1 (or A) material with a Flame Spread Index  $\leq 25$ ; Smoke Development Index  $\leq 450$ . These installation instructions are general in nature. Refer to the shop drawings for specific details.

### STORAGE & HANDLING:

Delivery time should be scheduled to minimize storage time of Formglas® FRP parts at the job site. Parts shall be kept clean and stored on a dry surface and not stacked or leaned on each other to prevent distortion and other physical damage. Use gloves when handling unpacked items.

### ITEMS FOR INSTALLATION:

Screw gun; Drill, bits, countersink and counterbore bit; #10 TEK Screws; Level; Saw(s)-see Cutting Instructions below; Dust masks or Respirator; Gloves; Sandpaper #120/150 grit; Wet Sandpaper #180/240/320/400/600/1200 grit; Painter's tape; Flexible scraper; Clean rags; Stir sticks; Mixing containers; Acetone; Catalyst - MEKP (Methyl Ethyl Ketone Peroxide); Caulk for joints (supplied by others); Gelcoat putty; Polyester adhesive (supplied by Formglas).

### CUTTING INSTRUCTIONS:

Cutting dust represents a nuisance dust when exposed to low concentrations from occasional cutting and grinding operations associated with the installation of Formglas® FRP parts that may cause irritation to the eyes, skin or respiratory tract. Take precautions to minimize exposure. Wherever possible cut/grind/sand outdoors or in a well ventilated area. Always wear goggles, a respirator (or dust mask), and protective clothing to minimize any irritation.

Use the most applicable method listed below for the type of cut required:

- A reciprocating saw with a medium composite type blade.
- A hand held disc grinder with a 4" (100mm) diameter medium composite or Diamond blade.
- A chop saw with a medium composite or Diamond blade for cutting small moldings or batten strips etc.

#### Method:

To prevent chipping the Gelcoat surface, apply painter's tape over the cut line and cut through the tape. Perform a test cut(s) first to validate the saw and blades effectiveness.

### GENERAL NOTES:

- 1) The support structure and/or framing to accept FRP parts and fabrications shall be installed level, straight and true within 1/8" in 8 linear ft. (3mm in 2500mm).
- 2) The substrate shall be free of obstructions and interference that prevents the correct positioning and attachment of the FRP parts. Structural framing and substrate materials shall be of the proper size and design for the intended use and shall be sufficient to properly support the installed FRP parts.
- 3) Refer to the shop drawings for specific details to install the FRP parts and/or fabrications.
- 4) Part thicknesses may vary. Allow for shim spaces between the FRP and the substrate.
- 5) Attach the FRP parts using corrosion resistant screws, bolts or other fasteners as shown on the shop drawings. Additional bracing, or fastening points etc. not shown on the shop drawings, may be required to ensure a proper installation.

- 6) Wherever possible, FRP parts are to be installed with concealed fastening methods.
- 7) Monolithic joints used to make two or more parts appear as one continuous piece are generally NOT recommended except for specific applications as detailed on the drawings.
- 8) All FRP joints must be caulked. A color matched or paintable one-compound elastomeric, low modulus, polyurethane sealant or equivalent is recommended - caulk supplied by others (e.g. Sonolastic Ultra or equivalent).
- 9) Apply painter's tape on either side of the joint and avoid smearing caulk beyond the joint - remove any excess immediately.
- 10) Use spacers to maintain a uniform gap between parts and install a bond breaker tape inside the joint over top of the fasteners.
- 11) Formglas supplies a gelcoat putty for hole patching of the same color as the parts supplied.

## ATTACHMENT:

### 1. Concealed Fastening:

Wherever possible, FRP parts are to be installed with concealed fastening methods such as beneath flashings or behind caulked joints. Parts should have pre-drilled oversize clearance holes for fasteners and neoprene shims (or equivalent) installed behind the panel edges being fastened to facilitate movement due to expansion and contraction. A bond breaker tape should be applied inside the joint over the top of the fasteners prior to caulking the joint. Refer to Figs. 1 and 2 below.

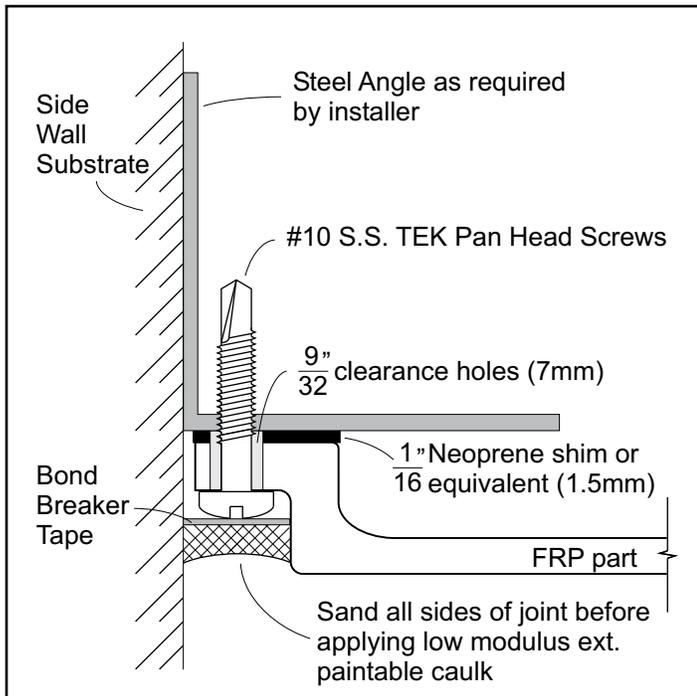


Fig. 1 Attachment Detail to Side Wall

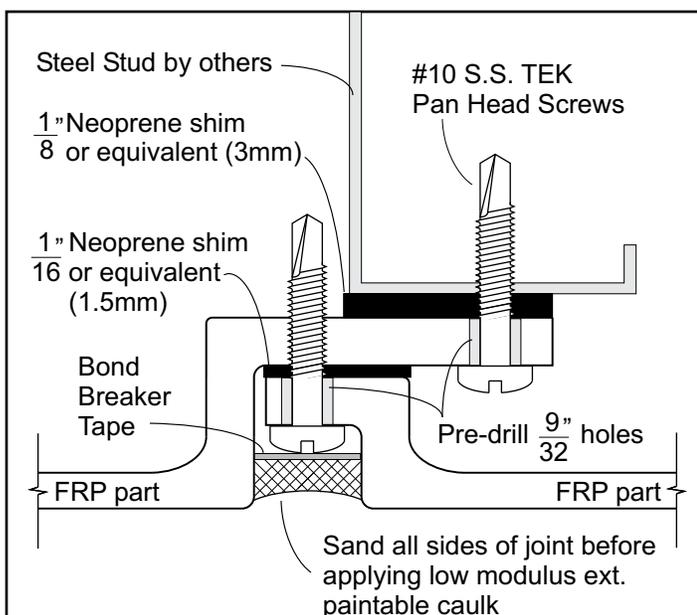


Fig. 2 Attachment Detail of Overlapping Parts

### 2. Face Fastening:

Where face fastening is called up on the shop drawings for attachment to the structure the fiberglass components should be pre-drilled and counterbored to accept No. 10 self-tapping screws with their length and thread style to suit the condition (stainless steel fasteners are recommended).

Screw holes should be filled afterward with a color-matched gelcoat putty and sanded or polished to match factory finish. A gelcoat top coat may be required to achieve a high-gloss finish. (Gelcoat materials supplied by Formglas - refer to the applicable instructions on page 4 for procedures).

### 3. Pre-mitered Corners:

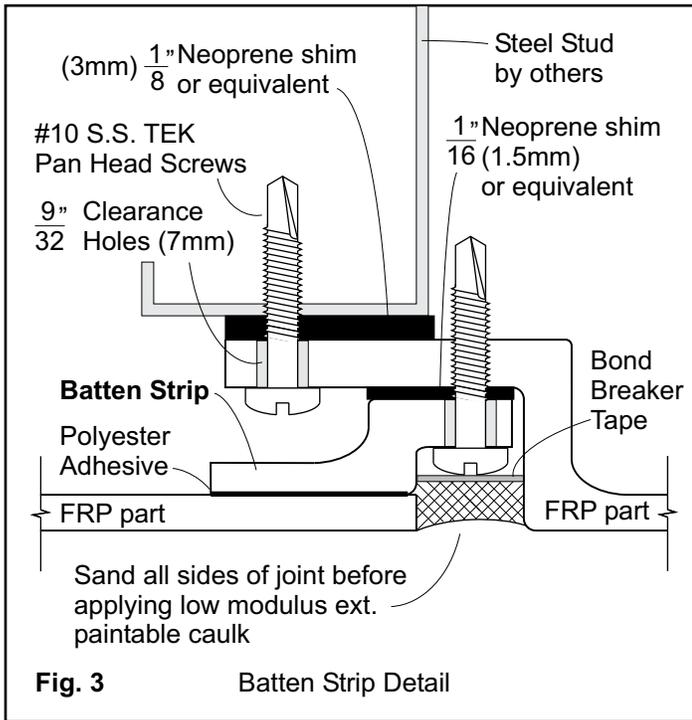
Where fiberglass moldings are supplied with pre-mitered flanged ends it is best to pre-fabricate the corner before attaching it to the structure. To do this, align the moldings and clamp the flanges together. Then drill bolt holes through the flanges 3" o.c. to receive a 5/16 hex head bolt. Unclamp the moldings, mix and apply MMA adhesive or fiber filled polyester adhesive to the flange of one part, assemble, and bolt tightly together. (Polyester adhesive supplied by Formglas refer to applicable instructions on page 4 for procedures).

### 4. Field Cutting:

Where shop drawings call for the component to be field cut to suit site conditions, the fiberglass part can be cut using a reciprocating saw with a medium composite type blade. To prevent chipping the gelcoat it helps to apply masking tape along the cut line, then cut through the tape. If after field cutting, two parts of similar profile are to be joined together the preferred method is with Batten strips - see item 5. below. Alternatively, it is recommended that both parts be face fastened to the support structure, then if access permits, fiberglass the parts together on the backside using polyester resin and fiberglass mat. The joint on the show face can be filled using gelcoat putty supplied by Formglas or "Bondo", then sanded and finished to match the factory finish of the parts.

### 5. Batten Strips:

In situations where an intermediate part's length must be cut shorter to meet job site conditions and attached to other overlapping parts, the use of "Batten" strips for attachment purposes is recommended. Formglas can supply Batten strips for attaching to the backs of cut FRP parts. The Batten strips are attached to the cut FRP parts with the use of a polyester adhesive - use only a polyester adhesive supplied or recommended by Formglas for this purpose. After the batten strips have been securely bonded to the cut FRP parts, install them to the adjoining FRP parts and framing or substrate as shown in Fig. 3 on page 3.



## 6. Typical Monolithic Joint & Finishing:

Note: Monolithic joints are NOT generally recommended. Use only when indicated on approved drawings.

### Joint Preparation:

- Install the first component as per shop drawings.
- Dry fit the next component to the installed component to insure the joint fits and aligns:
  - For a bolt flange detail; align the joint, clamp the flanges together, and drill the clearance holes for the bolts. This will allow the bolts to align the joint when the components are fastened together
  - For overlap details; after the joint is fit together, remove the part and drill and countersink the clearance holes for the screws through the tape joint bevel.
- With 150 - 180 grit sandpaper sand the joint where components will be contacting each other, the tape joint bevel, and the face of the components extending ~ 2" out from the center of the joint. This will ensure the surface is cleaned of any dirt, oils or waxes.

### Joint Assembly:

- Apply a continuous bead of adhesive to the mating faces of the installed component. For this application, Formglas recommends a methacrylate adhesive system (Plexus MA550 or equivalent) or a fiber filled polyester adhesive with an extended 'gel time'.
- Assemble the prepared component to the installed component, fastening the part to the framing and

mechanically fastening the joint flanges together. Refer to Fig. 4.

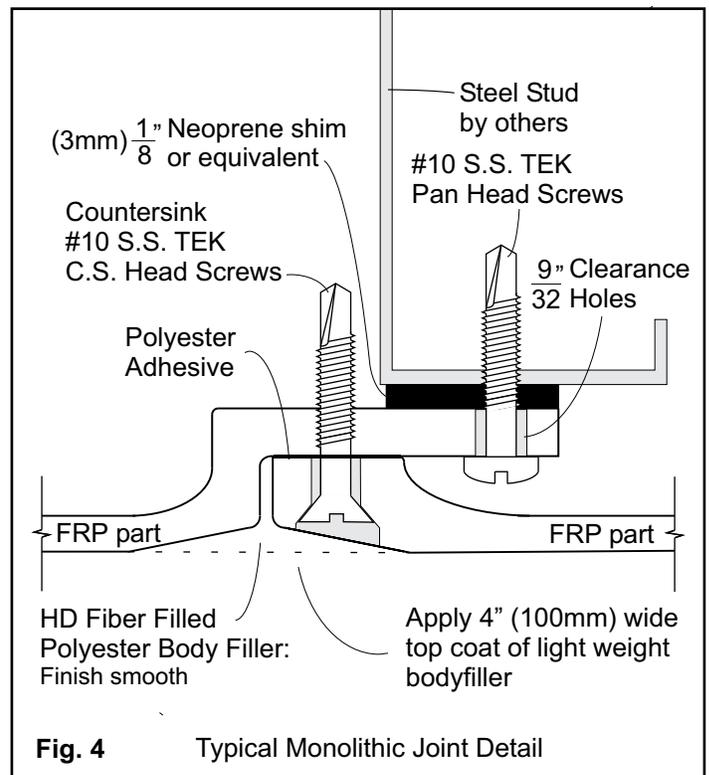
- Wipe off excess adhesive and allow adhesive to cure. (For the MA550 the cure time is ~ 2 hours depending on temperature).

### Joint Filling:

- Using a heavy duty, fiber filled polyester (automotive) body filler; fill the joint, allow to cure, and sand the filler smooth to the face of the FRP components. Finish sand with 120 - 150 grit sandpaper.
- Using a light weight polyester body filler of fairing putty, apply a thin layer over the first fill extending out ~ 2" from the center of the joint. Allow to cure and sand, tapering the patch from the center of the joint to where it meets the face of the FRP component. Finish with 150 -180 grit sandpaper.

### Painting:

- Lightly sand, with #220 grit sandpaper, the complete assembly of components.
- Ensure all of the body filler used for hole filling, patching or repairs is primed before painting. Use a primer that is compatible with the finishing paint.
- Finish paint: check with the paint supplier for recommended paints. Formglas suggests 'high solids polyurethane' for exterior applications and acrylic, polyurethane, or oil based enamel for interior applications.



## **PATCHING, FINISHING and REPAIRING:**

### **1. Instructions For Mixing And Applying Polyester Adhesive:**

**Note:** The working time for polyester adhesive #62-32 is 15-20 minutes depending on the ambient temperature. Best results are obtained when temperatures are above 65°F [18°C]. **Do not mix more material than can be used within the working time.**

**Preparation:** Sand the surface where adhesive is to be applied to ensure that all surface oils or mold release agents are removed. Dry fit the components to ensure proper fit and alignment. Mask any areas on the show face where excess adhesive might flow over when components are clamped together. Clean surfaces to be glued with Acetone or Methylene Chloride.

**Mixing:** Measure out the amount of #62-32 adhesive required into an 8 oz. (240 ml) container and catalyze at a rate of 1 to 1½ % by weight (3-5 gms. per 227 gms. or 3-5 cc. per 8 oz. ) Mix thoroughly with a small putty knife until the mixture turns color. (A uniform change in color indicates that the adhesive and the catalyst have been thoroughly mixed).

**Note:** Catalyst is to be supplied by the installer. The catalyst is M.E.K.P. (Methyl Ethyl Ketone Peroxide) which is available from most Auto Body or FRP products suppliers.

**Application:** The catalyzed adhesive is applied by a putty knife to the bonding surface of one of the parts. Components should be clamped or bolted together and excess adhesive removed. The assembly should be left undisturbed for 3-4 hours for the adhesive to fully cure (dependant on temperature).

**Clean-up:** Prior to curing, the polyester adhesive can be removed by Acetone or Methylene Chloride. Once cured the adhesive must be removed by using a grinder or power sander. It is best to clean up the excess adhesive before it is fully cured.

### **2. Instructions For Mixing & Applying Gelcoat Putty:**

**Note:** The gelcoat putty supplied is the same color and batch number used in production of your parts. The working time for the gelcoat putty will be 15-20 minutes depending upon the ambient temperature. Best results are obtained when temperatures are above 65°F [18°C]. **Do not mix more material than can be used within the working time.**

**Preparation:** Sand the surface where the gelcoat putty is to be applied to ensure that all surface oils or mold release agents are removed. Clean the surface with

acetone or methylene chloride.

**Mixing:** Measure out the amount of gelcoat putty required into a 8 oz. container ( 240ml) and add catalyst at a rate of 1 to 1½% by weight (4 cc per 8 oz.). Mix thoroughly with a small putty knife. (Catalyst to be supplied by installer and should be MEKP (methyl ethyl ketone peroxide) available from most Auto Body or FRP products suppliers.

**Application:** The catalyzed gelcoat putty can be applied by a putty knife to the void or screw hole to be filled. Putty should be left undisturbed for 3 to 4 hours to cure depending on temperature. All polyester materials including gelcoat putty will shrink during cure therefore over fill the void or a second filling may be required.

**Finishing:** It is best to allow 3-4 hours for the putty to cure before sanding. This time will vary with temperature. Wet sand the putty patch until the desired finish is obtained starting with 180> 240> 320> 400> 600> 1200 grit wet sandpaper then polish with a polishing compound if high-gloss is required. When sanding the putty, be careful not to sand through the original gelcoat surface, use a block and sand lightly. If factory finish is sanded through gelcoat resurfacing will be required (Refer to 'Instructions For Gelcoat Resurfacing').

**Clean-Up:** Prior to curing, the gelcoat putty can be removed using acetone or methylene chloride.

### **3. Instructions For Performing Gelcoat Resurfacing:**

**Note:** The gelcoat supplied is of the same color and batch number used to produce your order. Properly catalysed this will allow a working time of 15-20 minutes (30-40 minutes with spray formula). Best results will be obtained when temperatures are above 65°F [18°C]. **Do not mix more material than can be used within the working time.**

**Preparation:** Sand the area to be resurfaced with 180 grit sand paper and wipe with clean acetone. This ensures that all surface oils and mold release agents are removed.

#### **Mixing & Application:**

**BRUSH:** Measure out the required amount of gelcoat into a paper cup. Add catalyst at a rate of 1-2% by weight (5cc per 8 oz. cup). **DO NOT OVER CATALYZE OR THE GELCOAT WILL NOT CURE.** Mix thoroughly with a stir stick. Using a soft brush apply an even layer of gelcoat over the area to be resurfaced. If gelcoat starts to thicken (gel); stop, clean brush and mix a new batch of gelcoat.

**SPRAY:** Mix material as detailed in “BRUSH” and thin with acetone (up to 25%) to achieve sprayable viscosity. Apply in 3-4 thin layers allowing 5-10 minutes between layers for solvents to evaporate.

**Note:** Catalyst to be supplied by installer and should be MEKP (Methyl Ethyl Ketone Peroxide) available from any Auto Body products supplier.

**Finishing:** It is best to allow 8-12 hours for the gelcoat to cure before sanding. This time will vary with temperature. Wet sand the gelcoat patch until the desired finish is obtained starting with 240> 320> 400> 600>1200 grit wet sandpaper then polish with a polishing compound if high-gloss is required. Note: Matt finish is achieved at a 240 level with no polishing required.

**Clean-Up:** Prior to curing, the gelcoat can be removed using acetone or methylene chloride.

#### 4. Instructions For Repairing FRP Laminate Fractures:

**Note:** The following repair method is used for damage which penetrates completely through or deeply into the entire laminate.

##### Repairs from the laminate side or inside:

- Prepare the affected area by cutting away the fractured portion of the laminate to the solid part of the laminate. A keyhole or saber saw works well to cut away these ragged edges.
- Roughen up the inside edges of the affected area, using a power grinder. Feather out the backside at least 1” beyond the diameter of the hole to be patched.
- Clean the surface and remove all paint or foreign substances.
- Use a template to give 'shape' following the show face to the part. Tape cellophane (or wax paper) in place over a piece of cardboard (or aluminum) large enough to completely cover the affected areas with the cellophane against the show face of the part. (Aluminum is used when contour is present).
- Cut glass fabric and mat to the shape and size of the hole. Cut another set of reinforcement 2” larger in diameter than the hole. The materials and total thickness of each set should approximate that of the part being repaired. A set of reinforcement should consist of multiple layers of glass fiber mat followed by a layer of glass cloth.
- Mix an ample amount of resin (approximately one pint per square foot) and catalyst (4cc/8 oz.) thoroughly. Using the hole-sized set of reinforce-

ment, daub catalyzed resin onto the glass mat to thoroughly wet it out. Wet out the glass cloth in a similar manner. Apply the mat against the surface inside the hole. Then apply the cloth.

- Roll out or squeegee out all air bubbles. Allow the area to cure well. Build this laminate up to the same thickness or greater than the thickness of the original laminate.
- Apply catalyzed resin and the larger reinforcement over the hole patch and the surrounding surface.
- After the laminate has cured. Remove the cellophane and backing from the outside of the hole. Rough up this surface from outside, feathering the edge with a power grinder. Fill any voids with polyester body filler and sand smooth to the show face using 180 grit sand paper
- Now follow procedures detailed in “Instructions For Performing Gelcoat Resurfacing”.

##### Repairs from the show face side:

- If it is not possible to access the backside (blind hole) of the part, a template will not be used. Cut a piece of cardboard half again the size of the hole. Then cut the fiberglass mat and cloth along the same outline as the cardboard insert. Cut a second set of fiberglass mat to fit the hole and a thickness equal to the part. Thread a wire or wires through the center of the cardboard insert and then through the sets of fiberglass.
- Rough up the inside edges of the hole to at least half again the diameter of the hole. If a power grinder cannot be used, thoroughly sand by hand with coarse sand paper.
- Mask the area around the repair with paper and tape to protect the show face.
- Wet out the fiberglass with catalyzed resin. Force the plug through the hole. (Don't worry about neatness, the first concern is a structurally sound repair) Use the wire to pull back and secure the plug until the resin cures. When cured, check adhesion of the plug and proceed.
- Grind and sand down the patch and feather the surface to the show face. Fill any voids using a polyester body filler. Using 80 grit sandpaper then 180, smooth and blend the surface to be coated into the surrounding show face surface.
- Now follow procedures detailed in “Instructions For Performing Gelcoat Resurfacing”.

##### CARE & MAINTENANCE:

**Gelcoat Finish:** The colored show face on your FRP

product consists of a 15-20 mil thickness of an isothalic NPG polyester gelcoat with integral color. This is a hybrid gelcoat formulated to provide color stability and weatherability for many years.

**Normal Maintenance:** To maintain the surface finish, clean with soap and water or household liquid dishwasher detergent. More stubborn stains, minor cigarette burns and scratches can be removed by wet sanding the mark out and renewing the gelcoat to the desired finish. Start with 180 >320 >400 >600 >1200 grit wet sand paper then polish with a polishing compound if high gloss is required.

**Gelcoat Repair:** Should the panel be fractured during installation or use and the damage is to the gelcoat only

(gouge or scratch) that is deep enough to penetrate through the gelcoat but not deep enough to penetrate through the fiberglass laminate, follow the repair procedures detailed in: "Instructions For Mixing & Applying Gelcoat Putty" followed by "Instructions For Gelcoat Resurfacing" on pages 4 and 5.

**FRP Structural Repair:** Should the product be damaged to a point where the fracture penetrates completely through the structural fiberglass laminate, follow the repair procedures detailed in: "Instructions For Repairing FRP Laminate Fractures" followed by: "Instructions For Performing Gelcoat Resurfacing". Refer to pages 4 and 5.

## FINISHING MATERIALS

### **Gelcoat Putty: (XPUTTY)**

Gelcoat Putty is a patching compound supplied by Formglas to match FRP part color(s) made from the same materials as the parts supplied for a particular Formglas Job#. Supplied in 1 pint cans at the time of order shipment.

### **Polyester Adhesive: (XPOLYAD)**

Polyester adhesive is a fiber filled polyester resin adhesive supplied by Formglas used to bond FRP parts to one another. Supplied in 1 quart cans. Note: Requires a commonly available Catylyst: M.E.K.P. (Methyl Ethyl Ketone Peroxide) which has shipping restrictions and is supplied by others locally e.g. Auto Body or FRP products suppliers.

Other Recommended adhesives supplied by others:  
Valspar #5787T00003FFK Polyester Adhesive  
Plexus MA550 - Methylacrylate Adhesive System

### **Gelcoat Resin: (XGEL)**

Gelcoat is a pre-finished surface coating of the same color as the parts supplied for a particular Formglas Job#. Supplied in 1 pint cans at the time of order shipment.

### **Caulk:** Caulk for use with FRP joints (Not supplied by Formglas)

Use an exterior grade, color matched or paintable, one-compound elastomeric, low modulus, polyurethane sealant (e.g. Sonolastic Ultra by Sonneborn/BASF or equivalent).