

Formglas® GRG is a glass fiber reinforced gypsum composite made with alpha gypsum cement and glass fiber reinforcement. It is used in a broad range of architectural applications. Formglas® GRG has been fire tested to the ASTM E84 Standard and has a Flame Spread Index = 0; Smoke Development Index = 0. These installation instructions are general in nature. Refer to the shop drawings for specific details.

STORAGE & HANDLING:

Delivery time should be scheduled to minimize the storage time of GRG parts at the job site. Parts shall be: kept clean; stored indoors on a dry surface; not exposed to high humidity; not stacked or leaned on each other to prevent warpage or other physical damage. Use gloves when handling unpacked items.

ITEMS FOR INSTALLATION:

Screw gun; Drill and assorted bits; Level; Saw(s) - see Cutting Instructions below; Disposable dust masks (e.g. 3M Cupped respirators #8710) or a Respirator; Screws, Shims, Misc. mounting hardware (depending on the parts to be installed); Gloves; Sandpaper #80,120,220 grit; Painter's tape; Flexible scraper; Clean rags; Adhesive; Gypsum joint compound; Caulk for joints (supplied by others, if required).

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® GRG parts and may contain trace amounts of respirable silica. Take precautions to minimize dust production such as using dust collection attachments on saws etc. 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 from the dust.

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

- A miter or table saw with a Diamond or Tungston Grit blade (80+ tooth carbide blades work well but dull more quickly).
- A hand held disc grinder with a 4" (100mm) diameter Diamond blade for small cuts or cut-outs.
- A reciprocating saw with tungston grit blade - use primarily for curved cuts or cut-outs.

Method:

Dry Cut only. Perform a test cut(s) first to validate the saw and blades effectiveness. Keep cutting surfaces clean to prevent parts from being marked.

GENERAL NOTES:

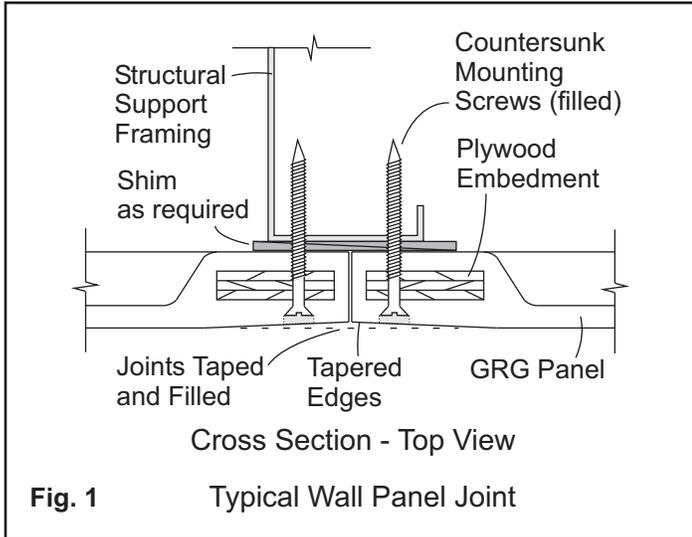
- 1) The substrates to accept GRG parts and fabrications shall be surfaced with suitable materials to suit the parts to be installed. Substrate surfaces shall be installed level, straight and true within 1/8" in 8 linear ft. (3mm in 2500mm).
- 2) The substrate and/or framing shall be free of obstructions and interference that prevents the correct positioning and attachment of the GRG parts. Structural framing and substrate materials shall be of the proper size and design for the intended use and sufficient to properly support the installed GRG parts.
- 3) Refer to the shop drawings for specific details to install the GRG parts and/or fabrications.
- 4) Part thicknesses may vary. Allow for shim spaces between the GRG and the substrate.
- 5) Attach the GRG parts using screws 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. Countersink screws below the GRG surface.

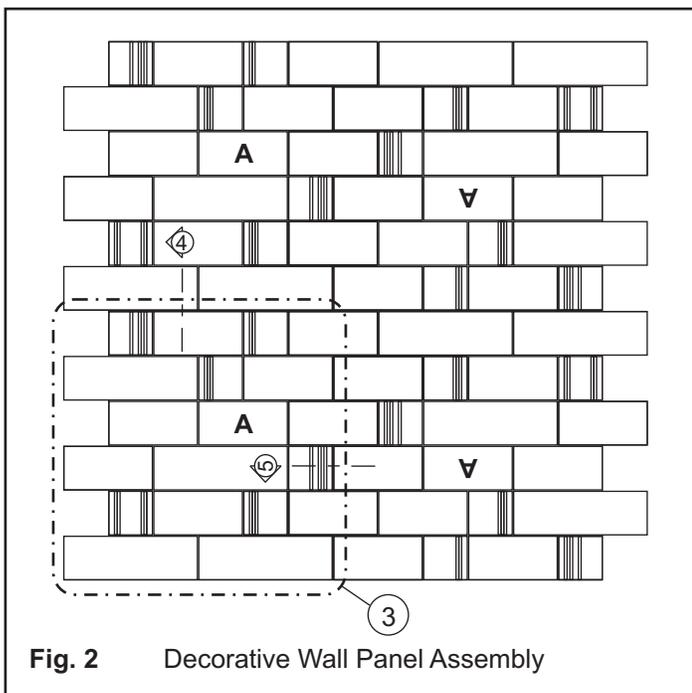
- 6) Large GRG parts shall be carefully lifted into place using suitable lifting devices and installed securely.
- 7) Where GRG parts are suspended, use all the suspension points indicated on the shop drawings as a minimum requirement, and use any additional support(s) as the site conditions may require.
- 8) Under certain lighting conditions (e.g. atriums, vaults, near light reflectors), fasteners, reinforcement, joint tape "read-through" may occur. A field applied skim coat may therefore be required.
- 9) Care should be exercised in selecting primers and sealers for use on GRG to make sure they will perform satisfactorily. The use of Glossy paint is not recommended for GRG.

Wall Panels:

Formglas GRG parts and panels are generally supplied unfinished and installed with face fastening methods to the substrate and/or framing, subject to the application. Typically, parts are secured in place with countersunk screws with the screw holes subsequently filled with joint (drywall) compound. Subject to the particular project design requirements, panels may be molded with a recessed tape joint for use with conventional wallboard joint finishing techniques. See Fig. 1.



In other applications, such as with wall panels with a patterned design, a spaced joint between panels may be desired that will be caulked. See Figs. 2 - 5 for an example of an application with a decorative wall panel with a patterned design. Fig. 2 depicts an assembly of 4 panels with a staggered block-like design. This assembly of 4 panels utilizes a single panel type, referred to as panel "A".



Alternating the panel orientation adds variation to the overall "block-like" appearance while reducing mold costs. Fig. 3 is an enlarged view of panel "A". Panel "A" has 6 block courses with a 1/4" joint space. All blocks have a uniform height but have varying lengths and have varying thicknesses so the blocks project out from each other as detailed in Fig. 4.

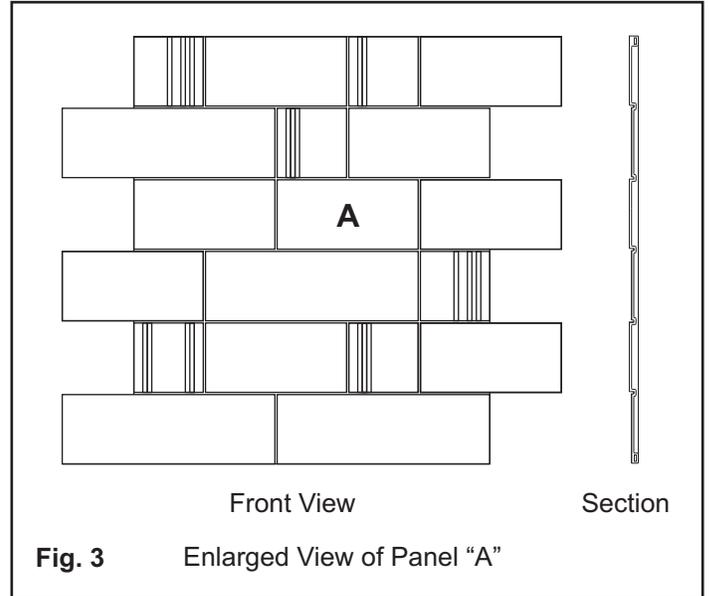
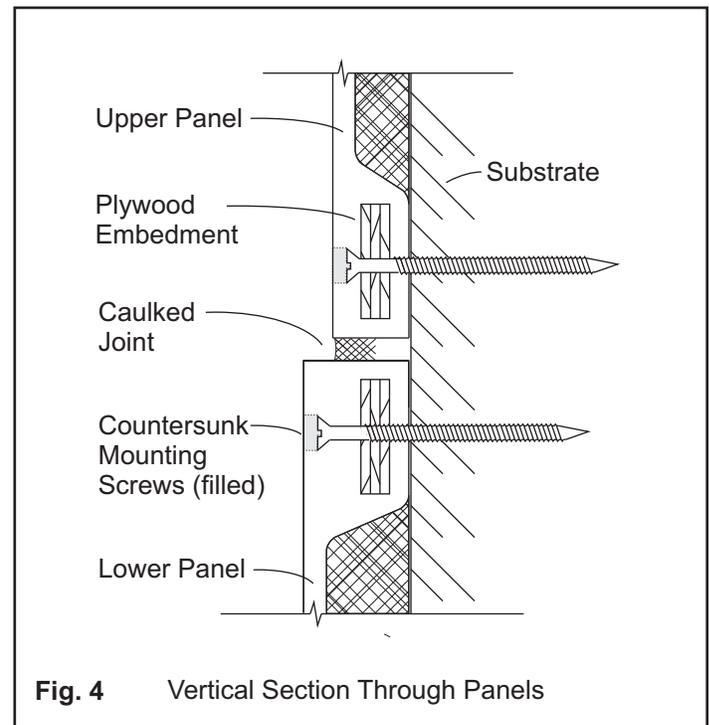
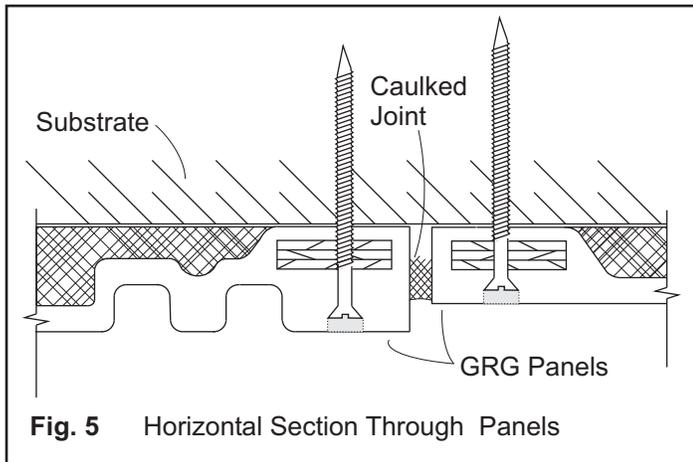


Fig. 4 is an enlarged cross-sectional view of detail 4 of Fig. 2 showing the horizontal panel joint. The bottom portion of an upper panel and the top portion of a lower panel are shown. Panels are installed with a 1/4" joint space to match the molded joint spaces between blocks. Use joint spacers to maintain a uniform joint gap. Panel edges typically have embedments to provide added strength and a means for secure



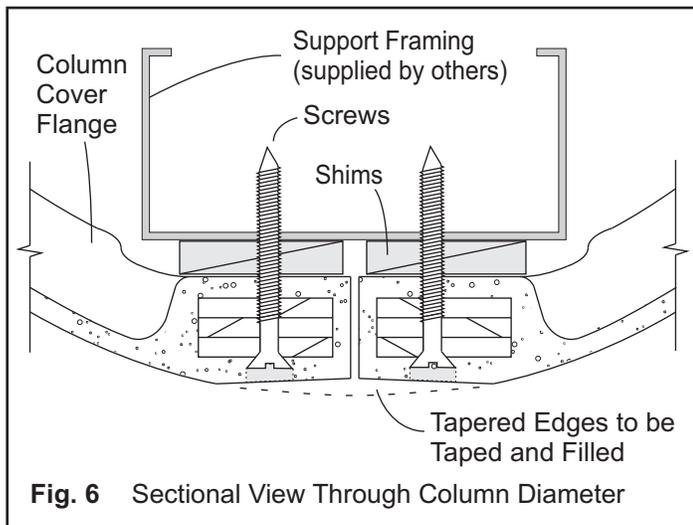
attachment. In this case, strips of plywood reinforcement are built into GRG panels. The panels are attached to the substrate with countersunk screws that extend through the plywood embedments into the substrate. In some instances, the use of construction adhesive may also be used to provide secure attachment. Use a recommended adhesive such as PL400 - see page 5 for adhesive and caulk details.

Fig. 5 illustrates an enlarged cross sectional view of detail 5 of Fig. 2. The portion of Panel "A" on the left side of this detail projects further out from the substrate than the adjacent portion of the "inverted" panel "A", on the right side of this detail.

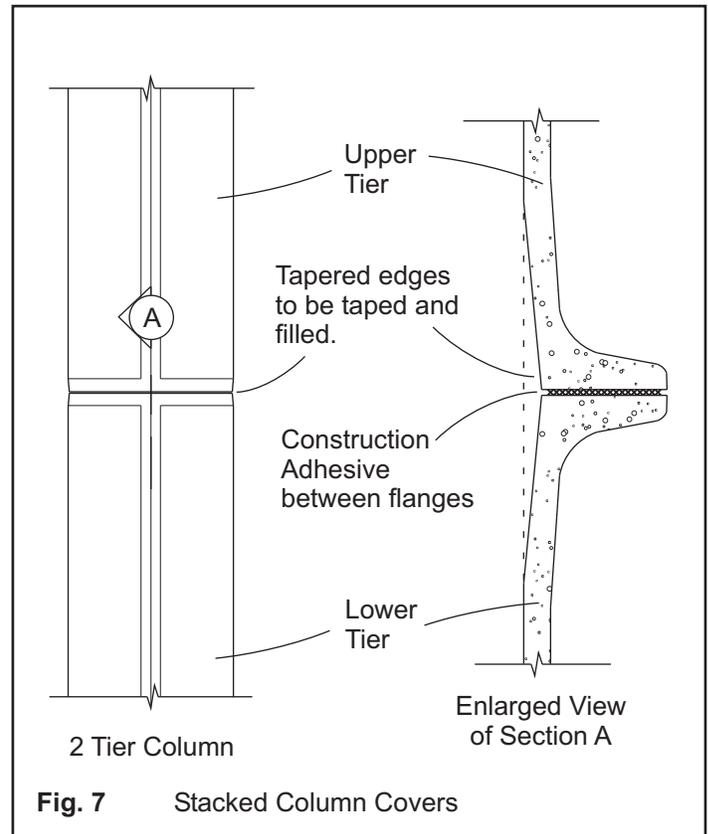


Column Covers:

The vertical edges of GRG column covers are tapered to accommodate joint compound and joint tape similar to finishing gypsum wallboard. This facilitates the continuation of the column curvature without a visible joint line. The column edges have plywood embedments to provide for the secure attachment of the column halves to the support framing (supplied by others). Shim the bottom flanges and vertical edges so the column covers are plumb, level and secure. See Fig. 5. Use construction adhesive as needed.



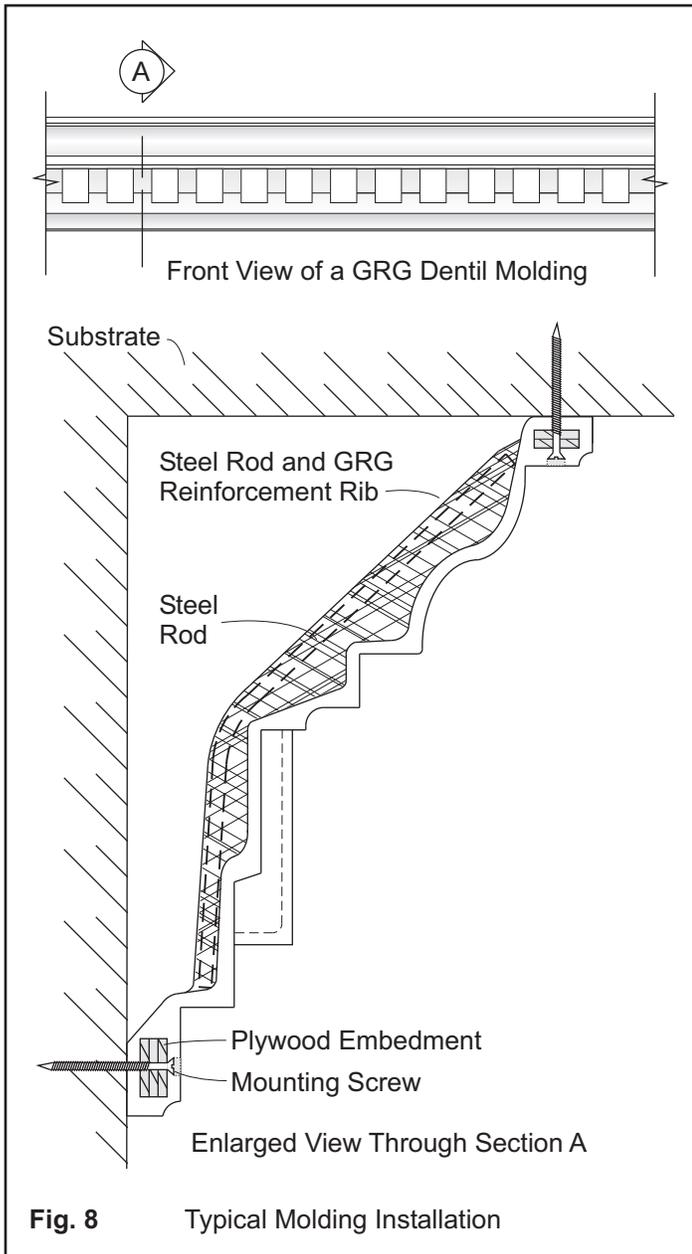
When the column height dictates the use of multiple tiers of column covers, the upper and lower edges of the column covers are also supplied with tapered edges to allow for joint finishing with typical drywall finishing techniques utilizing joint tape and compound. See Fig. 6. The use of construction adhesive between the upper and lower tier flanges is recommended.



MOLDINGS and OTHER COMPONENTS:

In most cases, GRG moldings and other components are installed with face fastening methods as detailed with the installation of wall panels and column covers. Use mechanical fasteners such as screws to secure GRG parts to the substrate and/or framing. Countersink screw holes so that the screws will be recessed approximately 1/16" - 1/8" (2 -3 mm) below the finished surface of the molding or part and fill the screw hole with gypsum joint compound as is done with patching drywall screws. Most GRG moldings and other components have built-in plywood strips embedded into the parts for reinforcement and attachment purposes. Install fasteners through these reinforced areas. Refer to the Formglas shop drawings for specific fastening details and the location of the reinforcement embedments. In some instances, the use of construction adhesive may be used in conjunction with mechanical fasteners to ensure a solid and secure installation. Depending on the molding size and profile, additional metal and/or glassfiber reinforced gypsum ribs may be incorporated into the part to provide additional strength.

For example, Fig. 8 illustrates a large dentil molding with a metal rod formed to the general part shape that is embedded into the molding with layers of gypsum and continuous glass fiber mat reinforcement combining the steel rod and GRG to strengthen the molding.



Variations in the molding size, shape and application affect the type of reinforcement required which may include other metal shapes such as angles, channels, z-bars etc. Moldings can also be made with a tapered joint at each end to join multiple lengths of moldings with a taped joint as is done with standard gypsum wall board finishing techniques. In addition, it is common to have molds made to provide pre-made inside and outside corner moldings to make perfect miter joints that will not come apart. This also makes the installation easier, however, a number of miter joints must be needed on the project to justify the miter mold cost.

CEILING PANELS:

The lightweight, high strength nature of GRG makes it ideal for use in ceiling applications. It is commonly used to make domes, vaults, coffers and other decorative ceiling panels. Large ceiling elements are assembled from multiple parts which are secured directly to a structural framework with face fastening methods similar to securing wall panels and other components - or- suspended with hang wire or cables. Metal angles, U-channels or other structural shapes are custom formed to the part's shape and embedded into the part with multiple layers of gypsum and continuous glass fiber mat. This adds greatly to the part strength allowing for larger part size, fewer joints and suspension points. Typically, ceiling panels are constructed with an overlap joint for attachment to each other as illustrated in Fig. 9.

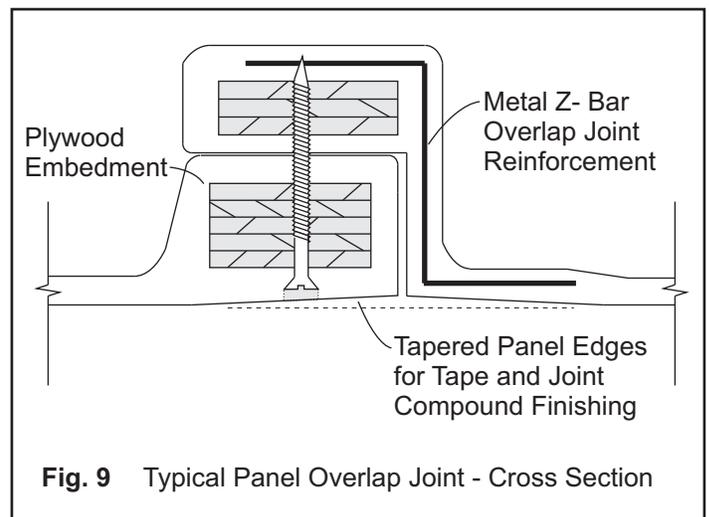
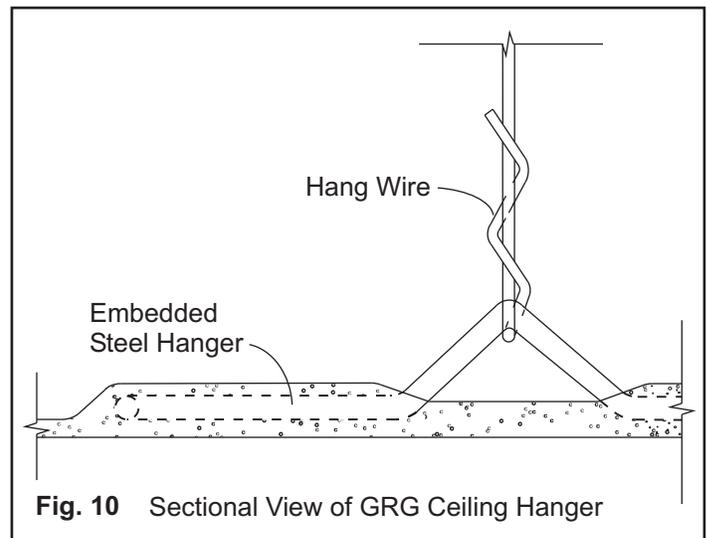


Fig. 10 illustrates a typical hanger embedded into a ceiling panel. The hanger is formed of 1/4" (6 mm) galvanized steel rod with the hangers ends formed outward in opposite directions to the hanger length. Additional layers of gypsum and glass mat transfer the load to a larger surface area beyond the hanger itself.



When ceiling panels or other components are suspended, use all the suspension points provided as a minimum requirement. Provide additional support as the site conditions may require.

FINISHING:

Unfinished GRG parts may exhibit slight imperfections, normally hidden by a textured finish. To obtain satisfactory results with smooth finishes, filling and sanding will be required to hide imperfections inherent in GRG. Under certain lighting conditions (e.g. atriums, near reflectors, vaults etc.) fasteners, reinforcement, and joint taping “read-through” may occur. A field applied skim coat may therefore be required. Use joint treatment materials to finish GRG parts and assemblies to produce surfaces ready to receive primers and paint finishes as detailed.

Proper priming of the GRG assemblies must be provided to avoid joint tape “read-through” due to the differences in porosity and absorption between the GRG parts and the joint compound material. In accordance to ASTM C1467, GRG parts subject to critical lighting or scheduled to receive a semi-gloss finish shall be prepared as a level 5 finish in accordance with ASTM Standard C840. Glossy paints are not recommended.

Care should be exercised in the selection of primers and sealers to make sure they will perform satisfactorily and fulfill the following functions:

- Provide a bonding surface for the paint to be used.
- Equalize variations of suction over the entire surface.
- Avoid nap raising.
- Before applying the primer, make sure the GRG surface is clean and the joint treatment material is thoroughly dry.
- Apply a sufficient quantity of primer or sealer in accordance to the paint manufacturer's instructions. More than one coat of primer may be necessary.
- Ensure primer is fully dried before applying paint.
- No less than two coats of paint should be applied.

See ASTM Standard C840 for other important industry specific finishing recommendations.

FINISHING MATERIALS

Joint Finishing and Patching:
Use gypsum wallboard joint compound for filling and patching along with joint tape as applicable.

Caulk: (Not supplied by Formglas) In applications where a caulked joint is required, the following Brand names are recommended.

Dow Corning 790 (available in variety of colors if a contrasting joint color is desired)
Dap Alex Plus White (Paintable)

Recommended Adhesives:
PL 400, PL 400voc, PL Premium - Manufactured by the Henkel Corporation - sold under Loctite and Lepage Brand names.
Note: PL400voc & PL Premium have 50 g/l VOC's or less for use at Green Building projects such as LEED® where low emitting materials are required.