

Trade Name
 Formglas[®] GFRG



Common Names
 Glass Fiber Reinforced Gypsum | GFRG
 Glassfiber Reinforced Gypsum | GRG
 Glass Fiber Reinforced Plaster Fabrications



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DOMES, LIGHT COVES, MOLDINGS, COLUMNS

FALLSVIEW RESORT, ONTARIO

Summary

Formglas GFRG is a composite of high strength alpha gypsum cement reinforced with glass fibers that can be factory molded into virtually any shape or size. Glass Fiber Reinforced Gypsum (GFRG) parts are usually provided unfinished for on-site painting. Formglas was the first manufacturer in North America to produce GFRG and has since evolved into the world's leading manufacturer of this versatile material. Formglas GFRG is a class A fire and smoke related material.

environmental perspective, GFRG is a lighter, stronger and more durable alternative that dramatically reduces the use of raw materials and the environmental impacts associated with their acquisition and transportation. GFRG is a product that embodies post-consumer and industrial recycled content, and yields other benefits for sustainable construction.

Detailed Description

GFRG is a white gypsum cement material that is molded into architectural elements used for construction and renovation of interiors. GFRG parts weigh approximately 2 lb/ft² ⇔ 10 kg/m² and are field-finished with paint or, depending on the application, factory pre-finished. Alpha gypsum is a material not to be confused with the softer, lower density and heavier gypsum used in drywall (gypsum wallboard) and traditional plaster applications. Where once traditional 'plaster castings' were used, GFRG is now specified because of its light weight, superior strength, sustainability characteristics, and ease of installation.

GFRG is commonly used to make decorative ceiling coffers, domes and vaults; columns, capitals and bases; wall cladding; pilasters and pediments; moldings, light coves and running trim; brackets and corbels; complicated geometric shapes, sculpted or perforated panels and many other decorative elements. These elements can be fabricated into virtually any shape or scale yielding fine surface detail, textures and patterns.

GFRG composites have enhanced physical properties compared to drywall or plaster, such as hardness and flexural strength. GFRG parts often incorporate embedments of steel or wood for added strength and to provide a means for attachment and suspension. Components are fabricated from precision made molds, therefore, finished components are dimensionally accurate and can be assembled with ease in the field.

GFRG ceiling elements are usually wire suspended. Most other parts are face-fastened with screws through built-in reinforcement that are countersunk and filled. Moldings can be supplied with factory-molded corners or they can be miter cut on site. For a monolithic finish, parts are made with tapered edges, and joints are taped in the same manner as gypsum wallboard. Parts are then primed and painted. The use of glossy paints for finishing is not recommended. However, architects and designers should contact Formglas to discuss their design intent.

Along with the fact that GFRG fabrications require less supportive framing, the reduced time and cost for installation versus field constructed shapes and components provides measurable cost benefits to the end user. From an

Most items are custom made to meet project design requirements and specifications. Formglas uses 5-axis CNC technology to machine precision patterns from which molds are produced to cast the required parts. In situations involving complex design elements or projects, Formglas will work with Architects and Designers to develop a practical plan for the parts and assemblies they envision through 3D modeling and/or scaled or full size mock-ups. Detailed shop drawings and material samples are prepared for approval prior to manufacture.

Technical Data

Refer to the following standards:

ASTM International (ASTM)

- C1381-2008 Standard for Molded Glass Fiber Reinforced Gypsum Parts
- C1467-2006 Standard for the Installation of Molded Glass Fiber Reinforced Gypsum Parts
- C1355-2006 Standard for Glass Fiber Reinforced Gypsum Composites

International Standards Organization (ISO)

- ISO 1182:2010 Reaction to fire tests of products - Non combustibility Test
- ISO 1716:2010 Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value)

European Standards (EN)

- EN 13501-1 Fire classification of construction products and building elements: classification using test data from reaction to fire tests

International Maritime Organization (IMO)

- FTP Code (IMO resolution MSC 61/67)

Physical and Mechanical Properties

Formglas uses alpha gypsum materials that are mined and processed in the USA from some of the world's purest deposits (over 99% purity of CaSO₄·2H₂O). Throughout the fabrication process, the gypsum material is subjected to strict inspection and testing to guarantee its high level of quality. Our prominent gypsum suppliers certify the raw materials are in compliance with the ASTM C1355 Standard.

Matrix:	Alpha Gypsum Cement
Finish:	Standard unfinished, white to off-white. Factory applied finishes available
Surface:	Standard smooth. Custom molded textured surfaces available
Density:	~105 lb/ft ³ ⇔ 1675 kg/m ³
Weight:	1½ -2 lb/ft ² ⇔ 7-10 kg/m ² **
Shell thickness:	3/16" ⇔ 5 mm nominal**
Edge thickness:	3/4" ⇔ 19 mm typical
Embedments:	Galvanized steel or wood (if required)
Glass Fiber:	5% typical
Max. length moldings:	12' ⇔ 3.6 m
Max. size molded parts:	40 ft ² ⇔ 3.7 m ²

* Typical weights: parts with deep surface relief or required added thickness (for acoustical mass) will weigh more. Please submit drawings for a more accurate estimate.

** Subject to manufacturing tolerances noted below. Weight and measurement conversions may be rounded.

ASTM C1355 and ISO Test Results

Flexural Strength Ultimate strength: Yield strength:	4700 psi ⇔ 32 MPa 1875 psi ⇔ 13 MPa
Flame Spread:	0
Smoke Development:	0
Behavior at 750°C:	Pass
Coefficient of Linear Thermal Expansion:	5.5x10 ⁻⁶ in/in/°F ⇔ 9.9 x10 ⁻⁶ mm/mm/°C
Humidified Deflection:	1/8" ⇔ 3 mm
Nail Pull Resistance:	176 lbf ⇔ 782 N
Impact Resistance:	6.5 ft.lb/in. ⇔ 8.8 j
Barcol Hardness:	60
Rockwell Hardness:	72 M scale
ISO Reaction to Fire Tests Mass Loss: Temperature Difference: Duration of Ignition > 5 sec:	20% 7°F ⇔ 4°C 0
Gross Heat of Combustion:	300 Btu/lb ⇔ 0.7 MJ/kg

Manufacturing Tolerances

Shell Thickness:	± 1/16" ⇔ 1.5 mm
Dimensional (all directions): Parts 8' to 16':	± 1/8" ⇔ 3.2 mm ± 3/16" ⇔ 5 mm
Warpage or Bowing:	± 1/16"/ft. ⇔ 1.5 mm / 300 mm

LEED[®]

GFRG parts needing to contribute to LEED[®] MR credits must be indicated at the time of bid request. Nominal additional costs may apply.



MR Credit 4: Recycled Content

GFRG parts can be supplied with a minimum of 10% recycled content. The actual amount varies depending on the individual part design and type of reinforcement used. For more information, visit the LEED[®] information page on the formglas.com website.

Other credits may be available including:

- LEED[®] MR Credit 2.1 and 2.2: Construction Waste Management
- LEED[®] MR Credit 5.1 and 5.2: Regional Materials
- LEED[®] EQ Credit 4.2 Low Emitting Materials: Paints and Coatings

■ Classifications and Approvals

In addition to the ASTM and ISO Testing, Formglas GFRG is classified as “A1” in accordance with the European Standard EN 13501-1. This standard provides the reaction to fire classification procedures for all construction products, including products incorporated within building elements. A1 is the highest classification possible. Class A1 products will not contribute in any stage of the fire.

Formglas GFRG is approved for use on cruise ships and marine applications with Module “B” and “F” Certificates of Approval in accordance with the International Maritime Organization (IMO) and Marine Equipment Directive (MED) regulations.

■ Delivery, Storage and Handling

GFRG parts shall be transported and handled in a manner that avoids damage or excessive stress. Packaging or components showing signs of damage should be marked as such on freight documents, inspected immediately, and claimed for any damage due to shipping with the freight carrier. Advise the carrier and Formglas of any damage immediately. GFRG parts shall be protected from rain, snow, sunlight, excessive weather conditions, high levels of humidity, and job site damage. To prevent distortion, warping, and other physical damage, GFRG parts shall be kept clean and stored on a dry surface and not stacked or leaned on each other.

■ Preparatory Work

Do not deliver or install GFRG parts until the building is enclosed and weatherproof, wet work is complete, and the HVAC system maintains temperature and humidity at normal occupancy levels. Acclimatize GFRG parts for a minimum of 48 hours to the ambient temperature and humidity levels of spaces in which they are to be installed. It is the installing contractor’s responsibility to order the correct material quantities (including a waste allowance) and verify the field dimensions and conditions for inclusion into the shop drawings.

Site Conditions:

Review the site conditions for compliance with Formglas’ requirements relating to environmental conditions, installation tolerances and other conditions affecting the installation and performance of GFRG parts. Any unsatisfactory conditions are to be corrected prior to installation. Field measurements are to be taken to verify the dimensions, including those not shown on the drawings, and provide specific details of any changes for inclusion into Formglas shop drawings prior to it commencing the manufacture of custom molds and GFRG parts. Formglas will produce parts in accordance with the approved shop drawings only, and is NOT responsible for any deviations between the site conditions and the approved drawings.

Substrates:

The substrates to accept GFRG parts shall be installed straight and true within 1/8” in 8 linear ft. ⇄ 3 mm in 2500 mm and shall be free of obstructions and interference that prevent the correct positioning and attachment of the GFRG parts. Metal framing members shall be of the proper size and design for the intended use and shall be sufficient to properly support the installed GFRG parts. Metal framing members shall be installed in accordance with ASTM Standards C754 or C1007, as required. The location and incorporation of control joints is determined by the architect.

■ Installer Safety

Installers are to wear appropriate personal protection equipment when handling or installing Formglas materials. This should include eye protection, gloves and dust masks. Please adhere to local regulations and rules established at the job site. Before handling and installing Formglas materials, installers are responsible for reviewing MSDS information which is readily available at www.formglas.com, or included with the crate(s) used to ship Formglas materials, or by calling Formglas at 1.866.635.8030.

■ Installation

Install GFRG parts as indicated on approved shop drawings, other recommendations and the contract requirements. Comply with ASTM C1467 Standard for the Installation of Molded Glass Fiber Reinforced Gypsum Parts. GFRG parts shall be carefully lifted into place using suitable devices and installed securely. The installing contractor is to supply and install all brackets and shims as required for the installation and proper alignment of the GFRG parts with adjacent parts and materials.

Attach GFRG parts to substrates and framing with screws, bolts or other fasteners as shown on the shop drawings. Countersink screws below the surrounding surface. Where GFRG parts are suspended, use all the suspension points indicated on the shop drawings or on the back of the GFRG parts as a minimum requirement, and use additional support(s) if required. Install control joints between GFRG parts as determined by the architect.

Unfinished GFRG 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 GFRG. 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 GFRG parts and assemblies to produce surfaces ready to receive primers and paint finishes as detailed. Countersunk fasteners and damage

are to be patched to match the GFRG part's texture. Note: In accordance to ASTM C1381 and C1467, GFRG parts are provided with a primer ready surface suitable to receive a flat paint finish. See "Finishing" below for more details.

■ Finishing

Finishing is typically completed by others, unless specialty pre-finished GFRG components such as Formglas Woodgrane™ are used. Proper priming of the GFRG assemblies must be provided to avoid joint tape "read-through" due to the differences in porosity and absorption between the GFRG parts and the joint compound material. In accordance to ASTM C1467, GFRG 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 primer 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 GFRG 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 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 finishing recommendations.

Note: Formglas also offers factory finishing for certain component types such as ceiling tiles. Be sure to ask your sales representative for further information.

■ Applications

To view photos of Formglas GFRG applications, or to contact a local Formglas representative, visit www.formglas.com.



FACETED COLUMNS

STEELCASE WORKLIFE CENTER, ILLINOIS



CEILING LIGHT SCOOPS & ESCALATOR CLADDING

MY ZEIL, GERMANY



DECORATIVE FISHNET CEILING

KOI RESTAURANT, NEW YORK



SUSPENDED WAVE CEILING ELEMENTS

GLOW RESTAURANT, ONTARIO



PERFORATED CEILING TILES

JEM STEAKHOUSE, CALIFORNIA

■ Samples Available

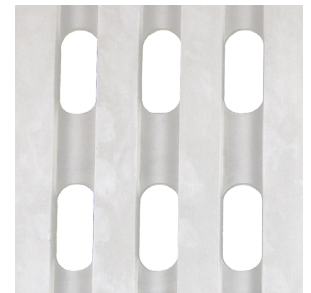
Below are five samples Formglas offers to demonstrate GFRG in various finishes and surfaces. We maintain an inventory of these, and samples can be requested by e-mail to either your local Formglas representative, or directly to samples@formglas.com.

Formglas is able to **custom fabricate** GFRG in a number of textures or patterns, and some may be available pre-finished. Please contact your local sales representative to learn more or discuss custom requirements for a specific project.



Formglas GFRG

Finish: Pearl White Paint
 Surface: Wave
 Sample Size: 3" x 3"
 Sample Code: 98035



Formglas GFRG

Finish: Paint Ready
 Surface: Slotted Rib
 Sample Size: 3" x 3"
 Sample Code: 98036



Formglas GFRG

Finish: Paint Ready
 Surface: Standard
 Sample Size: 4" x 5"
 Sample Code: 98127



Formglas GFRG

Finish: Paint Ready
 Surface: Elongated Perforation
 Sample Size: 5 3/4" x 7 1/2"
 Sample Code: 98128



Formglas GFRG

Finish: Paint Ready
 Surface: 3D Oval - Closed
 Sample Size: 3 1/2" x 5"
 Sample Code: 98129

Please note that colors shown on your display or printer output may NOT be an accurate representation of the actual product.