



## GFRC Cladding Systems, LLC

Glass  
Fiber  
Reinforced  
Concrete

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## Façade Re-cladding with GFRC

### What is GFRC?

GFRC, an acronym for "**G**lass **F**iber **R**einforced **C**oncrete", is a true concrete composite consisting of a Portland cement based mix with countless strands of alkali-resistant glass fiber embedded into the concrete matrix. GFRC does not have the graded rock aggregates or steel-reinforcing bars normally associated with concrete, and unlike concrete which is cast, GFRC is sprayed into forms in multiple spray passes to a uniform wall thickness of about 3/4".

As the concrete matrix hardens, the glass fibers act to greatly enhance the panel flexural and impact strength, making them ideal for exterior cladding or re-cladding applications. GFRC panels are lightweight (12-15 PSF), durable, and able to faithfully reproduce the color, texture, and feel of a wide variety of stone, masonry, and terra cotta materials.

Because GFRC does not require vibration when wet, panels can be cast in 3-dimensions with elaborate profiles and reveals, deep panel, soffit, and window returns, and finely detailed and subtle surface textures. Panels can be designed as wall units, spandrels, mullions, column covers, domes, cornices and three-dimensional sculptural architectural. GFRC is also used for fascia panels, soffits, sun screens, and interior feature panels.

### Why use GFRC for re-cladding Applications?

GFRC panels have a unique combination of properties that make them an ideal solution for facade re-clads and/or over-clads, as well as historical restorations and renovations.

- Panels have the color, texture and shape versatility to faithfully reproduce almost any existing non-glazed exterior facade;
- GFRC panels are up to 80% lighter than precast concrete panels, and can often be installed directly over existing facades without imposing excessive superimposed loads on the building structure;
- Panels have the low maintenance, longevity, and durability of precast concrete;
- Panels can be installed from the outside of the building with minimal interference to existing building functions;
- Panels can be factory pre-insulated to almost any desired R factor for high energy efficiency;
- \$/square foot cost of GFRC is considerably lower than either curtain wall, or replacement in kind of most stone and terra cotta facades.

The following three project case studies illustrate how the properties of GFRC contribute to provide cost effective, durable, and beautiful solutions to our customer's re-cladding problems.

### Case Study I: GFRC Reclad of Terra cotta and granite penthouse and cornice

In May of 2007, GFRC Cladding Systems completed the refurbishment of a mechanical penthouse located on top of a 90+ year old corporate headquarters building in Milwaukee, WI. The cracked and weathered terra cotta tiles shown in **Fig. 1a** below were first removed, and then replaced with a new panelized GFRC system (**Fig. 1b**).

***Fig. 1a: Terra cotta Penthouse (Before demolition)***



***Fig. 1b: GFRC Penthouse (After recladding)***



Note the use of rustication in the GFRC panels to reproduce the look of individual terra cotta tiles. Following this penthouse re-clad, GFRC Cladding Systems was asked to replace all the remaining terra cotta penthouses and interior atrium, as well as a large water-damaged granite cornice around the top floor. During this phase, which was completed in October, 2009, over 1,900 panels totaling 54,000 square feet were engineered, fabricated and erected.

**Fig. 2: GFRC Cornice**



The highly elaborate GFRC cornice shown in Fig. 2 consists of a projecting ogee with a deep soffit return with alternating cast rosettes and brackets, and a lower entablature with a classical "egg & dart" pattern and dentils. Many of the GFRC shapes on this cornice were fabricated from rubber molds cast directly from the existing granite and terracotta components. Panels were erected from the outside of the building only, with minimal interference to the offices or ongoing building functions during the reconstruction.

The GFRC re-clad provides a durable, lightweight, and faithful reproduction of the original granite and terra cotta cornice and penthouse at a fraction of the cost to replace it in kind.

### **Case Study II: Parking Garage Reclad**

**Case Study:** On an 11 story parking garage in Houston, Texas, the existing Marblecrete exterior (**Fig. 3a**) had corroded to the point that it was no longer structurally viable, and had to be replaced. Because of the high relative humidity and rainfall typical of the Gulf Coast, the owner wanted a replacement cladding without steel framing or other potentially corrodible elements. Panels had to be designed to resist high wind loads, yet be light-weight to minimize superimposed loads on the existing structure. Connection spans of nearly 15 feet made the design and engineering of the GFRC panels particularly challenging.

**Fig. 3:** *Marblecrete facade before demolition*



**The Solution:** In lieu of an integral steel panel frame, hollow GFRC “ribs” 6” to 9” deep were cast on the back side of the panel. These horizontal ribs are designed to resist wind loads, and transfer them to the two vertical “beams”. Threaded inserts embedded in the beams provide connection points for welding or bolting the panels to the parking garage structure.

**Fig. 3a:** *Architectural Face of GFRC Panel*



**Fig. 3b:** *GFRC Ribs and beams on back*



A prototype panel was tested successfully under simulated wind pressure loads of 1.3x the design load of 65.7 lbs/square foot (PSF). On average, panels weigh only 15-20 PSF. The largest panel measured 11'8" tall by 14'4" wide, and weighed under 3,000 lbs.

Over 500 total panels, totaling over 40,000 SF, were fabricated for this application. Panels were installed at night to enable the parking garage to be used continuously during construction. **Fig. 4** shows the new GFRC facade:

**Fig. 4: New GFRC Facade**



### **Case Study III: Hospital Reclad/overclad**

The original EIFS cladding at Miami Childrens Hospital had been damaged on multiple occasions during previous Hurricane seasons, ultimately forcing the evacuation of some patients, and leading to the decision to re-clad large sections of the hospital with a more robust cladding material.

To minimize the impact on patient care during construction, all erection work had to be carried out from outside the building. First, holes were punched into the existing EIFS cladding and steel outriggers were connected back to the existing concrete structure. The GFRC panels were then hung over the old facade and supported on the new cantilevered steel structure. Panels had to be light enough to install directly over the existing EIFS, yet strong enough to withstand Hurricane force conditions without exposing the building interior to wind or water.

***Fig. 5: Miami Childrens Hospital Reclad***



Nearly 90,000 square feet of highly profiled and articulated GFRC panels were fabricated, stained at our factory in seven different colors, and shipped to the job site for installation.

### **Approach to Facade Recladding and/or Restoration**

Based on our experience with re-clad projects, we believe that the chances for a successful project are optimized when the GFRC supplier is able and willing to supply a "turn-key" solution including all necessary design, engineering, detailing, fabrication, and installation in accordance with the Bid documents. Our approach typically will include one or all of the following steps:

1. Initial site visit(s) to coordinate preliminary activities with the construction manager, such as field dimensions, site logistics, selective removal of existing work, and project schedule.
2. Work closely with selected surveyor to coordinate all necessary field surveys. These surveys will consist of digital scans of building elevations both before and after demolition.
3. Determine areas (if any) that may require selective removal of masonry components to be catalogued and shipped to our facility in Garland, TX.
4. Shop drawings and stamped engineering calculations. We believe the most economic and timely solution is to panelize the facade in order to expedite the erection, and to minimize as much as possible the on-site time.
5. We will provide all necessary labor, tools, and equipment to install the panels in the sequence provided by the CM.
6. We provide Linear foot quantities to allow the CM to obtain accurate pricing from caulking subcontractors.
7. Any chips, stains, or other items incurred during unloading and installation will be repaired and cleaned by our forces to provide a complete and finished product.