



ELLIPTICAL FRP COLUMN FORMS HEIGHTEN AESTHETIC VISION OF GEHRY'S ICONIC BEEKMAN TOWER IN NYC: MAMMOTH CUSTOM FORMS INTEGRAL TO LOBBY DESIGN.

PROJECT PROSPECTUS:

Vital construction of one of the tallest buildings in Lower Manhattan began in early October 2006 on a one-acre parking lot on the west side of the New York Downtown Hospital. The prolific Beekman Tower (8 Spruce Street: between William and Nassau Streets) is a \$660 million project that will ascend 76 stories (850 feet) and rejuvenate the downtown skyline by the time of its projected completion in Spring 2010.



ARCHITECTURAL/ELLIPTICAL VISION:

Los Angeles based architect Frank Gehry, known worldwide for his signature undulating metal shapes, is designing the curving glass-and-titanium-skinned tower for Brooklyn's Forest City Ratner Companies (FCRC). Located in close proximity to ground zero and Wall Street, the cast-in-place reinforced concrete tower's gleaming design will command a hypnotic downtown presence—regenerating its allure. Ultimately, the mixed-use tower will boast approximately 1-million-square feet of space and offer more than 900 residential units as well as office, school and retail space.

Integral to the design's interior will be a stylistically dramatic lobby adorned with colossal oval-shaped concrete columns. The unique elliptical columns were created by using custom designed FRP (fiber-reinforced polymer) column forms by Molded Fiber Glass Construction Products (MFG-CP: Independence, KS). MFG-CP, a division of Molded Fiber Glass Companies (EST: 1948), custom-designed four (4) 19-foot elliptical shaped forms to create an imposing presence in the behemoth project's interior lobby.

Ultimately, the immense elliptical forms will span the lobby's 1st two floors and provide a beautiful aesthetic finish; creating an architectural effect that blends in with the sinusoidal-curved ceiling of the lobby.





FRP OVAL-FORMING CHALLENGE:



The 2-piece oval columns were made using an FRP gun roving process with resin, chopped strand matt and 24 oz. woven roving. Additionally, 1” balsa core and ¾” plywood ribs were produced to provide reinforcement and to sustain concrete pour loading to avoid shape irregularities. Because of their enormous size; largest being 11’ long x 4.5’ wide x 19’tall, removing the forms from the mold required two fork lifts to put the halves together properly.

FRP OVAL-FORM SET-POUR-STRIP PROCESS:

The project’s concrete superstructure contractor was Sorbara Construction (Lynbrook, NY), whose Chief Estimator & Project Manager Billy Kell noted the form-and-cast challenge stating, “The columns were an odd shaped, stand alone form so selecting the right company to make forms was important so we could easily work with them during the pour. Ultimately, the FRP forms poured easy.”

Because of the forms irregular configuration, they also required unique bracing schemes for the steel rebar reinforcing cages around their perimeter; using a Grade 60 steel with a yield strength of 60000 psi.

Once the forms and rebar cages were in place and ready to pour, Kell indicated that they had to be aware of honeycombing — referring to voids in concrete caused by the mortar not filling the spaces between the coarse aggregate particles. Typically an aesthetic problem, honeycombing may also reduce the durability performance and the structural strength of the columns; depending on the depth and extent of the voids.

According to Kell, “We had to pay attention to the segregation of the concrete mix to make sure that no voids could occur in the formwork which could damage the columns’ aesthetic finish. Ultimately, it was a methodical pour that took a whole day with exterior/interior vibrators used to ensure an even pour.”

Sorbara Job Super Albert DeRoss pointed out the immense task of moving, setting, securing and stripping the forms stating, “They were a very unique shape and the biggest thing was their size and weight—almost 20 feet and at least 200 lbs. Plus, the ribbing adds weight because of the concave nature of the form which essentially looks like a boat hull so they had to be crane assisted to move them.”





DeRoss noted the forms' unparalleled pouring challenges including:

- Form Size — immense size of forms required the concrete to be brought up in lifts.
- Slow Pour — about four (4) feet of concrete poured per hour; taking five (5) hours total.
- Pour Amount — up to 11-12 yards of concrete used for the big forms and 3 yards for the small ones.
- Pour Sequence — done on different levels due to the form's size.

FRP OVAL-FORM SOLUTION / CONCLUSION:

DeRoss deducted that, "Because of the FRP material and outside plywood support (applied every four inches; acting as yoke); we were actually able to cut the pour time in half. Ultimately, they were stripped in sections of four (4) and produced a smooth, one-seam look. Had these forms been done in lumber it would have taken 3X as long at 3X the cost."

Leading East-coast producer and supplier of shoring and forming products Engineered Devices Corporation (EDC: Ridgefield Park , New Jersey) selected MFG-CP to custom manufacture the FRP forms after extensively considering other alternatives. According to EDC V.P. of Sales Greg Limbardo, "Because of the column's architectural prominence, unusual massiveness and the requirement that all concrete be placed monolithically; most other form systems would have been less manageable and excessively labor intensive. The FRP forms were simply easier to work with and the concrete was cast to a superior quality."

#

©2008 Molded Fiber Glass Construction Products. All rights reserved.

