



MUSCLE & FLOW: CUSTOM FRP DOME FORMS PROVIDE OPTIMAL WAFFLE SLAB RIGIDITY & AIRFLOW FOR GEORGIA TECH'S NEW \$80 MILLION MARCUS NANOTECHNOLOGY BUILDING CLEANROOM FACILITIES.

PROJECT PROFILE:

As one of the nation's top 25 research universities, Georgia Tech's Georgia Institute of Technology (Atlanta, GA) is poised to advance its position with an \$80 million nanotechnology center that will bring together the physical and biological sciences in a unique fusion of disciplines. The Marcus Nanotechnology Building (NRCB) will feature two cleanroom facilities that fuse a unique waffle slab deck design built using custom FRP (fiberglass reinforced plastic) dome forms to provide the load rigidity and airflow requirements essential to next-generation nanotechnology research operations.

The NRCB, which broke ground in August 2006 and is scheduled for completion in summer 2008, is comprised of 2 separate areas split by an expansion joint; a 5 story Lab/Office area and a 30,000 square foot, tri-level design cleanroom. Approximately 20,000 square feet of cleanroom space will be dedicated to nanotechnology physical sciences and engineering, adjacent to a 10,000 square foot facility dedicated to biological and biomedical nanotechnology research.

The projects' architectural firm, M & W Zander (Stuttgart, Germany/Plano, TX, U.S.), specified the unique waffle slab design for the NRCB cleanrooms to optimize airflow and utility (gas/water) exhaust services throughout the flooring system. The design's end-result was to provide cleanroom filtering by pushing air through the building with uniform velocity and minimum turbulence. Additionally, the dome configuration was specified very deep to ensure the slab's load per square foot strength to support the cleanrooms' end-use equipment load requirements.

FRP DOME DESIGN:

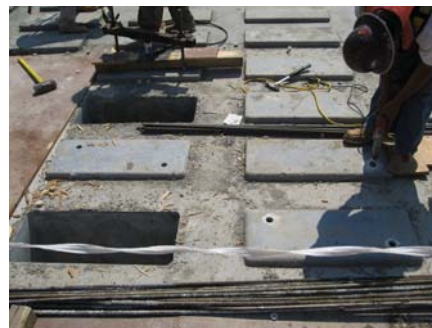
General Contractor, The Whiting-Turner Contracting Company (Baltimore, MD) enlisted the project's concrete trade contractor Untied Forming (Austell, GA) to source the unique formwork solution for the waffle slab. Having eliminated wood and steel options, United Forming awarded the bid to Molded Fiber Glass Construction Products (MFG: Independence, KS) who manufactured a complete range of custom one-piece fiberglass reinforced plastic (FRP) forms which could provide a stronger, flexible design that could meet the unique configurations, reduce labor and had the added benefit of re-usability for use on future projects.





According to MFG Engineering Manager Eric Brace, “the domes’ custom design focus was the depth of the forms; they had to be very deep and narrow for the size of void required for the floor. We produced three, rectangular shaped sizes of forms ranging from 44” deep x 18” wide x 38” long and smaller.” Additionally, Brace noted, “Because there would be a lot of contact surface the stripping would normally be difficult, however these forms wouldn’t have that problem due to the physical properties of the FRP material combined with a chemically active release agent called Nox-Crete™ PCE. Additionally, the concrete is finished 2” below the top of dome, so workers simply knock-down out of the bottom with a sledge hammer with no need for blow-plug air devices.”

United Forming’s Assistant Project Manager, Steve Dollar also noted that the custom forms design had to be altered from M & W Zander original, angular specs, “MFG quickly reconfigured the forms’ design to a straight taper form with bottom flanges to maximize the stripping process.”



CONCRETE POUR SPECS & ASSEMBLY:

A total of six floors of slab would require the MFG dome forms. On the first elevated deck, 22,980 square feet (sf) will consist of the open top waffle slab with a 16.5’ clear story height, while the other 19,875 sf will be a traditional beam and slab with a 20’ clear story height. On the first level, the traditional beam & slab design (four sections) will alternate with waffle slab design (six sections). This alternating format allowed for optimal concrete pours as the waffle slab pours were made first, then allowed to cure while the beam & slab pours were made. After the domes are stripped and the completed slab is in place, a heavy duty computer floor will cover the open waffle slab.





Concrete dome pours will be finished 2” below the top, creating multiple voids in the slab once the forms are removed. This dome-next-to-dome (open-top vs. concrete slab on top) slab features beams intersecting east-west which, once domes are pulled out, leaves the appearance of a 2’ x 4’ opening where the dome once was.

CONCLUSION:

According to Georgia Institute of Technology building owner Bob Rose, “They just finished the last of the waffles; the pours are finished and the forms are knocked through the bottom. This unique floor design has more holes than floor as the majority of it is forms! With over 3,000-plus holes in the floor it’s like a big grate that will facilitate the airflow process. This will create a laminar flow (vs. turbulent flow) that will streamline the uniform air velocity for the center’s research productivity.”



CORPORATE PROFILE:

MFG Construction Products Company, formed in 1962 and a charter member of the World of Concrete, manufactures a complete range of one-piece round column forms (RCFs), dome and pan forms for one-way and two-way joist slab floors, and customer forms for cast-in-place concrete construction applications. Made of fiberglass-reinforced thermo-set composites, MFG concrete forms can significantly reduce finishing costs and are fully re-usable.

