



PROJECT SPOTLIGHT

Technology helps with manufacture, assembly of Google headquarters

Google is much more than a tech powerhouse; it's a ubiquitous, seemingly everyday presence in our lives. The company has had such an enormous impact across the world since its founding in 1998, that the term *google* is now synonymous with *search*, and is used across the globe to describe the act of locating information on the internet.

It follows, then, that Google's new headquarters for thousands of employees in New York, N.Y., at St. John's Terminal was constructed with innovation as a key component of the building's interior and exterior design. To realize the dreams of the 1.3 million ft² (121,000 m²) structure, Cookfox Architects partnered with Turner Construction and Jersey Precast, based in Hamilton Township, N.J.

The massive St. John's Terminal, which spans two city blocks in lower Manhattan, consists of the building's original three stories topped with nine new levels. This expansion to 12 stories, along with the need for two high-rise elevator cores, necessitated a unique design that would ensure that the existing structure could support the added load of steel framework and cast-in-place concrete floors.

Working alongside Rizzani de Eccher, Jersey Precast applied the segmental bridge span technique to develop precast concrete building core panels with post-tensioning ducts. Compared with the enormity of the bridge segments, the core panels were tightly packed with heavy reinforcement, post-tensioning

ducts and multiple custom-made heavy steel plate assemblies up to 5 ft (1.5 m) tall. For all this to work in the field under extremely tight tolerances, the companies decided on short-line match casting for the core, where each precast concrete element is cast against the previous one. The precast concrete core was built just like a bridge span but oriented and post-tensioned vertically instead of horizontally.

George Hand II, Jersey Precast CEO, says that 298 segmental precast concrete units were manufactured to create the core. The units had a maximum weight of 84 tons (76 tonnes) and were about 29 ft 8 in. (9 m) long by 13 ft 6¾ in. (4 m) wide by 10 ft 4 in. (3 m) tall. In addition to the elements needed to build the core, Jersey Precast also provided 114 precast concrete stairs, 153 stair landing slabs, and 55 elevator landing slabs.

Hand says that innovation was rooted in every phase of the project. At Jersey Precast, powered carts were deployed to transport precast concrete pieces from forms to the storage yard. To preserve the integrity of each product manufactured, a specialized shipping frame was installed at the facility that remained in place until elements reached the construction site. Upon arrival, contractors used a hydraulically powered rotator to turn the pieces 90 degrees for installation.

Leveraging precast concrete significantly enhanced the construction process at St. John's Terminal, resulting in a new facility for Google that is as resilient as it is beautiful. "The use of architecturally detailed precast components not only resulted in an exceptional finished product, but also helped expedite project completion," Hand says. "This allowed the building to become operational more quickly while minimizing disruptions to the community."

—Mason Nichols

The new Google headquarters at St. John's Terminal in New York, N.Y., uses match casting with Lego-style connections. Courtesy of Jersey Precast.



Nashville courthouse clears the air using special concrete

Innovation and resilience are at the heart of the Fred D. Thompson U.S. Courthouse and Federal Building, a structure that leverages precast concrete to perfectly marry classic appeal with a contemporary aesthetic.

For the Nashville, Tenn., courthouse, the U.S. General Services Administration sought a design approach reflective of the U.S. justice system. Thanks to the use of precast concrete panels, columns, and box beams, this was accomplished in several ways. The building's facade is symmetrical, reflecting the need for balance in the courtroom. The panels are white, emphasizing the court system's ideal state as a conveyor of truth and balance in U.S. society and government, and the building's stately presence is a reminder of U.S. stability, a characteristic shared with the precast concrete elements that made it possible.

Chris Cruze, project manager for GATE Precast, says that bringing the courthouse to life required close collaboration among GATE, the project's general contractor, and the design team. One particularly challenging component involved the design and production of the "hashtags" located at the building's corners. These elements were named because they look like hashtags or pound symbols when viewed from above. They are also one of the primary architectural features of the building.

"Casting the hashtags required many series of sequential poured panels into square and box tubes, C shapes, and flat panels, which ultimately would be a self-supporting, pieced-together structure," he says. "Erecting this puzzle required

The main facade of the Fred D. Thompson U.S. Courthouse and Federal Building in Nashville, Tenn., is composed in a balanced and symmetrical manner reflecting the need for balance in the scales of justice.
Courtesy of Gabe Ford, Ford Photographs.



Coordination, fabrication, and placement of the Fred D. Thompson U.S. Courthouse and Federal Building rotunda precast concrete columns was one of the key design challenges. Courtesy of GATE Precast.

detailed thought, coordination, and a custom-made rigging apparatus."

Tight teamwork was also necessary in the fabrication and placement of the eight precast concrete columns that support the courthouse rotunda. Each column weighs more than 40,000 lb (18,000 kg), necessitating a high-capacity connection to the base footing. This meant many cast-in-place dowels were needed in the field. Each had to line up within fractions of an inch at the bottom of the columns.

"Despite best surveying efforts, the best way to make this work was to craft an as-built physical template of each of the eight dowel clusters at each column base and custom fabricate each column based on that template," Cruze says. "Once it was erected, the columns fit like a glove."

Beyond tight tolerances and the innovation needed to ensure successful construction, the courthouse was also designed to LEED Gold BD+C standards, with certification pending. The building's facade features photocatalytic concrete that uses a specially formulated cement to oxidize nitrogen oxides, a primary smog-causing compound. With this cement, the concrete undergoes a self-cleaning process, removing air pollutants from the atmosphere while reducing the facade's required maintenance. To date, the courthouse is the largest photocatalytic structure in the U.S.

The Fred D. Thompson U.S. Courthouse and Federal Building is a testament to the design flexibility that precast concrete affords. Thanks to the use of precast concrete, the building will serve as a lasting symbol of the justice system's importance and permanence in U.S. culture for decades to come.

—Mason Nichols 