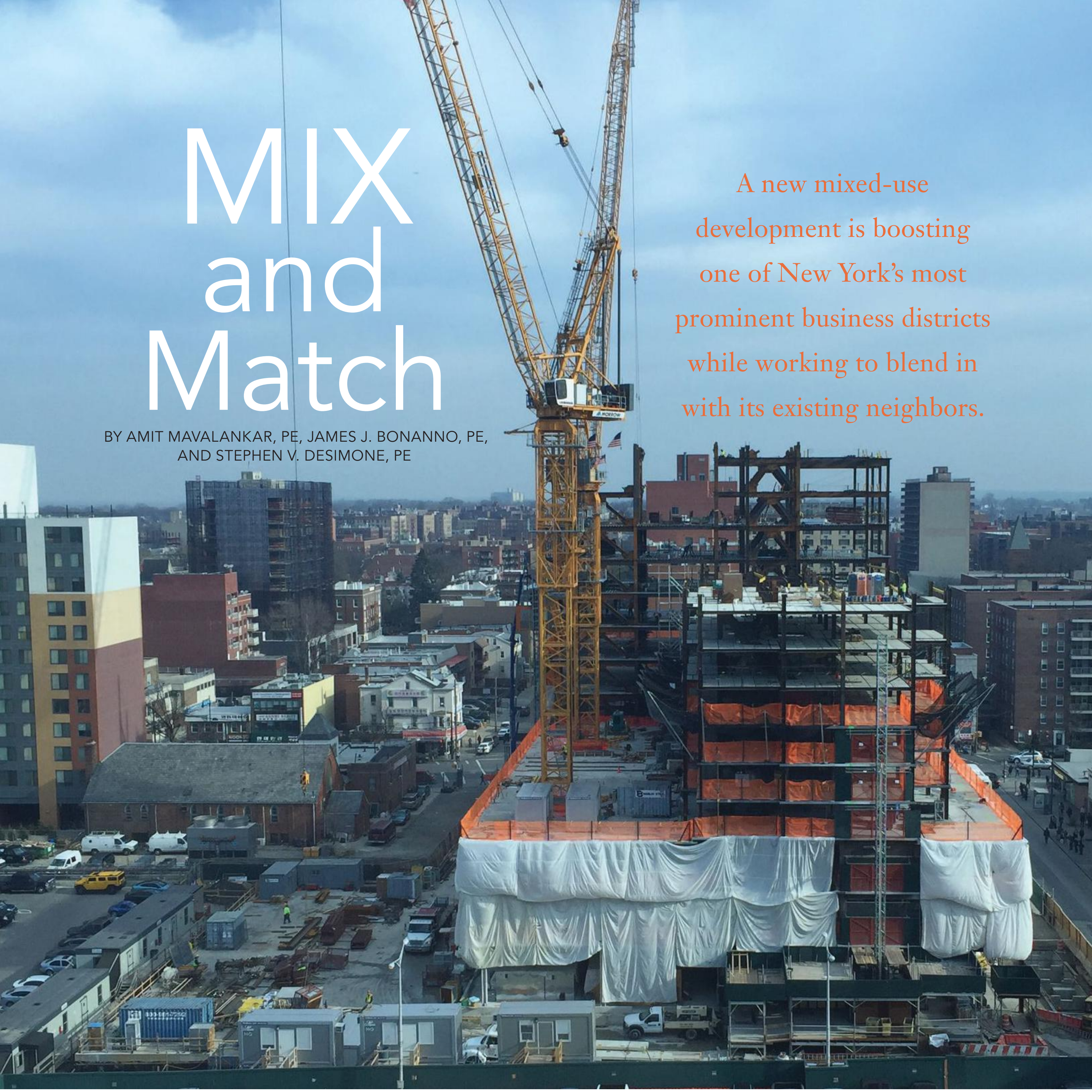

MIX and Match

A new mixed-use development is boosting one of New York's most prominent business districts while working to blend in with its existing neighbors.

BY AMIT MAVALANKAR, PE, JAMES J. BONANNO, PE, AND STEPHEN V. DESIMONE, PE

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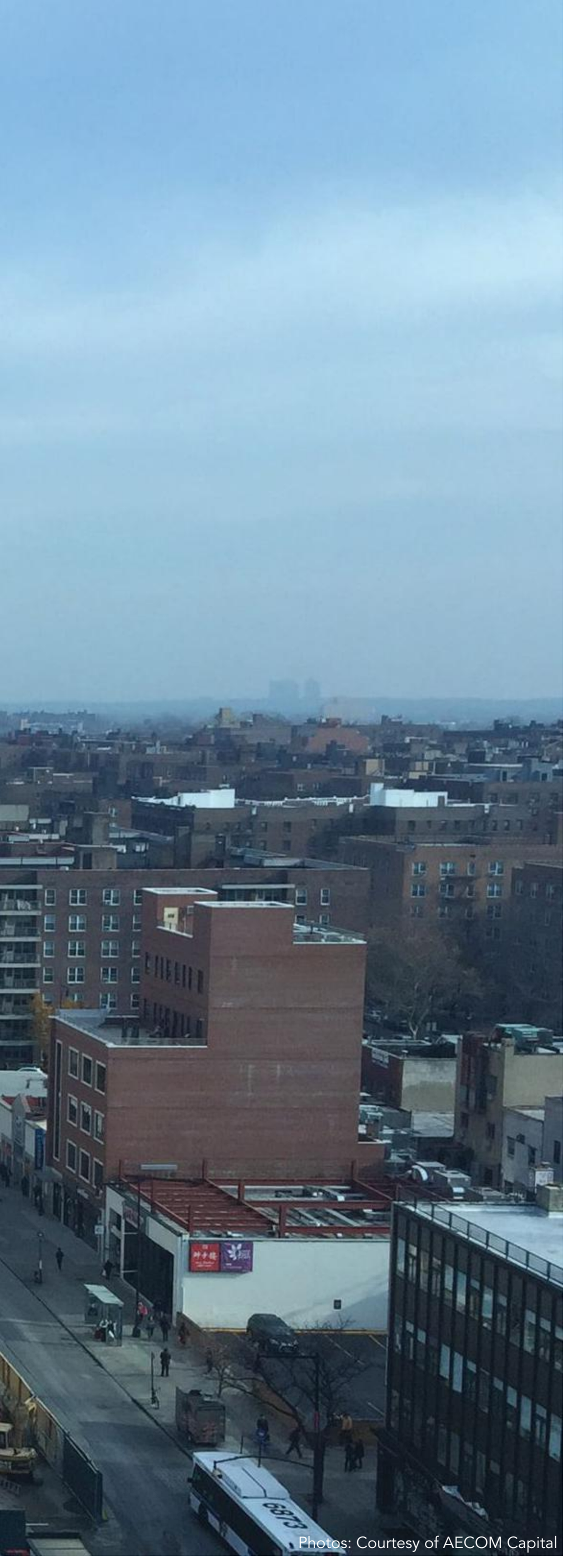
A rendering of the overall complex.

Phase 1 of the project uses 4,500 tons of steel.

The residential building is at left and the commercial building at right.



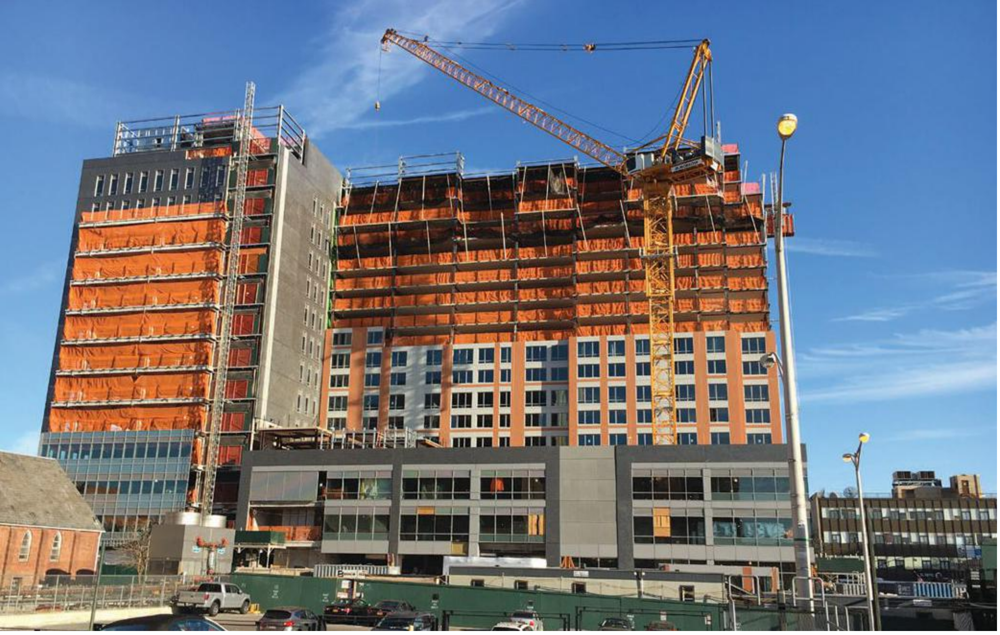
Photos: Courtesy of AECOM Capital

DOWNTOWN FLUSHING IN QUEENS is the fourth-largest central business district in New York—nothing to sneeze at in a city of 8.4 million.

As the epicenter of Flushing—a neighborhood of roughly 72,000 residents—the area is a stone's throw from Flushing Meadows Corona Park, home of the USTA Billie Jean King National Tennis Center, and the New York Mets' Citi Field.

Currently rising from its center is a 1.8-million-sq.-ft complex known as Flushing Commons. The mixed-use project is organized into four components comprising a residential building and office, retail, parking and community space in a total of five distinct buildings. Phase I is a development of approximately 670,000 sq. ft, with a 14-story residential tower and an 11-story office building, both steel-framed. Underneath the buildings is a concrete-framed four-story, 270,000-sq.-ft below-grade garage with 980 parking spaces.

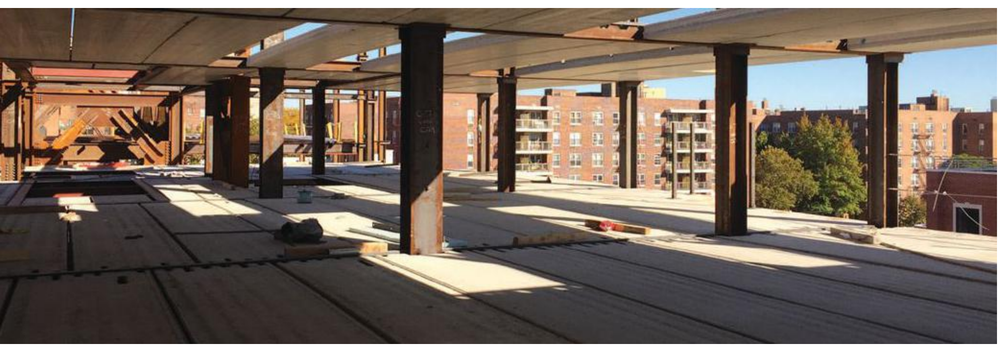
The massive project achieved its first milestone this past spring with the topping out of the residential tower and the office building. Using 4,500 tons of structural steel, Phase I is expected to be completed early next year, with the entire project scheduled to open by 2021.



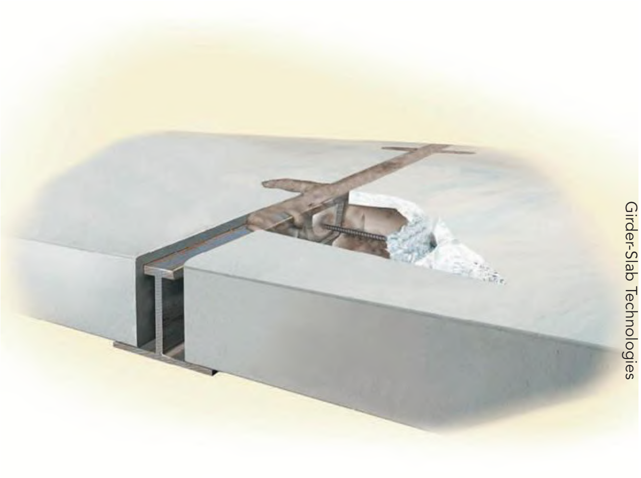
Comprising 1.8 million sq. ft, the entire project will feature a total of five distinct buildings once complete.

Residential

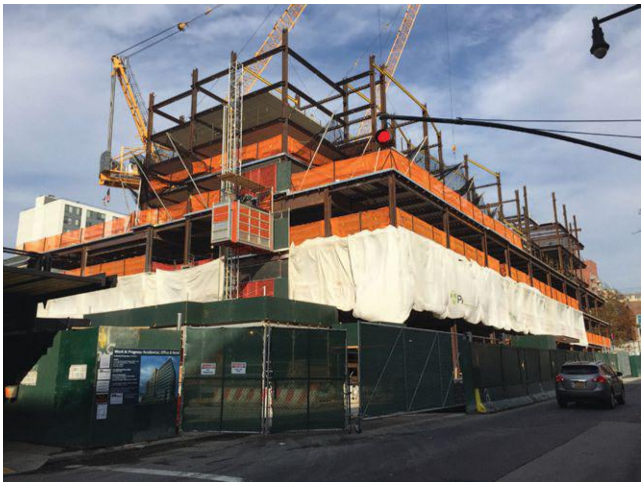
Designing a mixed-use residential tower is never an easy or straightforward task, as the column grids for parking and retail portions do not typically synch with the column spacing for the residential units. The columns for the residential units are usually located within the room layouts at locations where they may be most easily camouflaged by architectural elements, and trying to match them with the commercial column grids often imposes constraints on floor layout. The design team looked to the Girder-Slab system to address this issue. The system is an assembly of asymmetrical steel beams referred to as "D-Beams" and is fabricated from a standard rolled wide-flange section and a flat bar. It supports a hollow-core precast plank on its bottom flange.



Planks over the D-Beams for a typical residential floor, prior to grouting.



A rendering of the Girder-Slab System



Construction of the residential building.

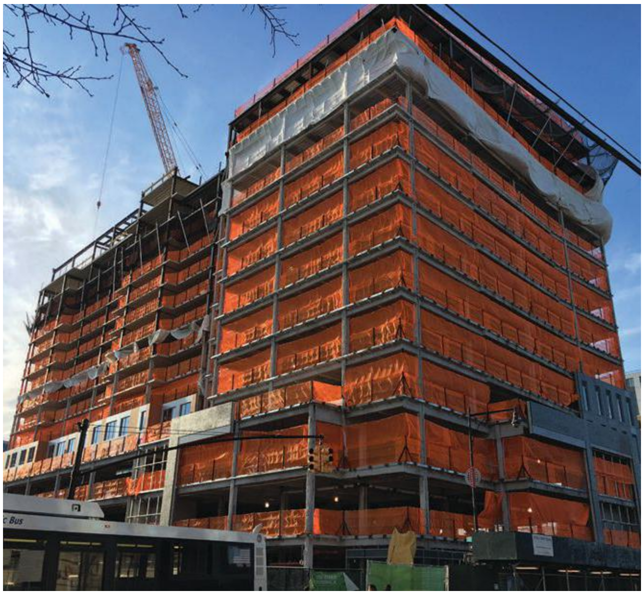
The gravity system for the residential building incorporates D-Beams for the typical residential levels to support 4-ft-wide, 8-in.-deep planks that span 28 ft, which matched the column spacing in the retail levels and parking garage. In the other direction, the beams span 18 ft to 20 ft between the W12 columns. The lateral force-resisting system was designed to react to wind loads and consists of concentrically braced frames around the stair and elevator core, using brace and column sizes up to W14×370. The system is predominantly drift-controlled, and fewer braced frames were used to control the overall as well as inter-story drift. The lateral shear forces from the steel braced frames are transferred to the concrete shear walls by strap beams.

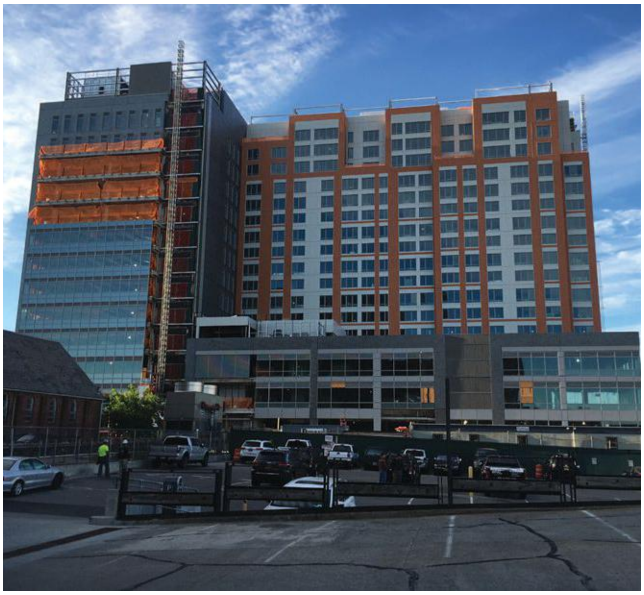
The residential tower's facade appears as a window wall, blending the brick and glass to form a typical residential look that fits in with the surrounding neighborhood. The facade panels are supported from the edge of the floor system and are attached to perimeter W10 beams in the north-south direction and specially designed solid precast plank with embeds in the east-west direction.

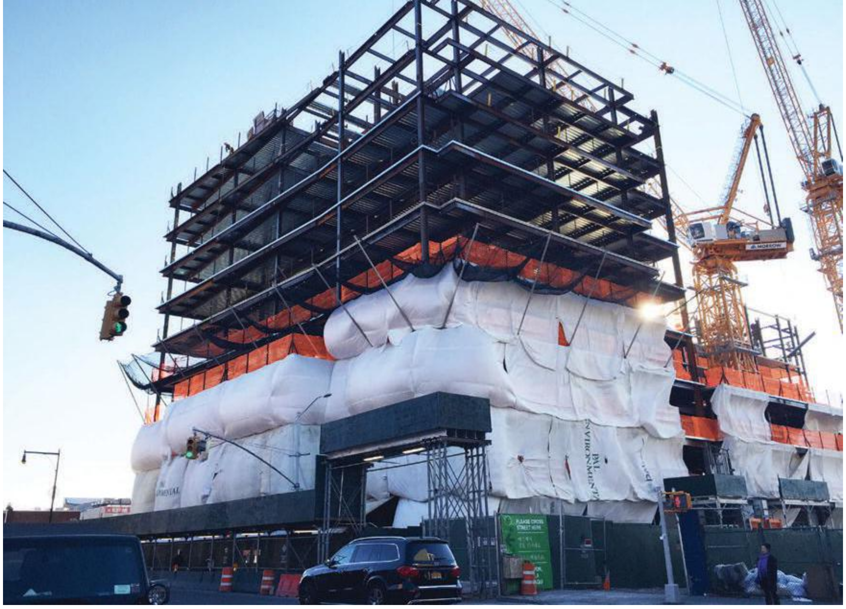
Commercial and Office

The gravity system for the commercial building consists of conventional composite wide-flange steel beams carrying 3-in. metal deck with 3¼-in.-thick lightweight topping concrete. The beams in in turn are supported by W14 columns. The parking column grid of 30 ft by 28 ft is also used for the retail and office floors above. As with the residential tower, the lateral force-resisting system consists of concentrically braced frames around the stair and elevator cores to resist wind loads, and uses wide-flange braces and column elements. Larger wide-flange sections were used limit the inter-story drifts. The lateral system is drift-controlled, and fewer brace frames were used at limited locations to keep the design in line with the architect's requirements.

Phase 1 includes a 14-story residential tower and an 11-story office building, both steel-framed, on top of a four-story, 270,000-sq.-ft below-grade garage with 980 parking spaces.

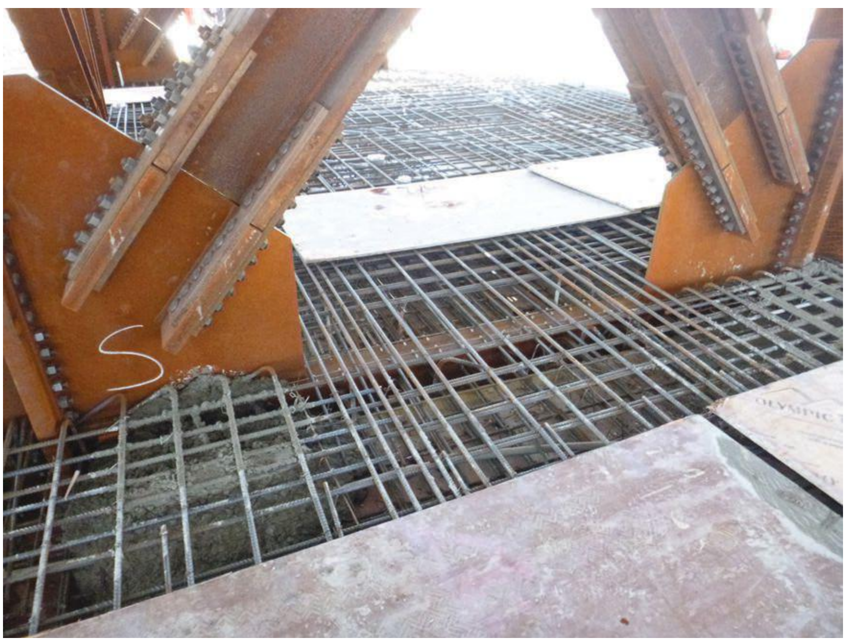






Construction of the 11-story office tower.

The facade consists of brick panels at the retail floors and high-performance curtain wall and patches of brick veneer at the commercial floors. The prefabricated panels are hung from the perimeter slab edges, and 5/16-in.-thick to ½-in.-thick steel plates cantilever from the top flanges of the perimeter beams to receive the embed plates for the various facade attachments.



A strap beam erected on-site.

Construction Coordination

The architect and engineers used 3D building information modeling (BIM) to coordinate the design with various other disciplines. The use of a Revit model in the preliminary phases of design facilitated early coordination between different trades and resolve clashes between structural and MEP components. The steel fabricator used Tekla to model the steel-framed buildings. This helped the general contractor coordinate the strap beams, concrete podium and facade embeds to support the panelized facade system with the structural interfaces. The contractor and design team used Autodesk's Constructware as a submittal tracking system, which helped smoothen the construction administration process.

This level of coordination, over a project with so many components and in a tight urban setting, is impressive but also expected for such a high-profile development at the heart of New York's largest and second-most populous borough.

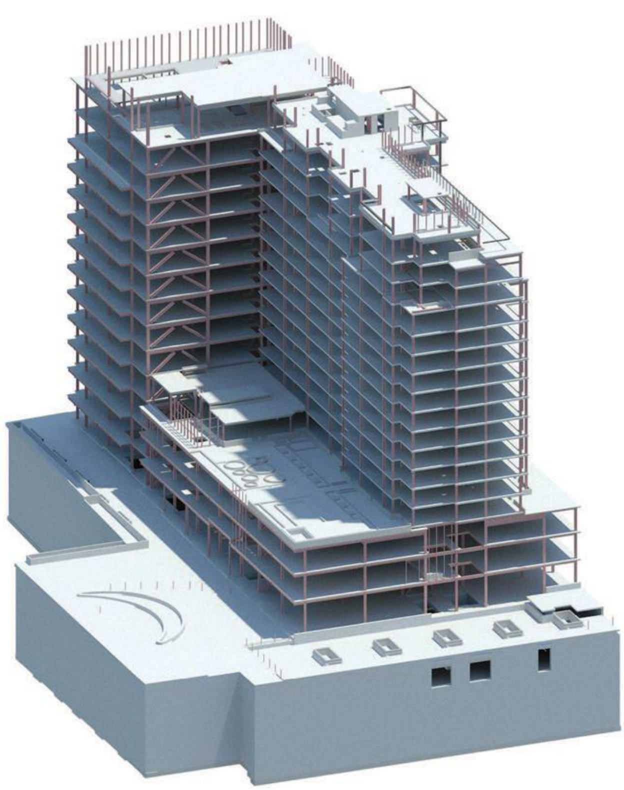
Owners
F & T Group, The Rockfeller Group, AECOM Capital

General Contractor
Tishman Construction, New York

Architect
Perkins Eastman Architects, New York

Structural Engineer
DeSimone Consulting Engineers, New York

Steel Fabricator, Erector and Detailer
Berlin Steel Construction Co., Kensington, Conn.



A Revit model of Phase 1.