



TOP: An aerial view from 34th Street.
LEFT: Workers maneuver megacolumns and steel beams to construct support for a crane.

PHOTOS COURTESY OF DESIMONE CONSULTING ENGINEERS

900-Ton Steel Platform Is Key To 34th Street Multi-Use Building

by David S. Chartock

A 900-ton steel platform will be used to pick up the gravity load of a 28-story, 590,000-sq.-ft. concrete residential tower at the \$120 million, 34th Street Multi-Use Building that is under construction just off Eighth Avenue on Manhattan's West Side.

Vincent DeSimone, chief executive officer of DeSimone Consulting Engineers (DCE), the project's New York-based structural engineer, said concrete was right for the base of the building and below and steel was right for the theaters because of the clear spans that were required. So, the challenge was convincing everyone about mixing concrete and steel and defining each separate area for the economy and speed of the project.

Included in the 35-story project will be one level (45,000 sq. ft.) of parking located 32-ft. below grade and one cellar level of retail that will be called the concourse level. The first floor will be a combination of retail and building-support space with the theater lobby located on 34th Street and the apartment lobby

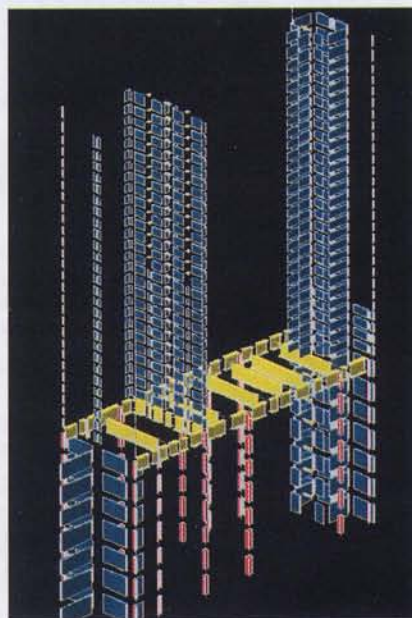
located on 33rd Street. The second floor will also contain retail space, bringing the total amount of retail space for the project to 85,000 sq. ft. The 14-theater Loews' complex will total 108,000 sq. ft. and be located on floors three to six. The seventh floor will serve as the basement for the apartment building. It will house HVAC equipment and building support space. There will be 27 floors of apartments, one floor of amenities and a 28th floor common terrace.

The Apartment Building

"The upper concrete structure that will form the apartment building is very economical," said DeSimone. "What we did was put the columns at the corridor, perimeter and closely spaced those columns. This gave the architect a free span from the interior corridor to the perimeter, providing for a more flexible apartment layout. It also provided us with reinforcing of approximately 4 lbs. per sq. ft. Most buildings today are in the area of 7-9 lbs. per sq. ft."

The apartment building will consist of concrete shear walls that will go up on

one side from the ground floor to the 33rd level. Then another shear wall for the tower will be transferred by the same mass to the shear wall going to the sixth



The model used for lateral loading: Yellow represents the podium, which consists of 10-ft. deep plate girders. Blue represents the shear walls. Red represents the steel megacolumns.

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The steel structure installed above the concrete structure.

floor down to the foundation. This was a challenge because the tower is a heavy structure that will be picked up by the 10-ft.-thick steel plate girders, noted Zoe

Pappas, a DCE project manager.

"Because we needed to avoid the opening for the 14 Loews' theaters, the nine columns that support the

tower through the plate girders are steel from the ground floor to the sixth floor (level 12) and above that will be concrete," she added.

The heavy columns are W-14 by 550 steel double columns with Grade 50 steel plates. These columns are supported on the ground floor by the concrete columns, which go down to the foundation. The built-up steel double columns are 33 in. by 33 in. to accommodate the large load. To make it economical, W-14 by 550 steel was used because no special premium would be required for special shapes.

Absorbing the Load

The heavy columns are supported by the concrete columns, the largest of which are approximately 66 in. by 50 in. at 10,000 psi. This one column absorbs 15 percent to 20 percent of the total tower load, Pappas explained.

In effect, "we transferred 28 stories of the building. We also had to ensure clear spans for the theaters. The solution

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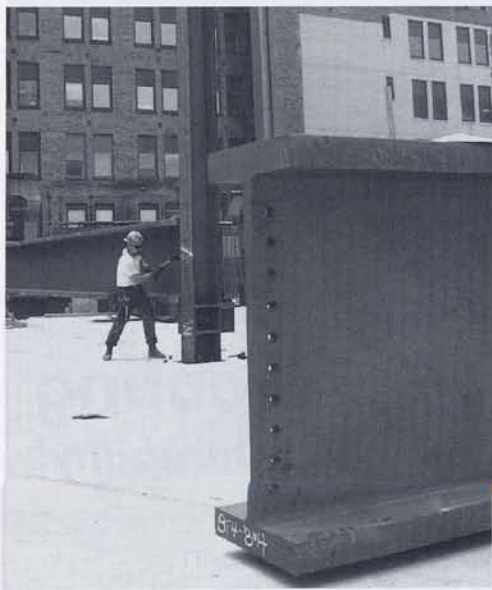
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was to create a podium made of longitudinal and transversal steel plate girders through which a 20-in., 8,000 psi concrete mat, which was designed to behave as footing for the tower itself, makes the connection for the steel through the shear studs and reinforcing," Pappas said.

The concrete mat will likely be made in two placements, according to Charles Alvarez, president of Century-Maxim Construction Corp., the project's Port Chester, N.Y.-based concrete superstructure contractor. The concrete mat, he added, will serve as a transfer slab in lieu of beams. In this case, "The whole slab becomes the beam," he pointed out.

"Basically," Pappas said, "we have the building foundation at 140 ft." The theaters are below it. The theater space features 60-ft. clear spans that will be formed using 40-in. and 44-in.-deep steel beams and girders.

"Another interesting thing about this project is due to the heavy loads, the connection between the large steel columns and the steel plate girders are done using bearings connections," said Pappas. "The plate girder sits on the column and the columns are built using stiffeners to facilitate erection. The double steel columns required the fabricator to splice some columns because some 80-ft. span plate girders could not be

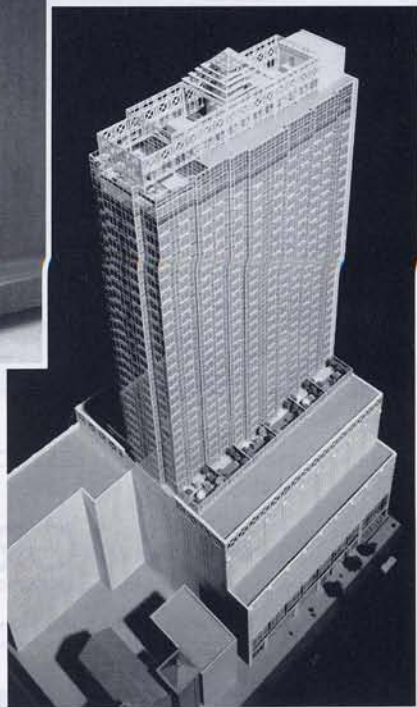


LEFT: A worker installs W-40 steel beams.

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BELOW: A rendering of the 34th Street Multi-Use Building just off Eighth Avenue on Manhattan's West Side.

RENDERING COURTESY OF SBLM ARCHITECTS



lifted in one piece. They were lifted in three pieces and the bearings connections facilitated under difficult circumstances."

Falcon Steel Co. is the steel erector and Helmark Steel Inc. is the steel fabricator. Both firms are located in Wilmington, Del. John O'Brien is president of Helmark and vice president of Falcon. O'Brien's firms are furnishing and erecting 4,300 tons of steel for the project. One of the major challenges facing his firm is the backlog of work for fabricators. Because of its own backlog, Helmark farmed out some of the work for the project.

O'Brien estimated that a full month was saved on initiation of erection.

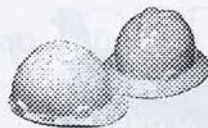
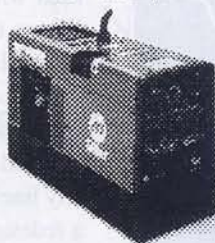
21 Transfer Girders

Another challenge, he said, is building the 900-ton steel platform,

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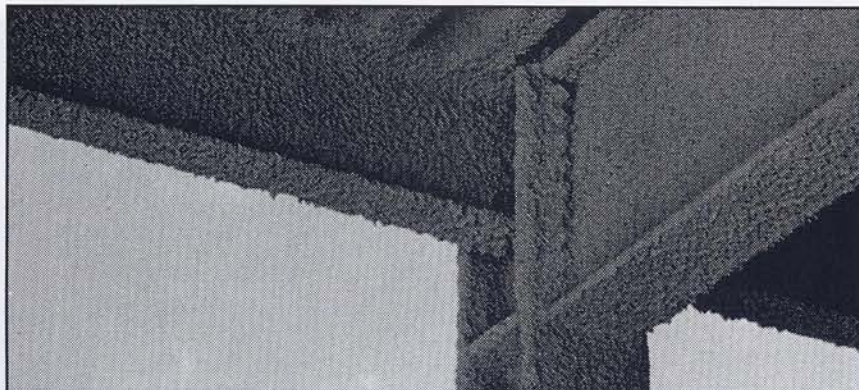
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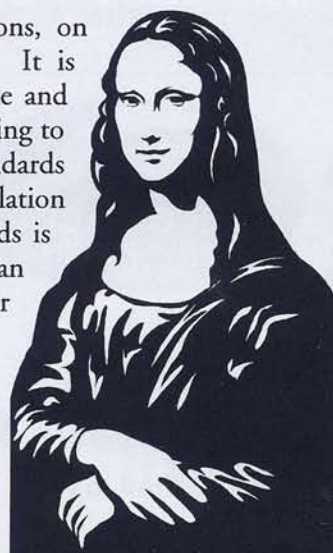
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which consists of 21 transfer girders. "The platform is the footprint of the concrete tower," he explained. "The platform will be approximately 8,250 sq. ft. and will be erected in October using a tower crane."

However, before any of these project components could be built, the project had to deal with a site that contained 40-ton per sq. ft. rock.

According to David Good, an associate at Mueser Rutledge Consulting Engineers (MRCE), the project's New York-based geotechnical and foundation engineer, the rock below the site is the second hardest rock in New York. It is gneissic schist rock, and nearly 30,000 cu. yds. of it was removed by drilling and blasting. Hydraulic rams were also used to remove the rock, but they were largely ineffective because the rock was both hard and horizontally jointed. Horizontal joints, Good explained, do not permit hydraulic rams to split the rock along natural planes of weakness.

Difficult Rock Removal

Good said the difficult rock removal was compounded by the four abutting structures, which included a four-story building in poor condition, a brick church and 18- and 22-story buildings. MRCE seismographically monitored these buildings as well as the nearby Amtrak tunnel below 33rd Street and a nearby subway line below Eighth Avenue.

The four-story structure and the church foundation were founded on the till and had to be underpinned to rock using spaced-out underpinning piers.

The existing 18-story building was supported on rock. Level footings were used where the rock was at subgrade. Where the rock depths exceeded 5 ft. below the basement level, large square, hand-excavated caissons were used. The east edges of the large square caissons intruded upon the 34th Street site property line by more than a foot. This led to a redesign of the steel reinforcement in the proposed 30-in.-thick foundation wall to accommodate the caissons. The caissons were covered with foam sheets to act as a bond breaker and cast into the wall. This was accomplished with mini-

mal disruption to both the schedule and project cost, Good added.

On the east side of the site, the 22-story steel-framed brick structure, built in the late 1800s, presented “a difficult challenge,” according to Good. “The basement for this building was two stories deep, only about 6 ft. shallower than the basement of the new structure. Here the steel frame carried the building loads, so the nonstructural brick walls only supported themselves. The brick was laid directly against the rough rock cut to provide a smooth interior face. At some points, the brick was only one course thick or absent altogether. This required extremely careful removal of very hard rock using small air tools. A limited area of brickwork was replaced. To maintain the long-term integrity of the existing brick infill wall below grade, the new foundation wall was tied to it structurally.”

The new building is supported using footings on rock, Good pointed out. Without the hard rock, the footings would have been huge and unable to



Steel beams being installed to support a crane.

accommodate the load, Pappas added, noting that “without the hard rock, this building would have been totally different. It would have required either a mat, footings, or pile caps or caissons,

increasing costs enormously.”

A Contemporary Look

“The owner wanted a very contemporary look. Sleek. But we were chal-



Steel megacolumns used in this project.

lenged by the project's economics, especially for the residential tower, to satisfy the owner and create a building that appeared as a single structure," said David Nicholson, an associate at SBLM Architects, the project's New

York-based architect.

The solution was to make the skin of the building for the retail and residential portions aluminum and tinted green glass. There will be a large windowless portion of the facade to accommodate

the theater floors. To provide a single look for the theater area, a modularized alucobond skin, which is a sandwich of two aluminum sheets bonded over a plastic core, was used.

Nicholson said this exterior skin over the theater floors is being prefabricated in Pennsylvania in pieces that are 12 ft. wide and 30 ft. high. This allows for the rapid erection of the skin and enclosure of the building.

Nicholson called the design of the residential tower "unique" because "the elevators could not be positioned in the center of the hallways because they would have interfered with the layout for the theaters. As a result, the residential elevators are at one end of the building. This led to some interesting challenges in apartment layout, which were solved efficiently using a combination of studio and one-bedroom apartments that wrap around the elevators. There are a total of 330 apartments."

The project is scheduled for completion by June 2001. ■