Modern Steel Construction

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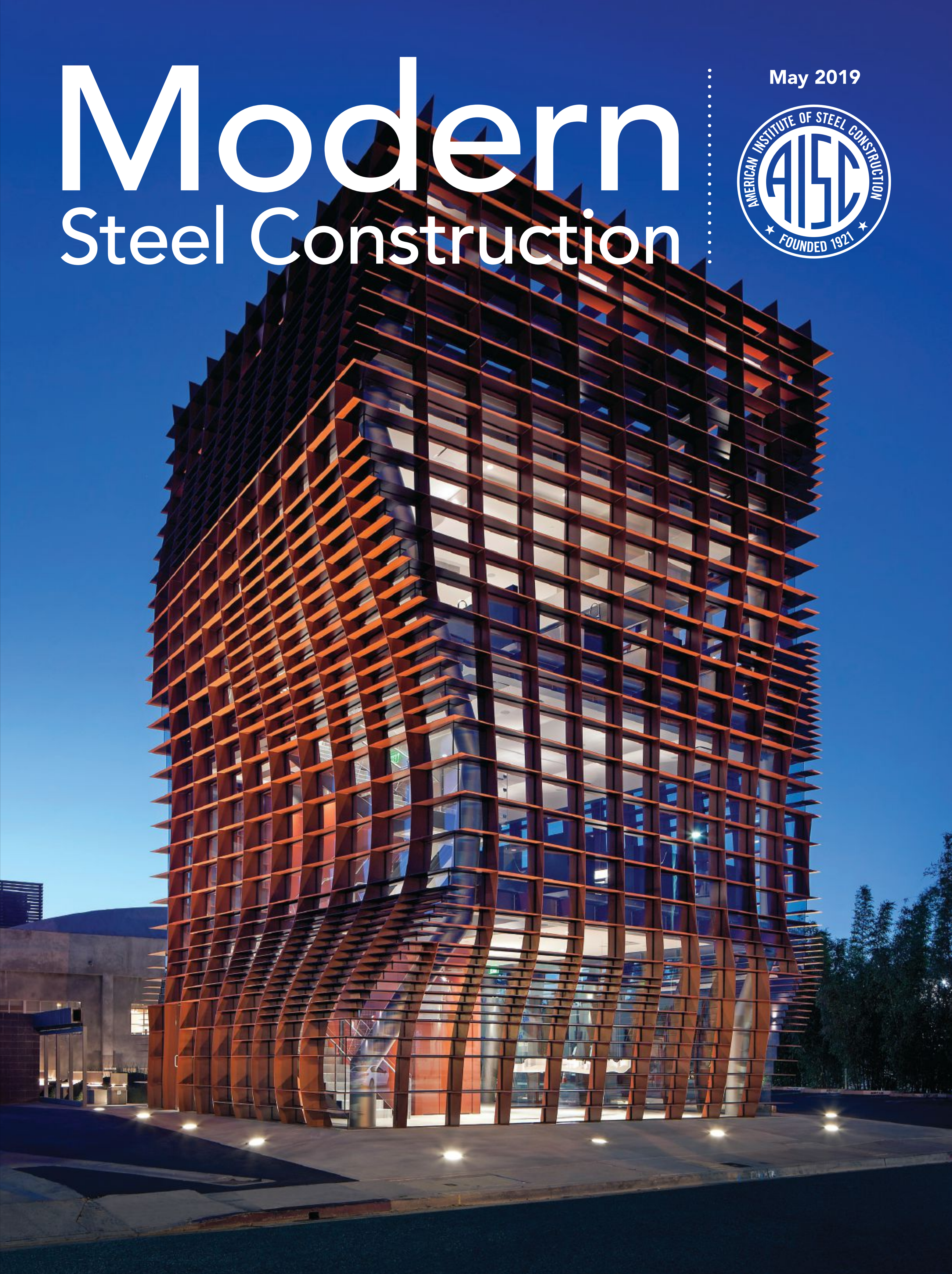


PRESIDENTIAL AWARD FOR ERECTION ENGINEERING TO FACILITATE ADAPTIVE REUSE

75 Rockefeller Plaza, New York

WHEN THE 34-STORY 75 Rockefeller Plaza was built in 1947, it was the tallest completely air-conditioned building in New York and the first skyscraper at Rockefeller Center.

Located on 51st Street between Fifth and Sixth Avenues in Midtown Manhattan, the steel-framed building totals 623,000 sq. ft, with typical floor plates ranging from 14,000 sq. ft to 30,000 sq. ft. The building has recently undergone a major repositioning, including restoration of the façade and base metalwork, retail, and lobby enhancements and new mechanical infrastructure.

Every aspect of the updated building, which anticipates LEED Gold certification, has been meticulously reinvented to provide a building worthy of its stature and location. The street-level façade is reinstated with tempered monolithic glass, bronze mullions, and Deer Isle granite. A new private terrace overlooking 51st Street and Rockefeller Plaza—home of the annual Rockefeller Center Christmas tree—invokes the original design of 75 Rockefeller Plaza. The revitalized streetscape features a distinctive, bronze curvilinear entrance, an architectural detail that also serves as a focal point for new retail space.

One of the most significant structural updates included reconfiguring the lobby into a double-height, 24-ft-high space connecting 51st and 52nd Streets. The former black granite at the lobby's interior has been replaced with white marble walls and terrazzo floors. The same Indiana limestone that clads the exterior of the building is also used for two walls of the interior. The lobby includes a skylight and gallery space that will exhibit revolving public art. The main lobby finishes continue to the ground-floor elevator lobbies, where artist-designed bronze elevator doors open to reveal refurbished elevator cabs.

The lobby renovation required the removal of four columns at the ground floor, three of which supported existing transfer girders. Multistory transfer trusses and removal of each column from the top down were among the schemes considered before the final design of a composite steel box girder was selected. While the multistory truss would have obstructed too much leasable space, column removal and transfer floor by floor would have provided a large column-free area across all floors—but was prohibitively expensive.

Courtesy of RXR Realty

Courtesy of RXR Realty

Gilsanz Murray Steficek

Courtesy of RXR Realty

The unique box girder solution (as opposed to a pair of built-up wide-flange beams) coordinated nicely with the planned sculpted lobby ceiling, which required the transfers to be as narrow and shallow as possible. The composite box girder had to be carefully specified, as this configuration and method are typically applied to bridges rather than buildings. As such, both the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360, available at **www.aisc.org/specifications**) and AASHTO bridge specifications were consulted. Other design challenges included eccentrically reinforcing existing columns and modifying the existing partially restrained wind frame. Of particular note were the constructability challenges of erecting and preloading a new steel box girder around the existing transfer girders to effectively extend these transfers to the next column line. A scaled 3D model was printed to help communicate the design concept and erection/preloading procedures to the steel fabricator and the owner.

To preload the girders, a solution was developed that maintained redundancy throughout the entire loading procedure and did not require any temporary structure or shoring. This method, involving a yolk system with 500-ton jacks, pushes the girder and pulls the below column up, loading the girder in flexure without any significant displacement. At that point, the final connections are completed and the existing column removed.

Effects of column shortening and resistance from the steel moment frame above were all considered during the loading process. Maintaining the building's lateral stiffness was a primary focus throughout the project. The building was originally designed under New York's 1938 building code, which included no wind or seismic requirements and therefore accounts for a small amount of lateral stiffness relative to modern buildings. Careful attention was paid to reinforcing connections and keeping the relative increase in member loads to a minimum. ■

For more on this project, see "Playing to the Base" in the February 2018 issue, available at ***www.modernsteel.com****.*

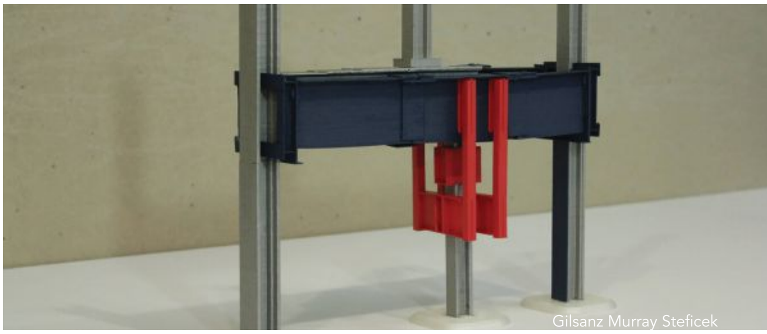
Owner and General Contractor
RXR Realty, New York

Architect
Kohn Pederson Fox, New York

Structural Engineer
Gilsanz Murray Steficek, New York

Steel Fabricator, Erector, and Detailer
Orange County Ironworks, Montgomery, N.Y. AISC CERTIFIED FABRICATOR & ERECTOR


Gilsanz Murray Steficek


Gilsanz Murray Steficek

> "The adaptive reuse of the 1947 building shows the long-term viability of a steel structure and the endless possibilities of structural modifications."
> —Craig Wehrmann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