ELEVEN TIMES SQUARE

Multiple Personalities

With the completion of Eleven Times Square, at Eighth Avenue and 42nd Street, one of the final pieces of the Times Square redevelopment project will be in place. The redevelopment has transformed the once-seedy district into an international landmark of theater and glitz. Any building erected there must encompass the 24-hour environment in which business and entertainment converge. Eleven Times Square itself is home to another sort of intersection; its steel–concrete hybrid structure takes advantage of an oddly shaped site to embrace the around-the-clock bustle while offering the flexible, column-free tenant space necessary for SJP Properties' $1.1 billion speculative office tower to be a successful venture.

"The concept here was to create a building that responded to the two different environments in Times Square," says the tower's designer Dan Kaplan, senior partner at FXFowle Architects. The site's north facade cuts back dramatically at the sixth floor to signal, with the neighboring Westin Hotel, a gateway to 42nd Street and Times Square. The canted upper portions of the façade add presence to this podium, with large-scale street-level signage and a subway entrance identifying its retail and high-capacity uses. In contrast, the structure's south facade reflects its primary purpose as an office building. The 41st Street corner corporate entrance volume, marked by a grand 54-foot-high glass wall, marks an end to the hurly-burly of the district to its north. Due to open in early 2010, the 40-story building will add 1.1 million square feet of office space to a sour real estate market, but it stands apart from other developments with a unique steel structural design that allows it to adjust to tenants' ever-changing needs.

The building's form stems in large part from a site geometry that could not support a center-core building. FXFowle and structural engineer Thornton Tomasetti determined that a side-core design provided the most efficient lateral and torsional stiffness for the structure on its L-shaped site, in which the long leg is oriented east to west. An inward-sloping north face sets the building's concrete core in the crook of the L, offset from the bulk of the tower's mass. Steel floor framing kept the weight of the building low, reducing torsion and lateral drift induced by this 30-foot cantilever on the building's north side. Columns appear at least 15 feet away from the corner windows. "You basically feel like you're suspended out in this bay window overlooking the city," says Kaplan.

Due to its narrow dimension and low weight, under wind loads the tower develops tension uplift beneath the concrete core. To resist these forces, a system of rock anchors was installed at the base of the core. Seventy-seven 3-inch diameter rock anchors were drilled 40 to 60 feet into rock; the 150ksi bars were tensioned to 600kips each. To facilitate transfer of these forces to the core, the bars were jacked and locked off on the top of the footing, then extended to the first floor and anchored within the concrete core walls.

Eleven Times Square will be an environmentally responsible building befitting its marquee location. The tower's unique architectural features include floor plates that broaden as the building rises skyward and six tenant-exclusive terraces. Corner offices on every floor offer panoramic views of the Hudson River, Times Square, and the Empire State Building. The building's floor construction and perimeter gravity-supporting structure are steel, providing a flexible structure ideal for the New York office market. Closely coordinated with Eleven Times Square's façade and lower levels, the frame maximizes the floors' regularity and flexibility so that connections and materials are readily accessible to tenants who may wish to add communicating stairs, or reinforce floors for cafeteria space, heavy filing cabinets, or mock courtrooms.

Above the fifth floor, column layout is closely coordinated with the architecture to provide column-free corners and facades, maximizing views of the city. FXFowle designed the building's south facade with a 45-foot cantilever corner to keep the corporate lobby entrance clear of columns as well. Office floors seem to float above 41st Street, creating an open entrance space. Eli Gottlieb, a vice president at Thornton Tomasetti, says the team identified a special erection sequence for the south truss that runs between the eighth and eleventh floors and supports column No. 1 over the lobby entrance. The truss was erected using a temporary erection column between the first and third floors; with the column supporting the steel frame, crews were able to continue constructing floors while fabrication of the permanent cantilever truss was being completed. "The use of steel allowed the cantilever truss to be built cleanly while maximizing the windows on the three floors of the truss," says Gottlieb.

Including connections, the project used 6,800 tons of steel. The majority of steel members are rolled wide flange sections varying from small to jumbo sizes. Jumbo sections are limited to the heaviest columns and transfer girders. The third- and sixth-floor systems of transfer girders are built-up plate girders. In the plate girders, the flanges and webs are varied along the section to minimize the amount of material used.

The plate girders were sized to allow the maximum plate thicknesses to be 4 inches or thinner in order to

Facing The retail podium cuts back on the building's north and west sides at the 6th floor, creating a terrace for future tenants.

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Far left The northeast elevation.
Left The west elevation.
Below The building's L-shaped site, as seen from above.
Facing Steel framing allows the building to have a unique cantilevered shape, creating column-free corners and office floors adaptable to a range of uses.

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Facing The 38th-floor crystal, the apex of the tower's north and west faces, supports a triple-height curtain wall and skylight with a system of architecturally exposed structural steel. **Above** A typical office floor plan.

utilize Grade 50 material. The sixth-floor girders are 48 inches deep with 24-inch-wide flanges. This flange width was determined for the largest flange forces utilizing a 4-inch-thick maximum plate. Additionally, the flange width is slightly wider than the W14 column sections bearing above and below the girders, thus simplifying the connections. HSS sections are used for the support of the exterior wall in double height spaces and in the screen walls.

The majority of the rolled steel for the project is ASTM A992 Grade 50. For the jumbo sections, starting with W14x370s, ASTM A992 or A913 fine-kilned Grade 65 was specified. Plate material was generally ASTM A572 grade 50, but varied depending on thickness and use within the project.

Wide flanged beams are used for most of the building's flooring. Columns range from rolled W14 to jumbo shapes. Where necessary, built up sections are used for columns and girders. The largest columns are 28-inch-square box columns with 4-inch-thick Grade 50 plates.

Steel connections to the core use embed plates cast into the concrete core with welded single-plate shear connections. These shear connections are designed with bearing bolts to avoid end fixity moments from being generated in the shear bars due to the rigidity of the concrete core and embed connection.

Most of the structure's connections are shop-welded and field-bolted connections. Bolts are typically ⅞-inch diameter A325s and 1⅛-inch A490s. Field welding was limited to attachment of the shear bars to the embed plates in the core walls, the top flanges of moment connections, and some larger column splices. Most shear connections in the typical floor framing are shear plates or extended shear plates. Moment connections at the columns are designed with bottom flange bearing connections and welded top flanges.

Like its structural components, the building's ductwork maximizes ceiling heights and tenant flexibility. Where ducts exit the core, beam depths are limited to 10 inches to allow the ductwork to exit at the highest point. As these ducts split, they drop under the typical W21 beams while allowing for a 9-foot-6-inch clear ceiling height on each office tower floor. At the girders, web openings were provided for tenants' services distribution. The girders are sized to allow the web openings to be unreinforced penetrations, thus minimizing fabrication costs.

With tenants' future costs in mind, SJP wanted the building's design to target LEED Gold certification. Its unitized curtain wall is important to the overall reduction of the building's energy consumption. "The real innovation on the curtain wall are the sunscreens,"

Left The 41^{st} Street corporate entrance.

“The design works very well because it allows the steel to do what it does best, which is the framing, the long spans, and the column-free corners.”

Dan Kaplan, FXFowle Architects

says Kaplan. “They are perforated aluminum; they’re almost like airplane foil wings that have two fins. Any shade that’s on the glass is energy that’s being reflected back to the sky versus having to be cooled off.”

Brackets cast in the floor slab support the majority of the curtain wall. Two of the most structurally unique areas are the exterior glass fin supported entrance between the ground and third floors, designed with engineers Schlaich Bergermann & Partner, and the 38^{th} floor crystal—a triple-height space forming the apex of the north and west faces of the tower. To support the curtain wall in this area, a system of architecturally exposed structural steel was developed. The frame consists of ¾-inch by 8-inch double plate mullions, which support the skylight and the façade by hanging from the roof steel and picking up a horizontal 8-inch round HSS section at the 39^{th} floor. The mullions are braced at the 39^{th} floor with a system of milled 3-inch round bars.

The ground-floor low-iron glass storefronts vary in height from 25 feet to 54 feet and encompass five separate systems: a 44-foot double-height projected storefront with 4-inch by 16-inch steel tube vertical mullions capped with a continuous skylight at 42^{nd} Street; a traditional storefront with reinforced mullions for the 25-foot areas on the building’s north and west sides; a 54-foot luminous glass wall with cantilevered milled stainless steel nosings supporting custom low-iron corrugated cast glass; the lobby entrance wall with stainless steel and glass exterior fins spanning 54 feet vertically at 10-foot centers; and the 41^{st} Street storefront, which uses 3-inch-by-11-inch steel reinforcing plates inside of aluminum mullions to span 38 feet vertically at 10-foot centers.

The tower’s exterior design may project different things to different people, but inside it accomplishes the same goal of flexibility for all users. “When you talk about a New York Times Company, or about Reuters or Condé Nast, or even a large law firm—dynamic media companies, tech companies, consultancies, teaming environments—the ability to combine and recombine space is essential,” says Kaplan. “The design works very well because it allows the steel to do what it does best, which is the framing, the long spans, and the column-free corners.” As one of the final and largest pieces of the corridor that includes many other giants, Eleven Times Square has a big role to play—but with its sights set on tenants’ future needs, the building will have the range to perform for a multiplicity of users. **M**

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Above Perforated aluminum sunscreens attached to the unitized curtain wall reduce the building’s energy consumption.
Left The tower’s shape maintains lines of sight on 42^{nd} Street.

ELEVEN TIMES SQUARE

Location: **Eighth Avenue and 42^{nd} Street, New York, NY**
Owner/Developer: **SJP Properties**, *Parsippany, NJ*
Architect: **FXFowle Architects**, *New York, NY*
Structural Engineer: **Thornton Tomasetti**, *New York, NY*
Mechanical Engineer: **Cosentini Associates**, *New York, NY*
Construction Manager: **Plaza Construction**, *New York, NY*
Curtain Wall Consultant: **Heitmann & Associates, Inc.**, *New York, NY*
Structural Steel Fabricator: **Cives Steel Company**, *Gouverneur, NY*
Structural Steel Erector: **Cornell & Company**, *Woodbury, NJ*
Curtain Wall Fabricator: **Permasteelisa Cladding Technologies, Ltd.**, *Windsor, CT*
Curtain Wall Erector: **Tower Erectors**, *Clinton, NJ*
Metal Deck Erector: **Cornell & Company**, *Woodbury, NJ*