METALS IN CONSTRUCTION

THE STEEL INSTITUTE OF NEW YORK
THE ORNAMENTAL METAL INSTITUTE OF NEW YORK
211 EAST 43RD STREET, SUITE 804
NEW YORK NY 10017

PUBLISHED BY Steel Institute of New York Ornamental Metal Institute of New York

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SPRING 09

THE COOPER SQUARE HOTEL /
ELEVEN TIMES SQUARE /
MUSEUM OF ARTS AND DESIGN /
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Above Stainless steel and glass curtain wall with aluminum sunscreens, Eleven Times Square.

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EDITOR'S NOTE
LEED®—Version 3 and still evolving

Three years ago in this column, I questioned whether green building practices would become fundamental to how we live. After all, longstanding campaigns to get us to conserve gas and electricity have produced only half-hearted compliance in the decades since their introduction. My reply was that, if the sustainable contributions of the steel construction industry were an example, there was reason for optimism. Today, we see businesses and organizations continuing to coalesce around initiatives related to sustainable development, despite unprecedented economic distress and only limited government incentives. Even Capitol Hill is pushing to enact climate change policy, rounding out this amazing paradigm shift. So the message must be clear: Since buildings alone account for 40 percent of global energy use and carbon emissions, the implementation of green building practices is seen as being essential to our collective environmental health. Another sign of this momentum is the United States Green Building Council's recent issuance of version 3.0 of its internationally recognized LEED® rating system. Launched in 2000 to help develop and implement sustainable practices, the system allows projects to earn points for environmentally friendly actions taken during the construction and use of a building. However, as it relates to selection of building materials, the LEED® system focuses principally on aspects of their production. Steel—the most widely recycled material on the planet—offers advantages in this regard, but yields other environmental benefits still not accounted for in the evolving LEED® system. For example, steel is a fast, safe construction material. Reduced time on site means less disruption to the community. Steel has a high strength-to-weight ratio, and so is resource efficient. Steel buildings require smaller foundations, meaning less construction noise and fewer deliveries, reducing emissions in the neighborhood. A steel building's long column-free spans allow businesses greater flexibility in arranging and rearranging functional relationships to fine-tune productivity. No longer meeting the needs of one organization, steel buildings can be readily adapted and reconfigured to serve another, increasing the longevity of buildings—something fundamental to overall sustainability. Listing these benefits is not to say that LEED® focus on production considerations is unimportant.

In the past decade, there has been a 28 percent reduction in the energy required to produce steel, contributing to an overall reduction of 50 percent over the last half-century. On-site generation of electricity using process gasses has eliminated these emissions from the generation sector, lowering overall emissions from steel production to levels well below Kyoto standards. Most importantly, virtually no steel ends up in landfill. There is no site waste and any waste that is generated at the fabrication plant is returned to the supply chain. Steel can be recycled indefinitely without loss of property or performance. This means steel always has value, almost guaranteeing it is never discarded. From its mid-1800s beginnings, steel recycling has become a self-sustaining industry—one that will continue in the unlikely event that green building practices, like the conservation campaigns of the '70s and '80s, fail to become fundamental to how we live.

Gary Higbee AIA, editor

THE COOPER SQUARE HOTEL

Hip to be Square

Left The glass, aluminum, and ceramic curtain wall designed by Carlos Zapata Studio accentuates the building's height with shifts of material and pattern.

Cooper Square, the bowtie of streets at the throat of the Bowery, is transforming into an intersection of major contemporary architects. Although developer Ian Schrager may not have been able to erect the bipedal building that Rem Koolhaas and Herzog & de Meuron conjured for him there, Charles Gwathmey finished the Astor Place apartments in 2005 and Thom Mayne is nearly done with a new Cooper Union academic center that is cloaked in rippling steel mesh. The most recently completed addition, The Cooper Square Hotel, captures the spirit of design experimentation in every detail, including a curtain wall that gives the building an outstanding presence among its neighbors.

The hotel's design, by Carlos Zapata Studio (CZS) and architect of record Perkins Eastman, expresses the dynamism of the address' polyglot urban fabric. The site includes an 1845 tenement, occupied by two immovable residents, which is now shored up in steel. The new glass-and-aluminum tower abutting it twists and bridles to a height of 21 stories, and a similarly skinned five-story structure on the site's north side mediates between the hotel and the smaller-scale buildings surrounding it. In another nod to context, the taller component sprouts a green, cantilevered nub that references the copper roofs of neighbors like St. George's Ukrainian Church.

In addition to evoking nearby landmarks or a particularly local kineticism, the design differentiates itself from the neighborhood by soaring up and away from it. "Our design approach is always the same; it's not about being sculptural just to be sculptural," says CZS principal and studio director Anthony Montalto. "It's about using light and shifts of material and plane to accentuate a certain directionality. Here, we wanted to accentuate verticality." The building's faceted surfaces slope back and pick up light, giving hotel patrons the impression that their temporary home contains many more than 21 floors and 145 units.

The architects deployed ceramic fritting in the panelized curtain wall to underscore this heightening effect. "Traditionally, frit has been used purely to block sun while maintaining your full glass expression," Montalto says, "yet of late I think it's become a design element. Technology has improved to a level that you can do a lot of things with frit." The curtain wall comprises Saint Gobain's low-iron Diamont glass without low-e coating, and units are insulated 6 millimeters outboard and 6 millimeters inboard with a 12-millimeter gap between the heat-strengthened lites. Although the lites are butt-glazed, the interior fully expresses 2½-by-3½-inch anodized aluminum mullions. On much of this glazing, the white ceramic dots are applied to surface 2 to appear most dense at the top to and disappear toward the bottom. The pattern is positioned at the top of the window, to emphasize or deemphasize particular surfaces. Occasional accent patterns, which fade from left to right or right to left, further amplify the building's appearance of height.

CZS also envisioned the building's ornamental metals in that vein. Like the ceramic frit, white anodized aluminum panels, which are not part of the enclosure system, are die-cut in a similar pattern and attached to the panelized curtain wall. The top of each of these 20-gauge aluminum panels, which measures approximately 1⁄16 inch in thickness, features the largest, ¾-inch-diameter holes in the greatest density. Farther down the panel the circular incisions diminish in both number and, at ⅜-inch diameter, size.

Gundelfingen, Germany-based Josef Gartner, the 141-year-old manufacturer that today specializes in panelized curtain-wall systems, fabricated functional as well as decorative claddings and assembled the two before shipping the units to the United States. Bernhard Rudolf, Gartner's director of project management, says his is a job of orchestration. "I buy the glass from somebody else, I buy the insulation, I buy the metal sheets, I buy the extrusions. For me a curtain wall is more or less pieces supplied from elsewhere." In the case of The Cooper Square Hotel, sister company Pohl made the 5-foot-wide anodized aluminum panels in three different heights, creating them with a numeric-controlled punching machine.

Where perforated aluminum replaces glass panels, Gartner anchored and sealed hanging strips

Above Curtain wall panels were manufactured in the Josef Gartner factory before being mounted into concrete-slab anchor channels.

Facing A green cantilevered corner references the neighborhood's copper roofs.

The Cooper Square Hotel captures the spirit of design experimentation… expressing the dynamism of the address' polygot urban fabric.

to the galvanized and insulated portion of the curtain wall, and hung and locked the panels in the factory. The second skin is independent, Montalto says, and the 2-inch space between the face of the curtain wall and the face of each aluminum sheet "allows water and weather to pass behind and within" and lends dimensionality to the building's skin. Moreover, where glass and aluminum do overlap, the gradation of dots provides a transition between materials. "The metal is more transparent, per se, as it gets closer to the glass," Montalto notes. "It goes from something that's very metallic to not-so to glass." In order to install the entire composition into the largely cast-concrete hotel structure, ironworkers from Tower Installation mounted the panels in concrete-slab anchor channels, maintaining a smoke seal between the layers. Elsewhere in the building, the same panels finished in bronze do double-duty as a rain screen. The pattern even inspired details like the stainless-steel dots that stud the hotel entry's grand mahogany doors.

Montalto thinks The Cooper Square Hotel is part of a nascent design trend. "The basic building components, the treatment of flexibility of glass, the use of ceramic, the use of ornamental patterns, is only going to give architects more and more flexibility," he says. Rudolf seems unfazed. He admits that complicated geometries of a project like Cooper Square Hotel oblige Gartner to figure out curtain walls in CATIA instead of simpler AutoCAD. Even so, "architects always use new panels, new materials, because you are not expressing your image if you copy. And who will buy architecture when everything is the same?" **M**

Previous page: © The Cooper Square Hotel; this spread: © Carlos Zapata Studio

© Carlos Zapata Studio

Above: © Carlos Zapata Studio; right: © The Cooper Square Hotel

Facing White anodized perforated aluminum panels, which are not part of the enclosure system, create a second building skin and add dimensionality to the structure.

Above Hanging strips were anchored and sealed in the galvanized and insulated portion of the curtain wall before perforated panels were hung and locked to the system in the factory.
Left The 21-story tower is fused with a red brick tenement that could not be demolished.

THE COOPER SQUARE HOTEL

Location: **25 Cooper Square, New York, NY**
Owner: **A private group of investors**, *New York, NY*
Lead Developer: **Matthew Moss**, *New York, NY*
Design Architect: **Carlos Zapata Studio**, *New York, NY*
Architect of Record: **Perkins Eastman**, *New York, NY*
Structural Engineer: **Leslie E. Robertson Associates**, *New York, NY*
Mechanical Engineer: **Ambrosino Depinto & Schmeider**, *New York, NY*
Construction Manager: **F.J. Sciame Construction Co., Inc.**, *New York, NY*
Curtain Wall Consultant: **Front Inc.**, *New York, NY*
Structural Steel Fabricator and Erector: **Post Road Iron Works**, *Greenwich, CT*
Miscellaneous Iron Fabricator and Erector: **United Iron, Inc.**, *Mt. Vernon, NY*
Architectural Metal Fabricators: **Gartner**, *Stamford, CT*;
General Glass, *Secaucus, NJ*
Architectural Metal Erectors: **Tower Installation**, *Windsor, CT*;
General Glass, *Secaucus, NJ*
Ornamental Metal Fabricator and Erector: **United Iron, Inc.**, *Mt. Vernon, NY*
Curtain Wall Erector: **Tower Installation, LLC**, *Windsor, CT*

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.

© FXFowle Architects

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.

This spread: © Bernstein Associates Photographers

This page: © Thornton Tomasetti

© FXFowle Architects

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 41st 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 38th 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 39th floor. The mullions are braced at the 39th 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 42nd 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 41st 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

This spread: © FXFowle Architects

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 42nd Street.

ELEVEN TIMES SQUARE

Location: **Eighth Avenue and 42nd 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*

MUSEUM OF ARTS AND DESIGN

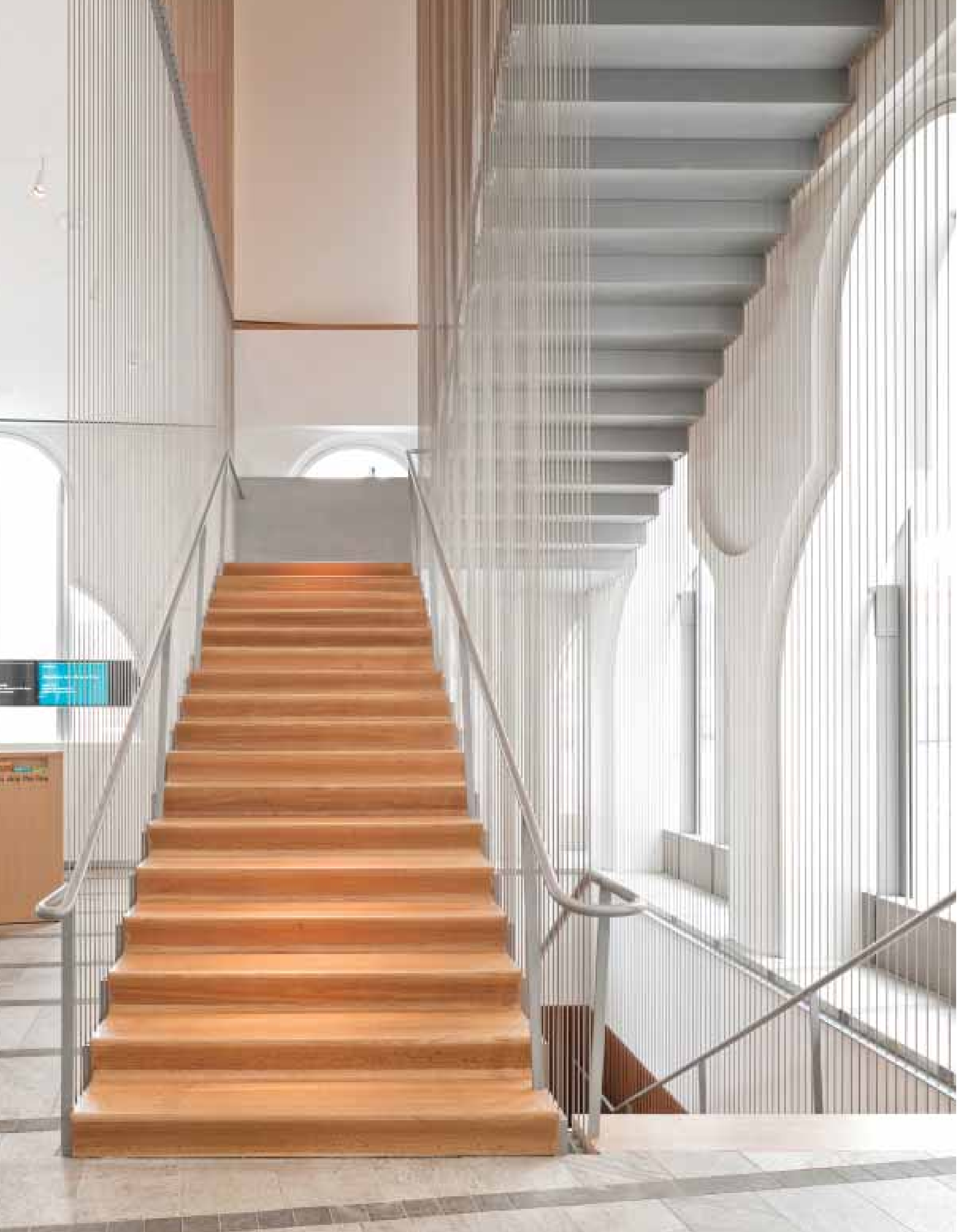
Mad World

The new Museum of Arts & Design (MAD), a reinvention of Edward Durrell Stone's modernist palazzo 2 Columbus Circle by Brad Cloepfil of Allied Works Architecture (AWA), touched off an impassioned preservationist debate by radically altering the original facade. But even those squeamish about the new light-admitting exterior agree that changes to the interior—notably the museum lobby's new ornamental entrance stair—were sorely needed to correct functional shortcomings that long plagued the original design.

Isolated on a miniscule island of prime Manhattan real estate, MAD contains a mere 4,500 square feet at street level—not much for a museum lobby intended to host 500,000 visitors annually. Such a small footprint became especially problematic with MAD needing to squeeze in a retail store and loading dock at ground level as well. Both client and architect determined that an elegant stair, while space taking, was vital to the project. "There was a desire to allow people to move up from the lobby quickly," says AWA partner Kyle Lommen, referring to the stair as a device for preventing newcomers from falling victim to elevator gridlock. "There is also a ceremonial quality in moving between a gallery and the lobby by another means than the elevator."

For AWA founder Cloepfil, the aesthetic goal was "to have the stair be as transparent as possible and to float in space. We wanted the ceremony but we didn't want it to become a major spatial plug. The quality of the structure, the floating metal plate, is just structural transparency."

Realizing this vision of something so sheer that it didn't visually intrude in the small lobby required some literal heavy lifting. The stair, which extends from the cellar floor to the second-floor gallery ceiling, is suspended on 300 Jakob Inox 6mm 1x19 stranded-



Previous spread, opposite and top: © Adam Friedberg; right: Allied Works Architecture

Previous spread Though it occupies valuable space in the museum's ground floor, the stair fulfils the architect's vision of a transparent, floating structure that allows visitors to move between floors with ease. The lobby also features Yves Behar's Swarovski crystal chandelier, *Mini Voyage*.
Facing Three-eighths-inch-thick A36-grade steel plates were welded together to form the stair's risers and treads, which were assembled in four main sections with two landings.
Above The stair hangs from the second-floor gallery ceiling on 300 Jakob Inox 6mm 1x19 stranded-wire cables.
Right The second- and third-floor gallery plans.

wire cables tensioned to approximately 900 pounds. Each of the woven stainless-steel stringers, which list a minimum breaking strength of 22.0 kN, measures ¼ inch in diameter. Spacing is 2½ inches on center to also function as a balustrade.

The subjects interviewed for this story say that no such installation has been attempted before. In that vein, Lommen says choosing a subcontractor "came down to who really wanted to take it on." The successful bidder was United Iron, Inc. (UI), and president Randy Rifelli concurs with a laugh, "It was beyond a challenge! It was one of the most difficult jobs we've ever done. And it was unknown, this concept of hanging stairs on cables without supports."

UI's first step was to fabricate the ⅜-inch-thick A36-grade steel plate that appears to run among the three floors without a seam. Steel plates were welded together to form the stair's risers and treads. Then each fully welded plate combination was welded to the next riser-tread module. The stair assembled into four main sections with two separate landing sections; Rifelli says his team used partial-penetration welds at each plate connection throughout the stair. Because four cables penetrated each tread, and each cable is single-span, "the cable ran through four points of the stair and it was critical that they line up perfectly," Rifelli says. "The visual vertical alignment is what provides the architectural splendor. To weld each plate to each other and to accurately drill the multitude of holes for the cable spacing was the tough part. To our surprise the lineup of the holes was better than expected."

With assembly completed, the stair sections were delivered to the project site on dollies, then hoisted into place via electric chain fall. Because the finish cables of the stair were only 3 inches from the walls, the cables could not be installed until the walls were finished. "The stair stayed on designed temporary channel supports for months while the walls were finished by other trades," Rifelli says. Indeed, the tight installation required careful project choreography. The plan was to have a maximum amount of finish work completed, with just minimal building structure exposed, when the stair was initially put in place. To finish the stair, the crew welded the sections together—performing on-site bead blasting at the welded location to complete the finish—and then installed and tensioned the cables for the stair. Just as they tensioned the cables by hand at the structural supports, United Iron's crew also performed the meticulous work of manually threading the 300 cables through their corresponding holes, and then of clamping and pinning them to the treads. (White oak tops the riser treads, appearing to cascade down the angular bent steel.) "We didn't have a lot of people doing it," Rifelli says, "but we did have a lot of man-hours."

Although one of the building's most expressive, and controversial, features is its new skin (created by incising the original windowless, load-bearing walls to allow light entry, giving MAD the overall appearance of a fragile shell beginning to break open), it is the lobby stair's seemingly unprecedented construction that represents the best of Cloepfil's design—the derring-do of the structure and its commitment to skilled execution. **M**

Above: © Adam Friedberg; left: Hélène Binet

© Adam Friedberg

Facing above Cables were tensioned by hand at the structural supports, then manually threaded through their corresponding holes and clamped and pinned to the stair's treads.
Facing left The new face of 2 Columbus Circle.
Above The woven stainless-steel stringers, which list a minimum breaking strength of 22.0 kN, each measure ¼ inch in diameter.

MUSEUM OF ARTS AND DESIGN

Location: **2 Columbus Circle, New York, NY**
Owner: **Museum of Arts and Design**, *New York, NY*
Architect: **Allied Works Architecture**, *New York, NY*
Structural Engineer: **Robert Silman Associates**, *New York, NY*
Mechanical Engineer: **Arup**, *New York, NY*
Construction Manager: **F.J. Sciame Construction Co., Inc.**, *New York, NY*
Curtain Wall Consultant: **R.A. Heintges & Associates**, *New York, NY*
Structural Steel Fabricator and Erector:
Cross County Contracting, Inc., *Pine Bush, NY*
Miscellaneous Iron Fabricator and Erector: **United Iron, Inc.**, *Mt. Vernon, NY*
Architectural Metal Fabricator and Erector: **United Iron, Inc.**, *Mt. Vernon, NY*

REGO PARK II

Rego à Go-Go

Can you build big-box retail on a borough-sized footprint? That's what the development and design teams for the new Rego Park II in Queens were determined to do when they began work on the $550 million retail and residential venture owned by Vornado Realty Trust. "The development is one of the first attempts to rearrange big-box retail into a vertical format, appropriate to an urban infill location with ground-level orientation and a mix of uses," says Giovanni Valle of the project's design architects Ehrenkrantz Eckstut & Kuhn Architects (EEK), who worked with architects of record SLCE Architects and Greenberg Farrow and structural engineers Severud Associates on the project.

At 440 feet by 600 feet—equivalent to three to four Manhattan blocks—the development's footprint is one of the largest in New York City, but for retail giants used to occupying more than 200,000 square feet with a single store the space could feel small and inflexible if it weren't for structural steel framing. "It allows for increased open floor area and, therefore, greater flexibility for location of interior partitions," says Valle. The 30-by-30-foot column grid creates easily modifiable space for tenants who could require mezzanines, and escalator and elevator openings. The structural design also allows unique architectural elements, including a curved metal roof, pedestrian platforms, bridges, and a tensile fabric structure, to achieve their intended form.

The development's three floors of retail space, which totals 694,000 square feet and connects to a five-level car garage, will supplement existing malls in the immediate area, with the goal of forming a cohesive shopping destination in Rego Park. The project also includes a 300,000-square-foot residential tower, which along with the retail complex aims to revitalize its portion of Junction Boulevard by transforming the neighborhood from one of numerous empty lots into a "mixed-use Main Street," says Valle. The new complex defines a block-long open-air galleria protected from the elements with a structural steel canopy covered with fabric cladding. The galleria links the retail complex and Junction Boulevard with the adjacent residential neighborhood. The fabric membrane of the galleria canopy is supported by twelve tied arches that span from the north building to the southwest building and parking garage. The arches are two-chord trusses with 12-, 10-, 8- and 6-inch diameter pipe; their web members are pipes that range in diameter from 1½ inches to 6 inches. The cables that tie the bases of the arches are ¾ inches in diameter.

The relatively small site plan necessitated the vertical stacking of big-box retail tenants in order to accommodate the required program. Parking was also stacked in order to remove cars from street level and create an inviting pedestrian-oriented shopping environment at grade. Two levels of parking and one level of retail are also located below grade to maximize area within the given footprint.

Typical floor construction for the retail buildings consists of concrete fill on composite metal deck. The structural steel beams and girders are composite with the concrete floors and use headed studs for shear transfer. Decking is primarily 3 inches deep, 18- or 20-gauge composite floor deck. Decking on the roof of the north retail building, where there is no concrete, is 3-inch-deep, 20-gauge roof deck.

A typical retail bay is framed with W18 x 35 filler beams spaced

Previous spread A block-long open-air galleria will be protected from weather by a structural steel canopy covered with fabric cladding.
Page 23 A rendering of the completed mixed-use development.

Top Erection of the five-level parking garage at the east side of the site.
Above The column grid of the future residential tower is oriented at a 45-degree angle to the retail building supporting it.

Previous spread, left: © Severud Associates; top: © Ehrenkrantz Eckstut & Kuhn Architects

Facing and top: © Bernstein Associates Photographers; right: Severud Associates

Above Steel erection for the retail building on the northwest side of the site.
Right A 30-by-30-foot column grid enables tenant flexibility.
Below Typical retail bay framing.

at 10 feet and W24 x 76 girders. Columns are W14 in varying sizes. Rolled shapes are ASTM A992, while most other material is A572 Grade 50. Round, rectangular and square HSS is ASTM A500 Grade B. Miscellaneous connection material is ASTM A36. The majority of connections are shop-welded and field-bolted with ASTM A325 or A490 bolts.

Designing a large complex for such a small site was one challenge. Sequencing the erection of steel for the 30-by-30-foot column grid project was another. Structural steel erection began on the southwest corner of the site, proceeding upward and northward, in sequences, finishing with the galleria. A Liebherr LR1400 crawler crane positioned in the subcellar erected the steel for this portion of the project. Next, steel erection began in the northwest corner of the site where a Liebherr LR1250, positioned on a platform (a small portion of the ground floor and supplemental framing erected from the street), erected upward and westward, in sequences, until reaching Junction Boulevard. The crawler crane then backed off the platform and erected the last sequences of steel.

In the meantime, the LR1400 used to erect the southwest building moved to the center of the north retail building and erected 90-foot transfer plate girders over the building's loading dock. This design allowed enough column-free space for trucks to maneuver when unloading deliveries. After erecting the plate girders, the crawler crane was moved to 97th Street on the east side of the site where, positioned

"Structural steel framing allows for increased open floor area and, therefore, greater flexibility for location of interior partitions."

Giovanni Valle, Ehrenkrantz Eckstut & Kuhn Architects

on another ground-floor platform, it erected the steel for the site's northeast corner. Finally, the steel truss bridge connecting the five-level parking garage to an existing garage across 62nd Drive (at the site's south side) was preassembled in a staging area at street level, and then lifted into place with a street crane. The project's approximately 7,300 tons of structural steel took eight months to erect.

"The 30-foot by 30-foot column grid readily accommodates the floor layouts for the retail tenants. With this column spacing, the transfer system at the roof of the southwest building (under the residential tower) worked well with an 8-foot depth restriction on the girders," says Chris Schneider of construction manager Bovis Lend Lease. This transfer system represented one of the bigger challenges for both the designers and the erectors of the project.

Although the project's retail and parking portions align with the city streets, the residential tower column grid is oriented at a 45-degree angle to the retail building that supports it. This orientation complicated the roof-level system of transfer girders. "The framing of the 8-foot-deep transfer girders was carefully studied to make it as efficient as possible," says Schneider. To anchor the reinforced concrete residential tower to the transfer system at the roof of the southwest retail building, bearing plates were installed under the columns and shear walls, and threaded couplers for the vertical reinforcement were welded to the bearing plates. At the shear walls, tie-down anchorages were provided at the ends by means of threaded rods which pass through the transfer girder top flanges and connect to the girder webs.

The hybrid structure presented other construction challenges, resolved through unique erection methods. The southwest retail building's stair and elevator cores were scheduled in concrete, but because the building supports the residential tower, the structural steel had to be erected before the concrete contractor was on site to frame the core walls. To resolve the issue, temporary 8x8 HSS columns were placed at the corners of the concrete walls. Then, a ring of channels framing from temporary column to temporary column created an opening for the walls. The floor framing connected directly to the temporary columns or ring beams, which allowed steel erection to proceed independently of the concrete.

The steel truss bridge that connects the new parking garage to the existing garage across 62nd Drive required additional problem solving with steel. On the new parking garage, steel brackets were field-welded to plates embedded in the precast concrete columns. However, since the existing precast concrete parking garage lacked sufficient capacity to support the vehicular/pedestrian bridge, the building team took advantage of an existing narrow space between the face of the garage and the property line to construct a steel frame able to support the bridge. The frame sits on a continuous grade beam that spans between

Top row: © Bernstein Associates Photographers; Severud Associates; bottom row: © Severud Associates; Bernstein Associates Photographers

© Severud Associates

Facing Retail tenants are connected by a series of catwalks in the Galleria.

Above A vehicular and pedestrian bridge across 62nd Drive connects an old parking garage with the new structure.

grade beams cantilevered from new mini-caissons drilled between the existing garage's pile caps. Slide bearings allow the two garages to move independently without inducing any forces in the bridge.

Taking advantage of the benefits afforded by using steel for rapid erection of the frame was important. The project's curtain wall assembly was coordinated to allow tenants to move into the building as soon as possible—enabling the building owners to begin collecting rent and generating revenue. The assembly is comprised of a metal panel system, both flat sheets and corrugated, mounted over rigid insulation (Dens-Glass sheathing with a waterproof coating) and cold-formed metal framing hung off the slab edge. With the exception of the storefronts, all of the building's exterior walls are curtain walls (totaling 170,000 square feet). The prefabricated wall panels were lifted into place with a Link-Belt RTC-8040 II crawler crane and field-welded to angles embedded in the edge of slab. With the envelope enclosed quickly, the development's anchor tenants were able to begin fit-outs of their respective spaces. The end result of the project teams' close collaboration was a streamlined erection process that allowed both owner and tenant to begin using the property as soon as possible. With cars removed from the street level, Rego Park II is immediately recognizable as a pedestrian-friendly place where shoppers, among rows of trees and shaded outdoor areas, just might forget they're at the mall. **M**

REGO PARK II

Location: **Junction Blvd. and Queens Blvd., Queens, NY**
Owner/Developer: **Alexander's of Rego Park II, Inc.**, *Saddle Brook, New Jersey*
Design Architect: **Ehrenkrantz Eckstut & Kuhn Architects**, *New York, NY*
Architects of Record: **Greenberg Farrow**, *New York, NY*
SLCE Architects, *New York, NY*
Structural Engineer: **Severud Associates Consulting Engineers, P.C.**, *New York, NY*
Mechanical Engineer: **AKF Engineers**, *New York, NY*
Construction Manager: **Bovis Lend Lease**, *New York, NY*
Structural Steel Fabricator: **Owen Steel Company**, *Columbia, SC*
Structural Steel Erector: **A.J. McNulty & Company**, *Maspeth, NY*
Miscellaneous Iron Fabricator and Erector: **Post Road Iron Works**, *Greenwich, CT*
Metal Deck Erector: **A.C. Associates**, *Lyndhurst, NJ*

ONE BRYANT PARK LOBBY

Banking on Green Design

On a recent tour of the Bank of America Tower, Serge Appel, an associate partner at Cook + Fox Architects and the project manager for the tower design, stands in the lobby and gestures through a cable stayed curtain wall at Bryant Park across Sixth Avenue. He tells the story of how, during the Crystal Palace Exhibition of 1854, which took place on the future site of the park, Elisha Otis publically tested his first elevator safety break, cutting its rope from 50-feet up and ushering in the skyscraper age as a result.

Appel says the building, also known as One Bryant Park, was designed as a monument to that history. The intertwining of skyscraper and nature led to this building, an homage that begins in its dramatic lobby—one built on a foundation of ornamental metal. "The whole building turns towards the park, from the torque of the building to the details of the lobby," Appel says. "It's not just about creating an environmental symbol, but also creating a literal connection to the environment." The challenge, then, is how to take a highly designed, rigorously engineered man-made building, one of the most technological ever conceived, and make it look not only natural but of nature. In this case, ornamental metal that the design team affectionately describes as "blackened" stainless steel forms the roots that bind the lobby to its surroundings.

The steel appears handcrafted, the result of a complex, proprietary acid treatment process by Stuart Dean that oxidizes a normally unoxidizable Type 304 stainless steel with a No. 4 directional hairline finish. The final product has the sheen of obsidian and the depth of ebony. Like other closely controlled materials—Jerusalem stone and caramel-colored leather—blackened stainless steel is used carefully to denote a transition from cooler stainless steel and painted aluminum, in the lobby's most public areas, to the warmer, richer finishes of its core. The tight editing provides both unity and simplicity to this technically advanced space. "We tried to really minimize the palette in the building, to keep it from being too busy," Appel says.

The most prominent stainless steel application is at the elevator banks, where it rings the entrance to each of the nearly two-dozen elevators arrayed in five banks: two on the ground floor for general tenants and three a floor up, in the Sky Lobby, which is exclusively reserved for Bank of America employees. At the mouth of each bank is a larger blackened steel entryway, though all bow before the massive 40-foot-high and 16-foot-wide archway intended as an exclusive north entrance for a second-tier tenant.

The panels range in size up to 7 feet by 4 feet and are made out of 16ga bent steel reinforcement clad in 14ga blackened stainless panels. Typical installation joints are simple butt joints. There are no joints at the intersections of vertical and horizontal profiles, which are shop welded and ground smooth until invisible, at which point the hairline finish is applied.

The elevator banks and secondary lobby also feature the blackened stainless steel in the form of ¼-inch-thick frames that border the leather wall

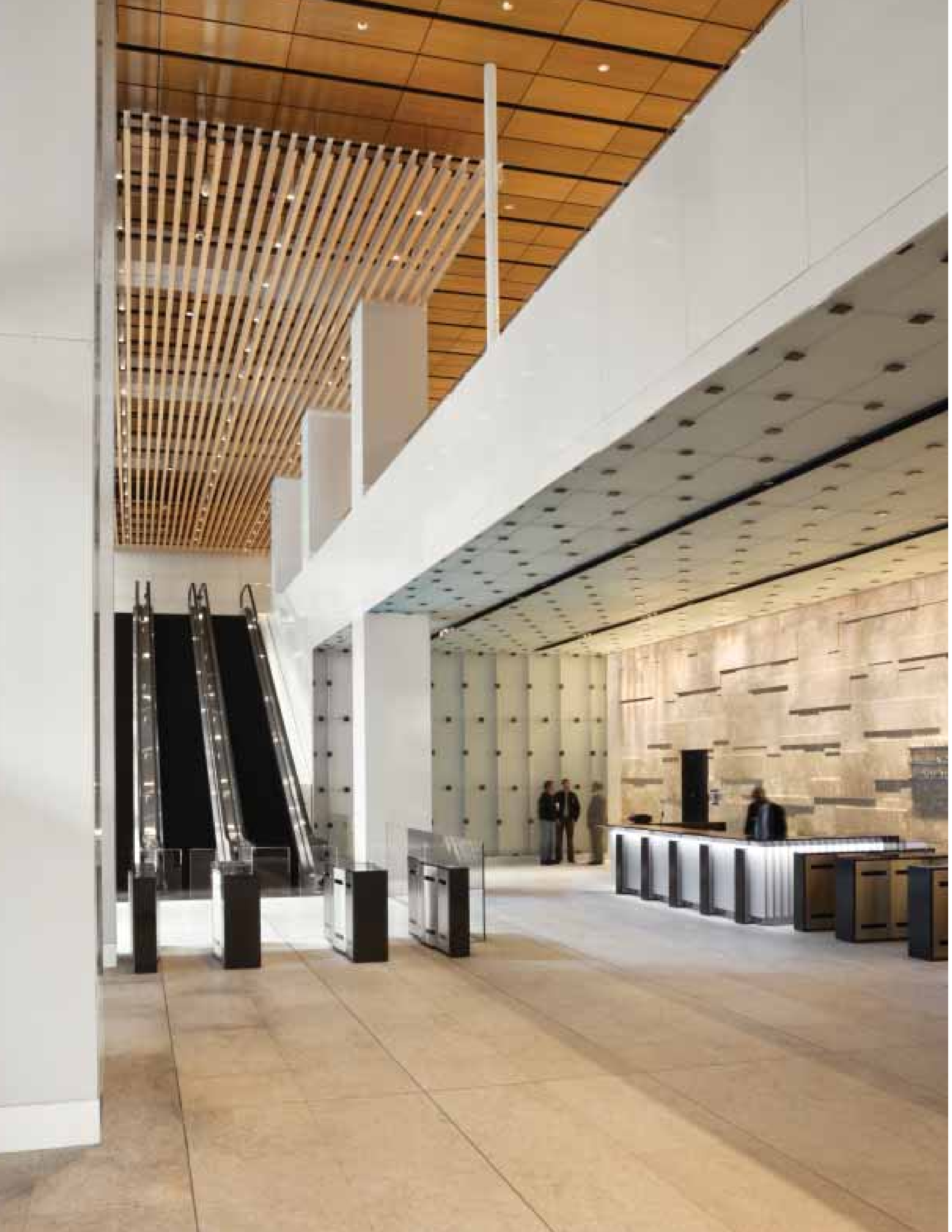
Previous page Blackened stainless steel, created with a unique acid treatment process, covers key card machines in the bank's lobby.
This page Blackened steel marks the entrance to each of four elevator banks.
Facing Blackened steel frames leather wall panels inside each elevator bank.

Previous spread and facing: © Bilyana Dimitrova; this page: © Cook + Fox

panels. Secured to concrete masonry units, the dark steel setting highlights the sumptuousness of the leather and furthers the natural look of the space.

The blackened stainless is also used as the cover plates for the security desks and key card machines that Appel acknowledges as a sad reality of modern office buildings, especially one named the Bank of America Tower. "We didn't want the security desks to look like a barricade," Appel says. "We wanted it to be one cohesive design element." A testament to Cook + Fox's attention to detail, the firm convinced the manufacturer of the key card readers to custom fabricate the covers using the blackened steel. Installed flush with the security desks the readers achieve the cohesion Appel desired, transforming a security barrier into something more natural and unimposing.

To further soften the security desks, lights are installed on the underside of the table, which is topped with leather to be warmer to the touch. The softly downcast illumination reflects off the steel, revealing a pearlescence that radiates throughout the space as the natural and artificial lights shift and change throughout the day. After all, if so much detail can go into the treatment of a single piece of metal, just imagine what lies in store throughout the rest of the building. **M**



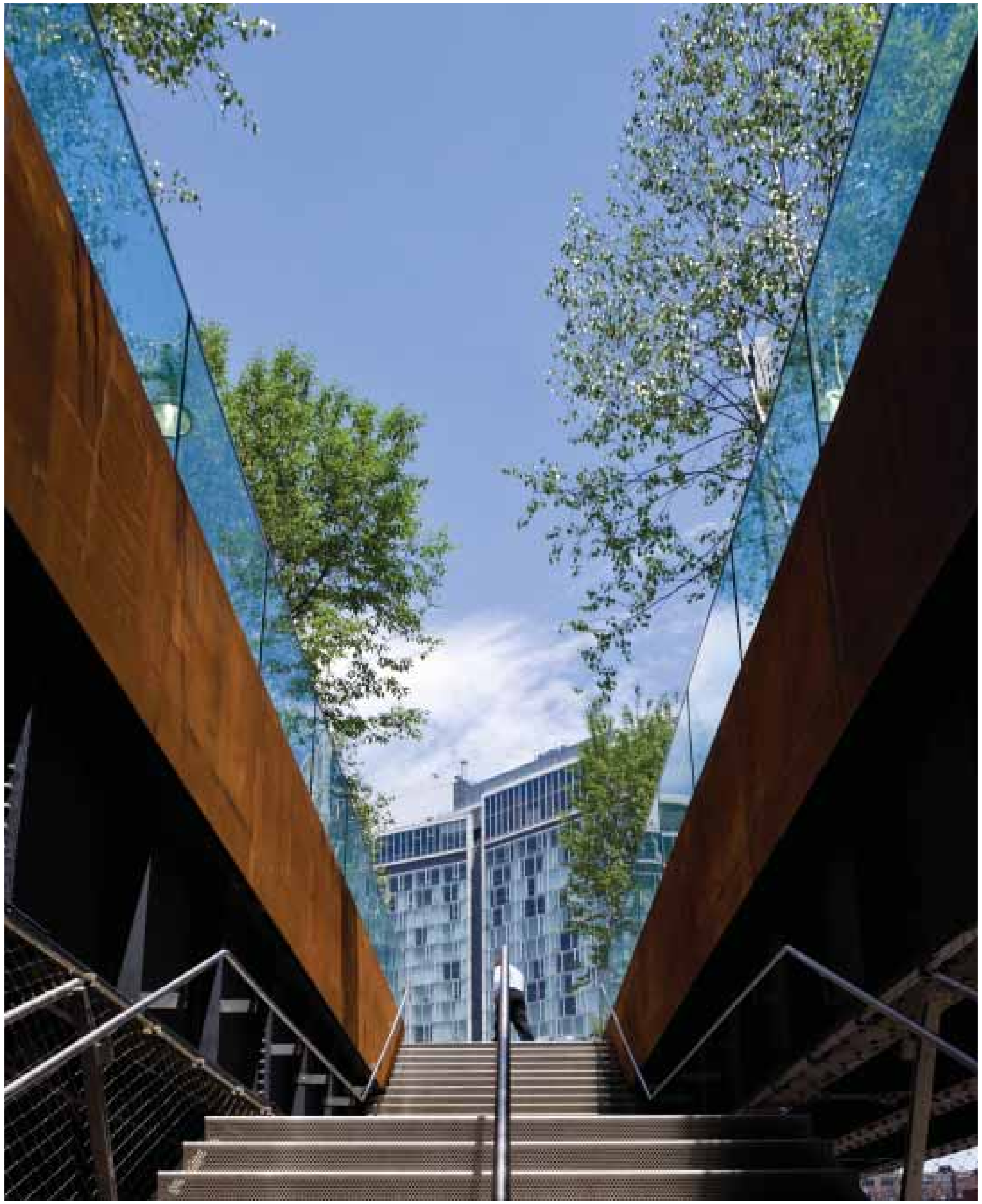
This spread: © Bilyana Dimitrova

Facing The uniformity of steel details creates the first impression of the building's sleek office environments. **Above** Illuminated blackened steel softens the look of the security desk.

The intertwining of skyscraper and nature led to this building, an homage that begins in its dramatic lobby, one built on a foundation of ornamental metal.

ONE BRYANT PARK LOBBY

Location: **1 Bryant Park, New York, NY**
Owner/Developer: **Bank of America at One Bryant Park, LLC, a joint venture between The Durst Organization and Bank of America**, *New York, NY*
Architect: **Cook + Fox Architects LLP**, *New York, NY*
Executive Architect: **Adamson Associates Architects**, *New York, NY*
Structural Engineer: **Severud Associates**, *New York, NY*
Mechanical Engineer: **Jaros, Baum & Bolles**, *New York, NY*
Construction Manager: **Tishman Construction Corp.**, *New York, NY*
Exterior Wall Consultant: **Israel Berger & Associates, Inc.**, *New York, NY*
Structural Steel Fabricator: **Owen Steel Company, Inc.**, *Columbia, SC*
Structural Steel Erector: **Cornell & Company**, *Woodbury, NJ*
Miscellaneous Iron Fabricator: **A-Val Architectural Metal Corp.**, *Mount Vernon, NY*
Miscellaneous Iron Erector: **Empire City Iron Works**, *Long Island City, NY*
Architectural Metal Fabricator and Erector: **Melto Metal Products**, *Freeport, NY*
Ornamental Metal Fabricators and Erectors: **Allied Bronze**, *New York, NY*; **Tower Installation, LLC**, *Windsor, CT*
Curtain Wall Fabricator: **Permasteelisa Cladding Technologies, Ltd.**, *Windsor, CT*
Curtain Wall Erector: **Tower Installation, LLC**, *Windsor, CT*
Metal Deck Erector: **Cornell & Company**, *Woodbury, NJ*



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Facing The Gansevoort Slow Stair, at the corner of Gansevoort Street and Washington Street, looking north.

HIGH LINE

Elevated Reuse

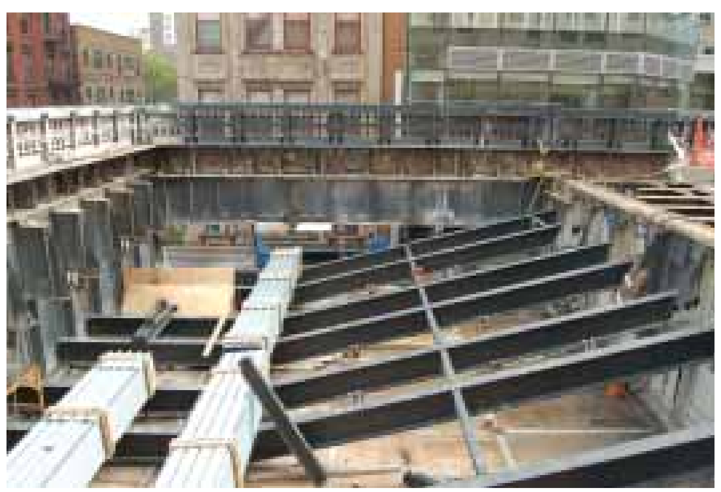
When the High Line was completed by the New York Central Railroad in 1934 so goods could be loaded and unloaded right inside factories that lined its route, its builders probably never fathomed it would see limited traffic as soon as the 1960s with the rise of interstate trucking. “The structure is just so massive, and so overbuilt,” says Matthew Johnson, a senior associate at Diller Scofidio + Renfro. “They wanted it to last for 100 or 200 years.” Nonprofit organization Friends of the High Line managed to save the massive West Side structure from threatened demolition, and then chose DS+R to transform it into a one-of-a-kind aerial park. Adding structural steel to the existing framework was integral to achieving the design vision because the firm wanted to play up the greenway’s colossal steel underpinnings as much as possible. “It has so many layers,” principal Ric Scofidio says, “it’s like a French pastry.”

Standing beneath the High Line, the rows of massive girders supporting the elevated tracks do somewhat resemble a slice of napoleon or baklava laid on its side. DS+R’s objective was to celebrate the steel structure undergirding the entire park by revealing it wherever a patron entered. As a result, the main stairways at Gansevoort and 14th Street punch through these girders, like a fork carving a bite out of the pastry’s center. This leaves the ornately riveted members that remain on either side clearly visible. Stan Wojnowski, an associate principal at structural engineer Buro Happold, said much of this work was made easier thanks to some incredibly detailed shop drawings that had been lying around the local office of CSX, the successor to New York Central. "Those drawings filled up three complete discs," Wojnowski says. “They were incredibly helpful with what we were doing.”

At the Gansevoort entrance, the stairs cut straight up through the tracks, as the southern terminus of the park is located at midblock (though the tracks once ran two blocks further, to Jane Street). Because the tracks were highly reinforced to accommodate freight trains, the approximately 46-by12-foot-cut, which removed portions of the existing 7- to 10-foot-deep girders, did not compromise the area’s structural stability at all. This was not the case, however, at the 14th Street entrance. There, because the stairs must rise up from the sidewalk and then make a 90-degree turn up and into the High Line, the 56-foot-long cut passed through one of the cross-bracing girders. This created a destabilizing arrangement in which a three-column girder became two smaller girders, one with two columns, and the other with one—Wojnowski compares this effect to that of a seesaw.

Because the park required elevator access for ADA compliance, among other reasons, the designers hit upon a brilliant solution wherein the elevator would do double duty, its structure serving as the second column of the destabilized girder. The first step, before the girder could be cut, was to support it with the elevator, which is made of ASTM A 500 tubes containing a glass-enclosed elevator, all of which was bolted to the existing structure. To further complicate matters, the connection occurs at one of the High Line’s numerous expansion joints. The solution was to install a steel seat on the expansion side of the new concrete slab. Once this seat was in place, the cuts could be made for the stair just as they were at Gansevoort Street.

Due to its position above the roadway, the High Line’s structural steel work had to be meticulously staged to minimize street closings—but nowhere more so than at the newly named 10th Avenue Square, the High Line’s only major avenue crossing at 10th Avenue and 17th Street. Because the original columns could not be built in the middle of this busy intersection, the structure carrying the rail beds had to extend to the sidewalks, creating a diamond-shaped square amidst the generally slim, rectangular path of the tracks. The designers decided to take advantage of this unique point along the park to cut down into the girders and create 10th Avenue Square, an amphitheater that provides views of the avenue and the Hudson River.



Top and left: © Martin Perrin; far left: © Friends of the High Line

Top: Design by James Corner Field Operations and Diller Scofidio + Renfro. Courtesy of the City of New York. Bottom: © Friends of the High Line

Facing, top A stepped wooden ramp covering the steel structure allows park visitors to see the city from a unique vantage point.
Facing, far left Steel beams were fabricated to create a sunken seating area at the 10th Avenue Square.
Facing, left Structural engineers used a Vierendeel truss to allow viewing windows to be cut in the existing girder.

Top The 14th Street elevator provides the second column of a destabilized girder created by steel removal for the entrance's "slow stairs."
Below The Gansevoort Street entrance.

To support the amphitheater, eight beams fabricated in an obtuse L-shape were lifted into the cut-out portion of the square. The square's new viewing windows are another impressive example of the project's ironwork. Their design involved cutting holes into the existing girder to create a Vierendeel truss. "It's the most inefficient truss you can imagine, but it works, if mostly for aesthetic reasons," Wojnowski says. Because of its complexity, the erection crew from Kiska continually checked with Buro Happold to ensure the site would be safe and secure when the cuts were finally made—they would have only a one-day window to perform the work, lest traffic on 10th Avenue should be blocked any longer. "They kept asking us, 'Are you sure about the sequence? Are you sure about the loads?'" Wojnowski recalls.

Before the cuts could be made, the truss had to be reinforced. This was done with ASTM A36 plates and angles of varying sizes of 8 inches square by 1 inch, 8 inches square by ½ inch, 16 ⅜ inches square by 1 inch, and L8x6x1 and L8x4x½, all of which were welded to the existing steel. The reinforcing steel and welds were sized so as not to locally overstress the existing steel at the welding locations and all reinforcing steel was installed on one side only. Then came the cuts, three of them at 8 feet 5 inches by 5 feet 10 ¾ inches. Despite the contractors' fears of deflection, Wojnowski says the system worked just as planned, with the platform deflecting no more than ¼ inch.

"The idea from the start was to really celebrate this amazing piece of engineering," Johnson says. "We wanted to really play up what was there already." The result is a revived structure that subtly integrates new steel with the existing framework—a testament to both steel's flexibility and longevity. Were it not for the resiliency of the steel already in place, this outcome would have been nearly impossible. But even after decades of use and exposure followed by decades more of neglect, Wojnowski says the design team had almost no problems completing the project. "That's the beauty of steel, it just made the whole process easier." M

HIGH LINE

Location: **Gansevoort Street to 30th Street, New York, NY**
Owner: **City of New York**, New York, *NY*
Developer: **Friends of the High Line**, *New York, NY*
Architect: **Diller Scofidio + Renfro**, *New York, NY*
Structural Engineer: **Buro Happold**, *New York, NY*;
Robert Silman Associates, *New York, NY*
Mechanical Engineer: **Buro Happold**, *New York, NY*
General Contractor: **KÍSKA Construction Corp.**, *New York, NY*
Structural Steel Erector: **KÍSKA Construction Corp.**, *New York, NY*
Miscellaneous Iron Erector: **KÍSKA Construction Corp.**, *New York, NY*
Architectural Metal Erector: **KÍSKA Construction Corp.**, *New York, NY*
Metal Deck Erector: **KÍSKA Construction Corp.**, *New York, NY*

ONE NORTHSIDE PIERS

Window Shopping in Williamsburg

Facing: © Toll Brothers; this page: © FXFowle Architects

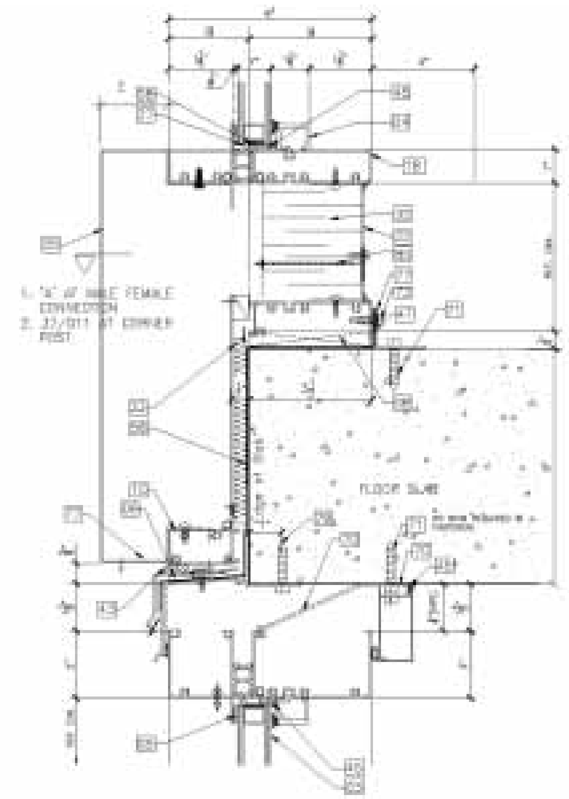
Facing One Northside Piers as seen from the public pier nearby.

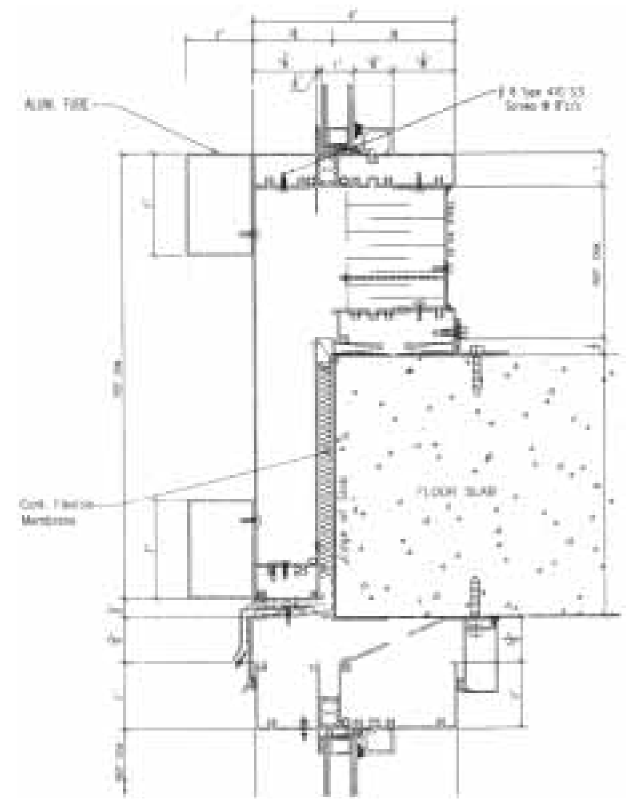
Above To the right of the balconies, the Type A window wall system includes thicker aluminum slab covers coated in white Duranar XL; to the left of the balconies, the Type B system includes two thin white aluminum strips.

From a distance, One Northside Piers, a new luxury condo tower on the Williamsburg waterfront, might look a lot like other glass-and-aluminum-clad residential towers. But a closer look reveals that the complex design by FXFowle Architects is a window wall system consisting of two window and slab cover typologies—a technique to break up the mass of the building, making it appear taller and thinner, as well as more visually intriguing. The window and slab covers are an integrated unit, an innovation by the fabricator allowing the architects freedom to create a more complex design, with multiple folds and planes, than would have been possible using separate windows and slab covers. This and other prefabrication capabilities helped the designers successfully achieve their ideas.

Part of a larger complex, the luxury tower and adjacent block of affordable housing are the first in a wave of new development following the Greenpoint-Williamsburg waterfront rezoning of 2005, a change that opened up the historically industrial area to residential use. The 29-story, 210,000-square-foot tower takes inspiration from the scores of glass-and-metal high-rises across the East River in Manhattan, but it avoids the cliché of being a "plain glass box," explains project architect David Lee of FXFowle, which worked with developers Toll Brothers, RD Management, and L+M Development Partners to complete the project last year. Instead, the 177-unit building appears as a series of interlocking volumes, its facades uniquely articulated by two types of window walls. In creating the two types, "we used a lot of the inherent aspects of the windows themselves—the mullions and such," says FXFowle project designer Joe Pikiewicz. "We've tried to accentuate some components and let others fade into the background to create differential patterns between different portions of the facade." Where the two systems abut one another on each side of the building, a vertical stripe or "fin" of aluminum marks the seam. On the north and south facades, a "zipper" of balconies further emphasizes this vertical division, which makes the building seem thinner.

One of the two system designs, Type A, features the bold horizontal lines of aluminum slab covers, which are more than a foot thick and coated in white Duranar XL, with mullions accentuated by 4-inch-deep snap-on ornamental pieces, also in white Duranar. Though mainly decorative, they cover a ½-inch-thick rigid insulation board that helps boost energy efficiency by preventing heat loss from the slab edge. Similarly, the snap-on elements, though mainly ornamental, aid energy efficiency by providing a small degree of shade. Though the snap-ons were nearly value-engineered out as nonessential elements, the designers prevailed because of their contribution to the overall appearance. "We put our foot down," Lee recalls. "When you go out to see the building, you really can't imagine the design without them."





The Type B system differs from Type A in that the slab covers each feature a pair of thinner white aluminum strips, accenting their horizontality. In addition, the gray-coated mullions have no snap-on covers, giving them a more subtle appearance.

To fabricate the window wall, FXFowle designers, the window wall consultant Gilsanz Murray Steficek, the construction manager Kreisler Borg Florman, and the owners chose a fabricator that could make mullions with only a 2-inch profile (formed from two 1-inch-thick pieces) for the vertical members, rather than a 4- or 5-inch profile. A ⅛-inch-thick steel plate is embedded in some of the mullions for additional strength, Lee says, when used in parts of the building subject to high wind loads—sometimes more than 60 pounds per square foot, as determined by wind tunnel testing, Lee says. From inside, the slender profile of the mullions minimizes obstruction of sweeping views of Manhattan, Brooklyn, and the East River. The designers also used wider window units at the corners—up to nearly 5 feet wide, as opposed to the typical panel dimension of 36 inches wide by 115 inches high—to help showcase those views from the living rooms. Glass used for the panels is Guardian AG-43, a 1-inch-thick insulated glass unit with low-E coating on the No. 2 surface.

Simple, unobtrusive aluminum and glass balcony railings from Aluspek were also chosen to maximize views. The aluminum portions, coated in a 10-micron clear anodized aluminum finish, create a sleek frame for a 6-millimeter clear tempered glass balustrade. The glass panels are 3 feet 7/16 inches tall and rest on a concrete base. Aluminum base shoes secured to the concrete with grade 304 stainless steel anchorages, support 3-foot-5/16-inch aluminum baluster rails capped with a 3¼-inch-wide by 1⅝-inch-high aluminum railing. The base shoe is independent of the guardrail, permitting adjustment at the time of the installation.

According to Pikiewicz, another advantage the fabricator offered was the opportunity to create a window unit with an integrated slab cover. Working in collaboration with the window company's engineers, the architects had the freedom to create a more complex design, with multiple folds and planes, than would have been possible with separate windows and slab covers, which would need to be easy to assemble on-site. That flexibility helped enable them to create the two window-wall typologies for the same building, Pikiewicz adds.

However, the unitized panels proved to be a mixed blessing. "They're used to much smaller concrete tolerances in Canada, and when we came to New York, a particular challenge was the amount of slab variation in the elevations," Lee remarks. In a more typical system, the slab cover would be installed after the windows, so it would cover any slight variations. In the case of One Northside Piers, to get each window and slab cover to line up with its neighbor, the construction workers sometimes needed to use shims, says Eric Platt, project manager from Kreisler Borg Florman. But overall, since the slab covers were integrated and didn't need to go on in a separate step, the system saved time, resulting in cost savings.

One Northside Piers, completed in May 2008, will soon be joined by a second, similar tower planned for completion by the end of this year, with a third tower to follow. Other present and future features of the complex include parking, landscaped walkways to the water, an esplanade, and a 400-foot public pier adorned with a wavelike stainless-steel sculpture, *Crescendo*, by local artist Mark Gibian. The architects wanted to have a visual attraction at the end of the pier, Lee explains, but the beauty of the arching forms of the sculpture is coupled with practicality: *Crescendo* simultaneously serves as an artwork, sunshade, and bench. Its curvaceousness provides a striking complement to the orthogonal lines in the tower onshore, yet the steel sculpture also shares a certain sensibility with One Northside Piers, a building whose metal surfaces serve multiple functions, aesthetic and eco-friendly. **M**

Facing, left The Type A slab cover;
Facing, right The Type B slab cover

Above Working with the fabricator to create window units with integrated slab covers allowed architects to create a more complex window wall system.

Below Glass and aluminum balcony railings maximize views of the East River.

ONE NORTHSIDE PIERS

Location: **47 North 4th Place, Brooklyn, NY**
Owners/Developers: **Toll Brothers,** *Horsham, PA*;
RD Management LLC, *New York, NY*;
L+M Development Partners, *Larchmont, NY*
Architect: **FXFowle Architects**, *New York, NY*
Structural Engineer: **McLaren Engineering Group**, *West Nyack, NY*
Mechanical Engineer: **Cosentini**, *New York, NY*
Construction Manager: **Kreisler Borg Florman**, *Scarsdale, NY*
Window Wall Consultant: **Gilsanz Murray Steficek, LLP**, *New York, NY*
Architectural Metal Fabricator and Erector:
Arista Architectural Metal & Glass, *Jamaica, NY*
Window Wall Erector: **Phoenix Contracting Group**, *Greenwich, CT*

THEODORE ROOSEVELT EXECUTIVE AND LEGISLATIVE BUILDING

A House Divided Must Span

In political terms, the Old Nassau County Courthouse at 1550 Franklin Avenue, Mineola, NY, could be considered a flip-flopper. The landmark turn-of-the century neoclassical edifice had become a jumble of old and new, often contradictory, architectural features over years of renovations and expansion—complicating the building's ability to exhibit a firm stylistic stand. Original interior features, such as 18-foot vaulted ceilings, were dropped and covered over, grand rooms were subdivided into small offices and cubbyholes, while remaining Ionic columns, gilded rotunda, and historical murals quietly faded into disrepair. In order to restore the historic principles of the initial design while adapting to the functional requirements of new-millennium government, the architects and designers behind the courthouse's recently completed $40 million renovation turned to structural steel.

The renovation of the courthouse—now known as the Theodore Roosevelt Executive and Legislative Building after the then-governor who laid the corner-stone in 1900—was a joint venture involving famed preservation architects John G. Waite Associates (JGWA), HWL International, Bovis Lend Lease, The LiRo Group, Greyhawk, and Carter Burgess. Equal parts renovation and restoration, the project involved adding a new 25,100-square-foot annex building to house the county executive and legislative chambers, while scaling the courthouse footprint back to its original 80,500 square feet, a process that called for the careful demolition of various additions and subdivisions that had accumulated over the years.

"The ultimate goal was to connect all the buildings together and create a complex that formed one campus," says John Gering, Senior Managing Partner of HLW International, the chief architectural and structural engineering firm behind the renovation. "We were dealing with multiple types of structures here," Gering says. "The old courthouse building was a very old reinforced concrete structure (the first public building ever to be so constructed) with different floor-to-floor heights, and the walls are literally 3 feet thick in some areas. Our challenge was to maintain the character of that building, returning it to its 1916 state, while incorporating an addition for the new Legislative Chamber."

To preserve the past without hindering function-ality, the architects designed a new glass curtain wall addition that encases the central structure of the old courthouse building, surrounding the circular press-room rotunda and creating a pair of glass corridors that link to the new annex building added at the rear of the complex. "Rather than destroying the character of the old courthouse, we wrapped the new glass structure around it, so that when people look at it from the outside they can still see the details of the original building," says Gering. "Those glass window walls formulate a new corridor that's internal to the space. When someone walks from the older building to the new legislative chamber they're actually walking by the exterior wall of the old building."

Erecting the glass link without disturbing the historic architecture required a certain structural finesse, facilitated by the properties of steel and the

Previous spread The hanging system used for new corridors clears the original structure's windows, keeping views unobstructed while allowing employees to pass to the new 25,100-square-foot annex building.

Above The second floor of the corridor is suspended from the roof structure by 1-inch diameter hanger rods spaced at 10-foot intervals.

ingenuity of expert ironworkers. "On all three sides of the old courthouse we definitely wanted to keep those two very different types of structural systems separate," says Tom Gasbarro, engineer of record with HLW International. "We didn't want to tie anything into the existing building, so there's an expansion joint at each side where they interface."

The architects still had to solve structural issues involving circulation within the glass enclosure without compromising the original aesthetic. For the two-level corridors adjacent to the central wing of the old courthouse, the challenge was to keep the original facade, and its windows, as unobstructed as possible. To clear the masonry arches of the windows, the architects devised a hanging floor system that gave the corridor an ample floor-to-floor dimension of 13 feet 6 inches, with a ceiling height of 11 feet 9 inches along the external face of the wall.

"The whole second floor is suspended from the roof structure in order to keep those windows unobstructed and the architecture intact," says Gasbarro. "The 60-foot span required to bypass the wing demanded a deeper beam than we had room for. So we ran our main spanning member, a W30x108, at the roof level and used 1-inch diameter hanger rods at 10-foot intervals to pick up the second floor of the corridor."

To maintain those long spans and brace against lateral loading, the architects chose a moment frame system augmented with a series of braced frames for the corridors. Corridor columns were predominantly wide-flange shapes of ASTM 992 Grade 50, with the largest beam at W30x108; the largest column was W12x96. Moment connections were typically field bolted with ¾-inch A325 bolts. Plates, angles and channels throughout were A36, while the composite metal decking of both the annex and the corridor conformed to ASTM A653 with a yield stress of 33 ksi. The hanger rods, clevis connections, and gusset plates were all left exposed and deftly sculpted to blend into the architectural design. From foundation to topping out, the glass corridor and annex building took 22 months to erect.

"Going into this we looked at multiple structural options, but we found that the new building addition required the kind of spans you couldn't get out of concrete unless they were very deep members," says Gering. "We had to have long spans for the legislative chamber and steel allowed us to achieve those. It never would've been possible with concrete."

Thanks to structural steel's ability to span the aisle between classic form and modern function, the Theodore Roosevelt Executive and Legislative Building is vetted for another century of public service. "It was a very old deteriorating building and this new, updated environment of the building addition brings them up to the 21st century," says Gering. "They were really still living in the 19th century. Literally." **M**

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Above The annex and connective corridors were constructed while the decaying original structure was reinforced.

Facing A glass curtain wall encloses the original courthouse's exterior wall and the passageway to the new annex.

Above To the right and left of the main building, ancillary areas were restored and returned to their original size.

"We had to have long spans for the legislative chamber and steel allowed us to achieve those."

Tom Gasbarro, HLW International

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THEODORE ROOSEVELT EXECUTIVE AND LEGISLATIVE BUILDING

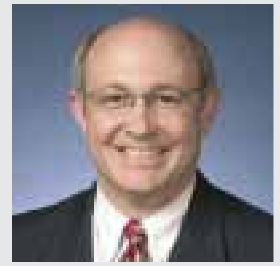
Location: **1550 Franklin Avenue, Mineola, NY**
Owner/Developer: **Nassau County Department of Public Works**, *Westbury, NY*
Architect: **HLW International**, *New York, NY*
Historical Architect: **John G. Wait Associates, Architects**, *Albany, NY*
Structural Engineers: **HLW International**, *New York, NY*;
Robert Silman Associates, *New York, NY*
Mechanical Engineers: **HLW International**, *New York, NY*;
Plus Group Consulting & Engineering, *New York, NY*
Construction Managers: **Bovis Lend Lease**, *New York, NY*;
The LiRo Group, *Syosset, NY*
Curtain Wall Consultant: **HLW International**, *New York, NY*
Structural Steel Fabricator and Erector: **Mometal Structures Inc.**, *Varennes, QC*
Miscellaneous Iron Fabricator: **Mometal Structures Inc.**, *Varennes, QC*
Ornamental Metal Fabricator and Erector: **Mometal Structures Inc.**, *Varennes, QC*
Curtain Wall Erector: **Jordan Installation Services Corp.**, *East Northport, NY*

New Date for Aging Buildings Symposium

Wednesday, December 9, 2009 has set as the date for **Aging Buildings: Designing for Longevity**, the fourth in as series of seminars organized and presented by the Steel and Ornamental Metal Institutes of New York in conjunction with the Architectural Engineering Institute of the American Society of Civil Engineers (ASCE). It will feature twelve leading researchers and practitioners presenting on issues that can impact longevity of the typical urban steel frame structure with glass curtain wall enclosure. The all-day program will be held at the McGraw-Hill Auditorium, 1221 Avenue of the Americas, New York, NY. For more information on topics and speakers, and to register for the program, go to www.aeinstitute.org.

Duane Miller Featured Presenter at Institute Seminars

In two of his latest seminars, Duane Miller, Sc.D., PE, Lincoln Electric's Manger of Engineering Services, brought New York area engineers and contractors up to date on welding requirements for seismic connections. On February 19, 2009, Dr. Miller presented **Listen to the Steel**, an all-day seminar offered by the American Institute of Steel Construction (AISC) at the McGraw-Hill Auditorium, in which the Steel Institute of New York was a participating sponsor. And on May 27, 2009, in another all-day program at the Auditorium, he covered requirements in **The AWS D1.8 Seismic Welding Supplement** to the Structural Welding Code. Planning is underway to offer another series of Dr. Miller's seminars in the late fall or early winter.



Duane Miller, Sc.D., PE

Corrections: In the story "Bank of America Stair" (*Metals In Construction* Fall 2008), the project's miscellaneous iron fabricator and the miscellaneous iron erector were misidentified. The fabricator is A-Val Architectural Metal Corporation of Mount Vernon, NY; the erector is Empire City Iron Works of Long Island City, NY.

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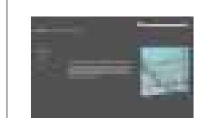

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Ornamental Metal Institute of New York

The Steel and Ornamental Metal Institutes of New York are not-for-profit associations created in 1972 to advance the interests of the structural steel and the architectural, ornamental, and miscellaneous metal construction industries. They serve a geographical area encompassing New York City and the adjacent counties of Nassau, Suffolk, and Westchester. Each sponsors programs to aid architects, engineers, construction managers, and developers in selecting structural systems and architectural metals for optimum building performance. Programs in which the Institute is engaged include:

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- Consultations on design and finishes for bronze, stainless steel, and aluminum for architectural and ornamental ironwork,curtain wall systems, window walls, and metal windows and panels
- Seminars covering structural systems, economy of steel design, curtain wall systems, design, and use of alloys and surface treatments for miscellaneous iron work, and issues important to the construction industry addressed to developers, architects, engineers, construction managers, detailers, and fabricators
- Representation before government bodies and agencies in matters of laws, codes, and regulations affecting the industry and the support of programs that will expand the volume of building construction in the area
- Granting of subsidies to architecture and engineering schools and funding of research programs related to the advancement and growth of the industry
- Publication of Metals in Construction, a magazine dedicated to showcasing building projects in the New York area that feature innovative use of steel

Institute staff are available with information regarding the use of structural steel and architectural metals for your project by contacting Institute offices at

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