METALS IN CONSTRUCTION

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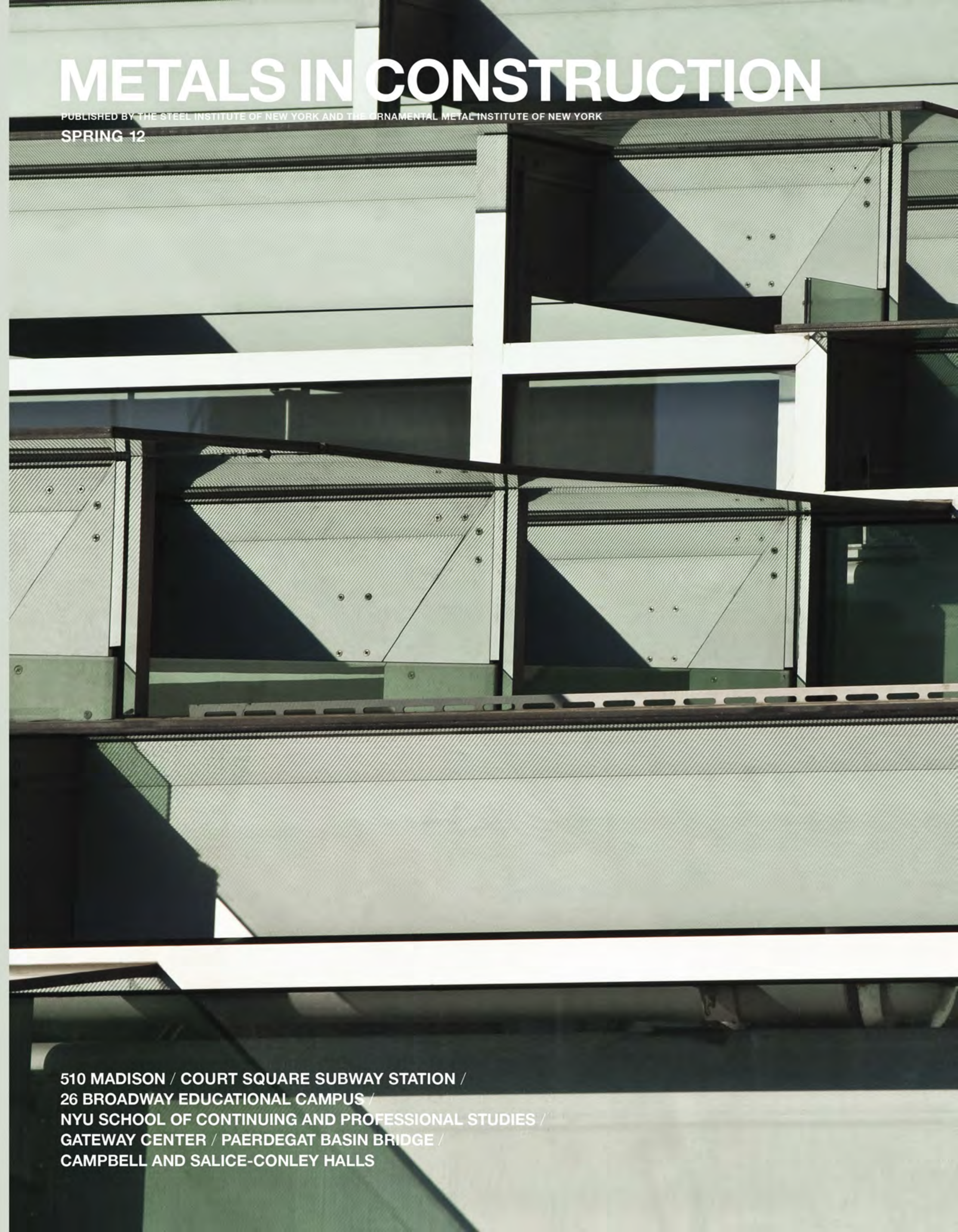
SPRING 12



510 MADISON / COURT SQUARE SUBWAY STATION /
26 BROADWAY EDUCATIONAL CAMPUS /
NYU SCHOOL OF CONTINUING AND PROFESSIONAL STUDIES /
GATEWAY CENTER / PAERDEGAT BASIN BRIDGE /
CAMPBELL AND SALICE-CONLEY HALLS

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SPRING 12

Above A custom-designed brise soleil at Ennead's Gateway Center.

Jeff Goldberg/Esto; cover: Timothy Schenck

Published by The Steel Institute of New York and The Ornamental Metal Institute of New York

EDITOR'S NOTE

Active facades next year's topic

EARLIER IN THE YEAR, THE publishers of this magazine co-sponsored a conference on the architectural opportunities evolving in curtain wall design as a result of advanced fabrication technology and innovations in materials. Titled METALS IN CONSTRUCTION FACADES CONFERENCE 2012, it illustrated how collaboration between architect and fabricator has empowered each to stretch their imaginations and inspire the next era of designs. While the conference focused on design, it acknowledged that cladding aging buildings in modern enclosure systems represented more than stylistic innovation, it meant significant savings in overall energy use and operating efficiencies. Until recently, lighting, mechanical, and control system upgrades received most of the attention for these benefits. But as the industry's perception of building enclosures has shifted from viewing them as passive casing elements to recognizing them as active players in the energy management of buildings, demand for energy-efficient building envelopes has been on the increase. In order to help the design and development community expand its knowledge in this area, the publishers will be devoting next year's conference, METALS IN CONSTRUCTION FACADES CONFERENCE 2013, to innovations in the cladding or recladding of buildings. Scheduled for Wednesday, February 13, 2013, the conference will explore current advances in enclosure systems and how they enhance environmental performance. For the most part, topics will focus on so-called "active facades," the latest in modern, modular curtain wall concepts. Defined in green building terminology as "a building exterior equipped with smart glass, shading systems, or other technologies that can dynamically change the enclosure's optical and thermal transmission characteristics," an active facades ensures optimal energy savings by fully integrating functions of climate cooling, heating, ventilation and regulation of sunlight. Presentations will be given by leading practitioners and will encompass both the latest technological developments in facades as well as innovation in the design, production and erection processes. We hope to see you there.

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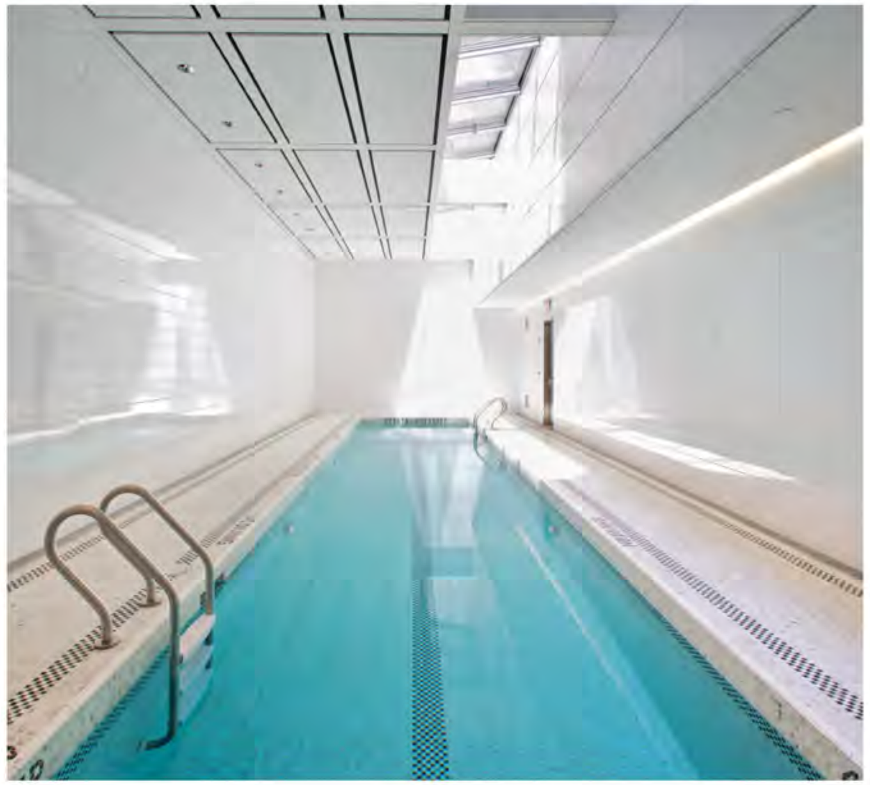
510 Madison

Some bold moves resulted in a minimal column-free interior for a new, high-end high rise on Madison Avenue.

BASE-AND-PODIUM BUILDINGS ARE the lingua franca of post-1960s New York office towers. They appear on the street, if not the skyline, as inevitabilities of the city's restrictive zoning requirements governing setbacks and floor area ratio. Completed in 2011 at the corner of Madison and East 53rd Street, 510 Madison certainly falls under the constraints upholding this tradition, but that is where the comparisons stop.

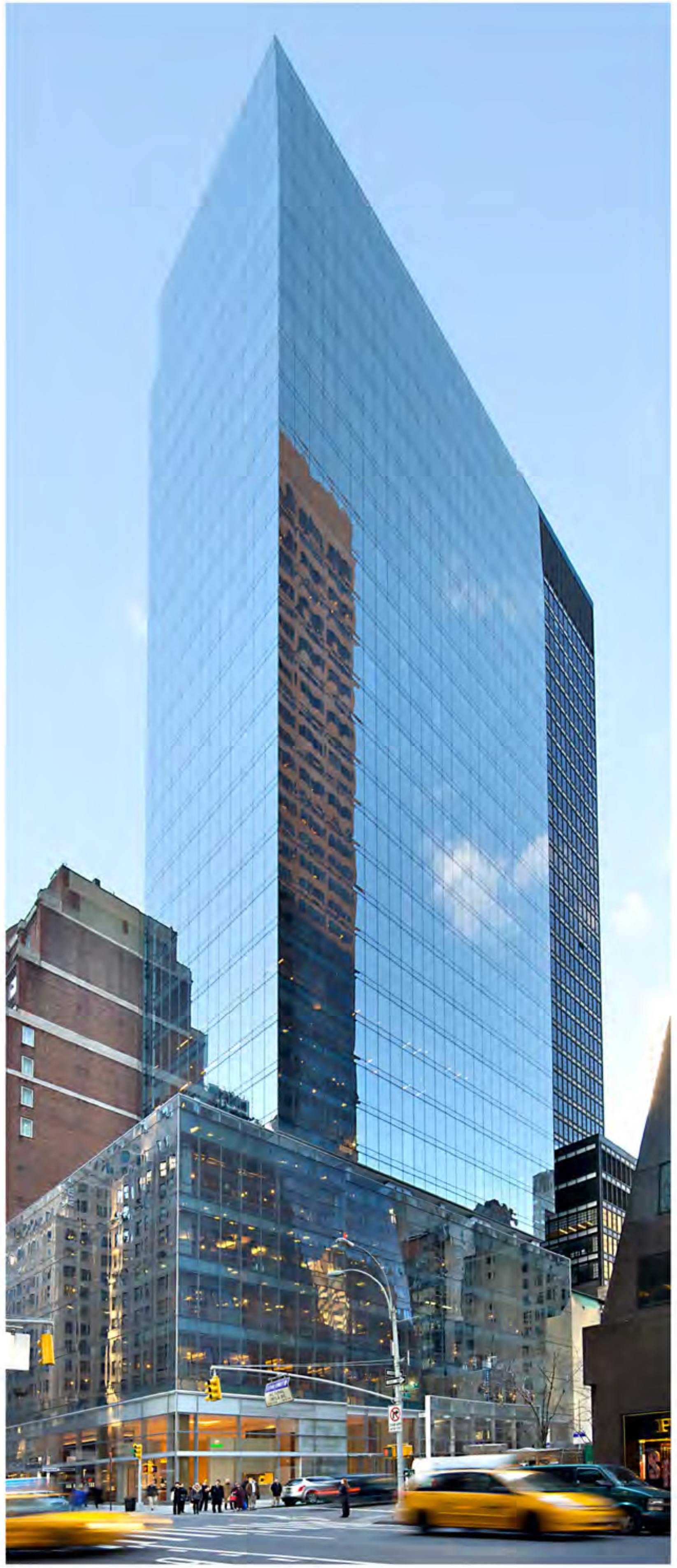
Like other towers of this era, its envelope profile is designed to maximize the amount of interior floor area possible within zoning constraints. But the designers of 510 Madison went one step further. Through a carefully conceived structural design, they were able to minimize the space lost to interior columns and the stair core. Because the building is only 30 stories (429 feet) in height, the engineers at Gilsanz Murray Steficek (GMS) were able to use just two bands of large wide-flange-section outrigger trusses, one each at the bottom and top of the tower, to control drift. Most designs include at least three. This allowed the engineers to shrink the footprint of the braced frame within the tower section to the point of imperceptibility, and added a full story of column-free office space. A 55-foot interior span ties the relatively small (only three elevators) south-side core, to perimeter columns that are set back 1-foot, 10-inches from the aluminum glazed curtain wall. "There's 2-feet, 6 inches from the glass to the column line, so you really get this feeling of disconnection between the facade and columns," says Karl Rubenacker, the partner in charge of the project for GMS.

Things could have gone quite differently for 510 Madison. Originally planned as a residential tower,



This page The building's structural steel design created long column-free spaces for the building lobby and a 50-foot-long pool.
Previous page A landscaped terrace on the sixth-floor podium, where an outrigger truss transfers loads to the tower above.

Right Trusses and transfer girders connect the tower to the base, allowing the tower floors to cantilever over the adjacent building to the west.



the recession shifted the priorities of owner and developer Macklowe Properties toward a 350,000-square-foot office building for the so-called Plaza District in Midtown. Dan Shannon, the design architect in charge of the project for Moed de Armas & Shannon Architects, says the focus of the building was column-free tenancies of between 11,000 and 45,000 square feet. Zoning restrictions meant an 85-foot base street wall on the site perimeter before they would need to step the building back for the tower above. "This created a structural challenge of driving the tower superstructure through the base without impinging on the quality of the base floor plate," says Shannon.

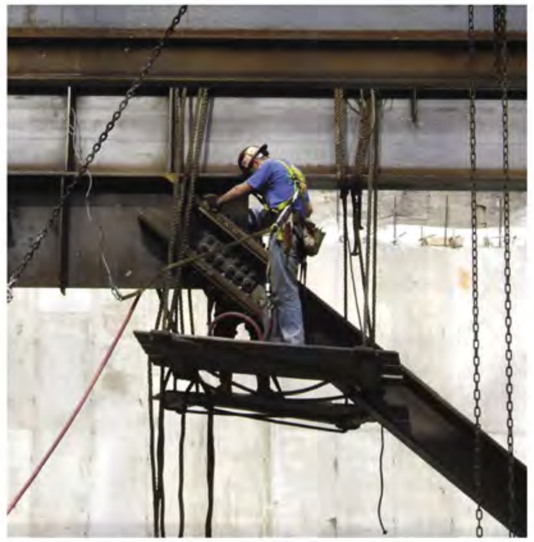
The outrigger truss on the level-six transfer floor effectively transitions between the columns along the perimeter of the five-story base and the 25-story tower above, transferring the truss loads in the level five ceiling with 6 foot by 9-inch-thick built-up plate girders. "The necessity of this truss gave the building a distinct architectural look of having the tower floating on the base," he says. "We couldn't just solve these problems with more steel, it had to be efficient and cost-effective." The engineers addressed the loads through adding more perimeter columns, while keeping the scale of individual components smaller. The owner's purchase of the air rights on the adjacent lot allowed the building to go higher, but instead the team designed the tower to protrude into the adjacent air space by approximately eight feet to allow for larger floor plates.

The building's envelope intensifies the lightness of the structure with floor-to-ceiling glazing that floods the interior with views and daylight, both of which are enhanced by 10-foot ceiling heights. The engineers used W18s for the interior spans, which allowed them to compress the ceiling plenum down to deliver those high ceilings within an overall 13-foot, 6-inch floor-to-floor height. Shannon also says the design team focused on coordinating the mechanical system with the structure, designing penetrations in the beams to anticipate future ductwork. "Doing that after the fact is not that effective, but if you plan for this, it could happen efficiently," he says. "Tenants understand how that affects ceiling height, so they are happy to coordinate around the openings." In the structural bays at the corners, engineers removed the columns to provide an unencumbered corner office view—an executive perk prized by the building's expected high-end tenants.

Achim Hermes, a structural engineer and the building's facade consultant from GMS, says the goal for the exterior was a monolithic, uniform building. The unitized glass-and-aluminum curtain wall, manufactured by Permasteelisa Group, consists of nominal 5-foot-wide, 1-story-high panels that are clipped onto anchors at the end of the floor plates. Tower floor slabs are 2½-inch concrete over 3-inch, 18-gauge metal deck. The building slightly chamfers with a 2 percent slope through the top three floors, though the curtain wall was easily sloped without special requirements. The curtain wall panels have Guardian AG43 glass in the vision zone, which couples a low-emissivity coating with a relatively high 43 percent visible light transmittance. The glazed shadow box spandrel, which is hidden from the interior, barely reads from the exterior. "None of the facade units contain reinforcing steel, they were all within the limits to handle the wind loads," says Hermes. The only departure from the curtain wall is the storefront system used along ground-floor retail.

Both the project's construction manager, Tishman Construction Corporation, and the steel fabricator were brought on board during the design process, which helped to smooth over coordination and constructability issues in connections and steel quantities. Structural analysis was performed using a variety of software packages, including RAM

Previous spread and this spread: Moed de Armas & Shannon



Right The building has been awarded a Gold certification using the LEED for Core and Shell rating tool, which includes points for the building's recycled steel structure.

Left The curtain wall's vision panels have a low-e coating and 43 percent visible light transmittance.
Above Steel erectors construct outrigger trusses at the sixth floor.

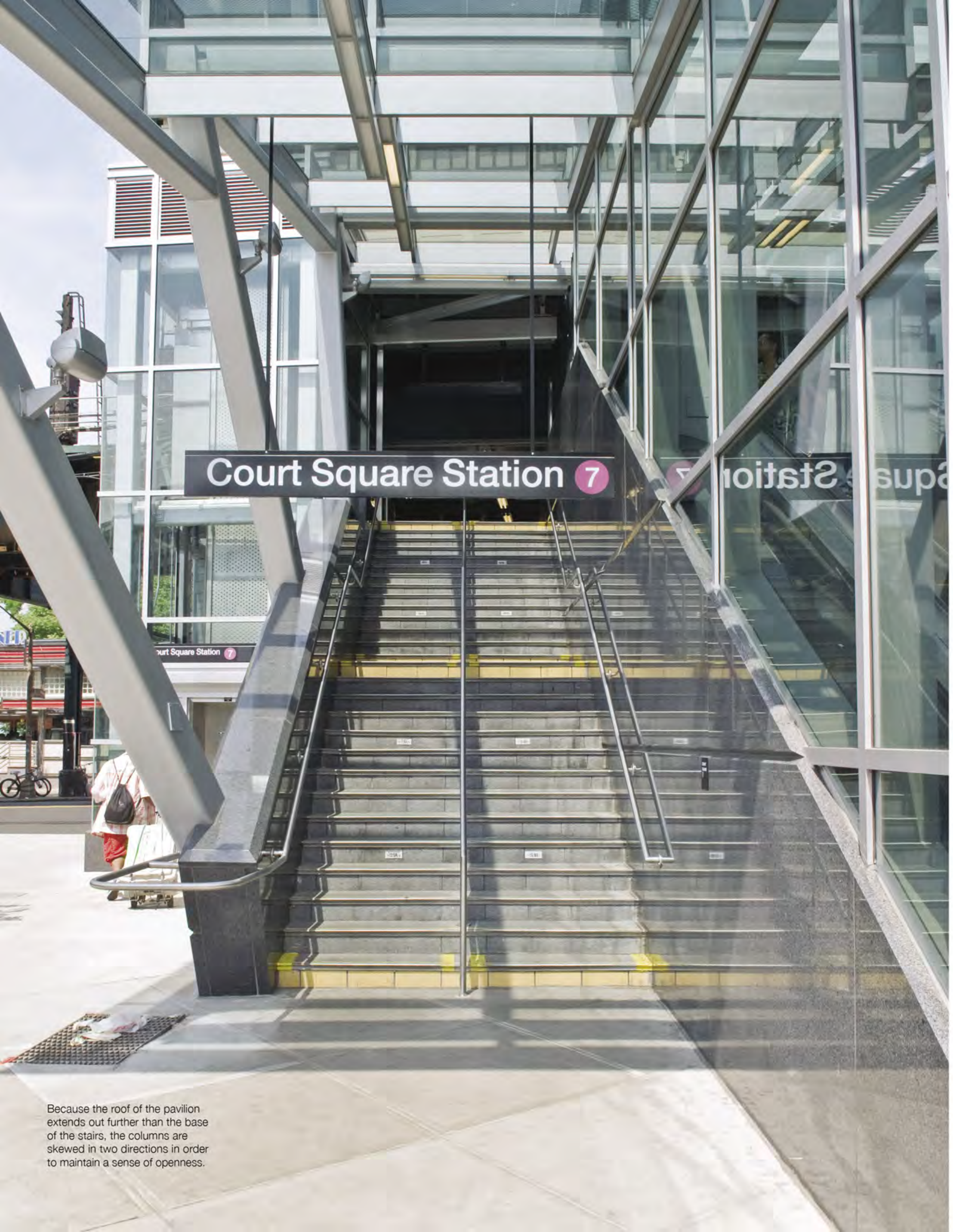
Gilsanz Murray Steficek; facing: Moed de Armas & Shannon

Steel, ETABS, and SAP2000, while GMS's engineers used internal analysis spreadsheets to design all of the connections. A wind tunnel analysis had been performed for the original residential building, which was planned to be 700-feet tall, so the wind consultants performed a simpler desktop analysis based on that outcome. "The torsional velocity of the highest rented floor's corner office was used to set the controlling wind criteria for drift and stiffness," says Rubenacker. GMS also carried out a progressive collapse study, which resulted in no changes to the design. The steel structure ties directly into concrete footings below grade on Manhattan's rock, with the cellar enclosed by a concrete foundation wall with an at-grade concrete slab.

The building, now owned by Boston Properties, was recently certified Gold using the LEED for Core and Shell rating tool, which in part relied on recycled steel used in the structure. An exposed structural steel stair also leads down to a basement health club complete with a swimming pool, another perk geared toward the expectations of high-end tenants. Added in with the high ceilings, column-free tenancies, and elegant outrigger truss transfer, 510 Madison has proven successful in attracting tenants, even in a challenging market.

510 MADISON

Location: **510 Madison Ave. New York, NY**
Owner: **Boston Properties**, *New York, NY*
Developer: **Macklowe Properties**, *New York, NY*
Architect: **Moed de Armas & Shannon**, *New York, NY*
Architect of Record: **SLCE Architects**, *New York, NY*
Structural Engineer: **Gilsanz Murray Steficek**, *New York, NY*
Mechanical Engineer: **I.M. Robbins**, *New York, NY*
Construction Manager: **Tishman Construction Corp.**, *New York, NY*
Curtain Wall Consultant: **Gilsanz Murray Steficek**, *New York, NY*
Structural Steel Erector: **Falcon Steel, Co., Inc.**, *Wilmington, DE*
Curtain Wall Fabricator: **Permasteelisa North America**, *Windsor, CT*
Curtain Wall Erector: **Tower Installation LLC**, *Windsor, CT*
Metal Deck Erector: **Falcon Steel Co., Inc.**, *Wilmington, DE*



Because the roof of the pavilion extends out further than the base of the stairs, the columns are skewed in two directions in order to maintain a sense of openness.

Court Square Subway Station

A new glass pavilion shelters stairs and escalators to an underground passage and an elevated station, creating a day-lit connection between the transit hub and the surrounding neighborhood.

FIRST-TIME USERS OF THE underground passage linking the E, G, and M subway lines in the Court Square complex are apt to find themselves rubbing their eyes in disbelief as they use the new link between the tunnel and the elevated station that serves the New York City's 7 train. Here, the dark walkway opens up into something subway riders don't often see: a dramatic, two-story, daylight-filled steel, aluminum, and glass pavilion. It's there to shelter the station's up and down escalators, interior and exterior stairways, and elevators, and was a long time in the planning.

Accomplishing wonderful design is never easy, and civic architecture in New York City has special challenges because so many parties are always involved. In the case of the Court Square, engineering and architecture firm Stantec ably balanced the input from three public agencies: MTA NYC Transit Authority, the New York City Planning Department, and the New York State Historic Preservation Office. Tishman Speyer Properties acted as the development manager for Citigroup, which funded the project to as part of a deal to develop a site nearby.

According to Stantec's principal James Ariola, who was a structural engineer on the project, each group had its own design priorities. "We had to accommodate pedestrian circulation, of course. And, there's a small plaza outside, so we needed to pay attention to the urban design issues. We were asked to make the structure as transparent as possible, to have a visual connection between people and the street."

"And, while we needed to pay homage to the historic forms and historic proportions," adds Stantec senior partner and architect Joseph Donovan. "Attaching anything to the elevated station that had any kind of a nostalgic intention was out."

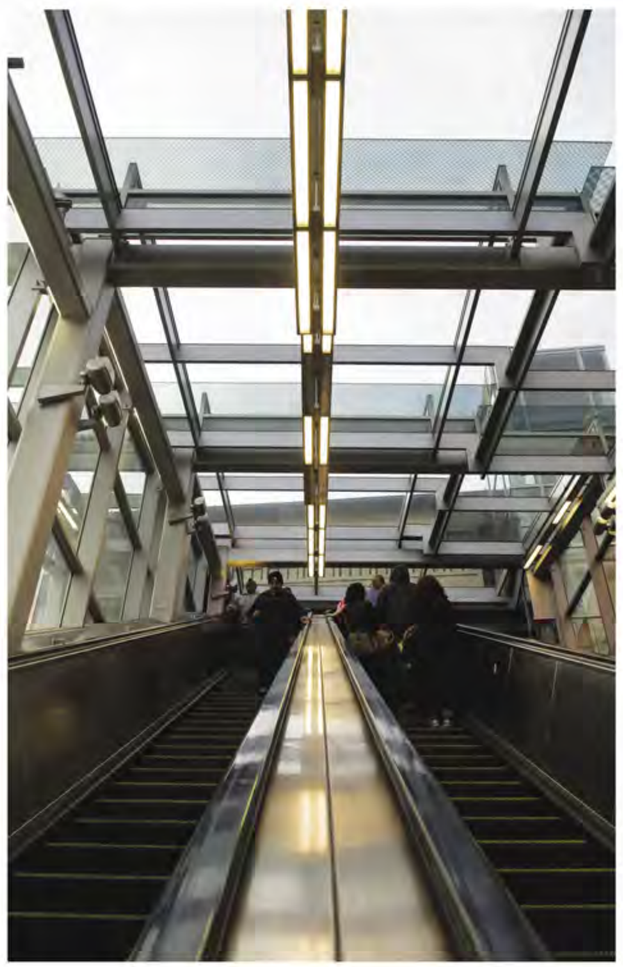
The resulting structure encloses a pair of escalators, an interior stair and elevators, used by transferring subway passengers, within a glass and extruded aluminum curtain wall. The roof is composed of a series of shallow glass dormers supported by extruded aluminum rafters and purlins, each of which stair-steps above the previous one. Slotted steel angle clips and bolts secure the 6063-alloy aluminum curtain wall and roof framing system to the substructure of framed-in square and rectangular HSS 46 ksi steel.

The use of the dormers, as opposed to a much simpler sloped glass roof, has the effect of increasing the volume of the interior space covering the stairs and escalators, and gives it a more spacious feel. And, as it turned out, the dormers were quite useful in providing openings to allow the pavilion to be passively ventilated.

Even though coating on the vertical glass that encloses the pavilion limits its visible light transmittance to 70 percent,

Left The designers devised a roof made up of a series of glass dormers to allow greater headroom over the escalators. The space just beneath the purlins is open to allow this volume to be naturally ventilated; the fritted glass is cantilevered over this space to protect it from the weather.
Below The pavilion that covers the link between the underground passageway and the elevated station that serves the 7 train is supported by HSS columns and beams, along with an assemblage of extruded aluminum purlins and rafters.

Right top and center Skewed HSS12x12x⅝ columns intersect the polished dimensional granite sheathing on the outside of the stair railing.
Bottom A series of glass dormers framed with extruded aluminum purlins and joists, which are supported by HSS square and rectangular tube, gives the escalators extra headroom, and shelters openings which allow the enclosed space to be naturally ventilated.



and the glass roof panels have an additional 60 percent frit pattern added to that, computational fluid dynamics studies showed that without some openings the interior would be unacceptably hot in the summer. Each of the dormers has a 1-foot high opening along three sides to allow heat to escape. The panes of roof-glass cantilever over the openings, and offer some protection from the weather.

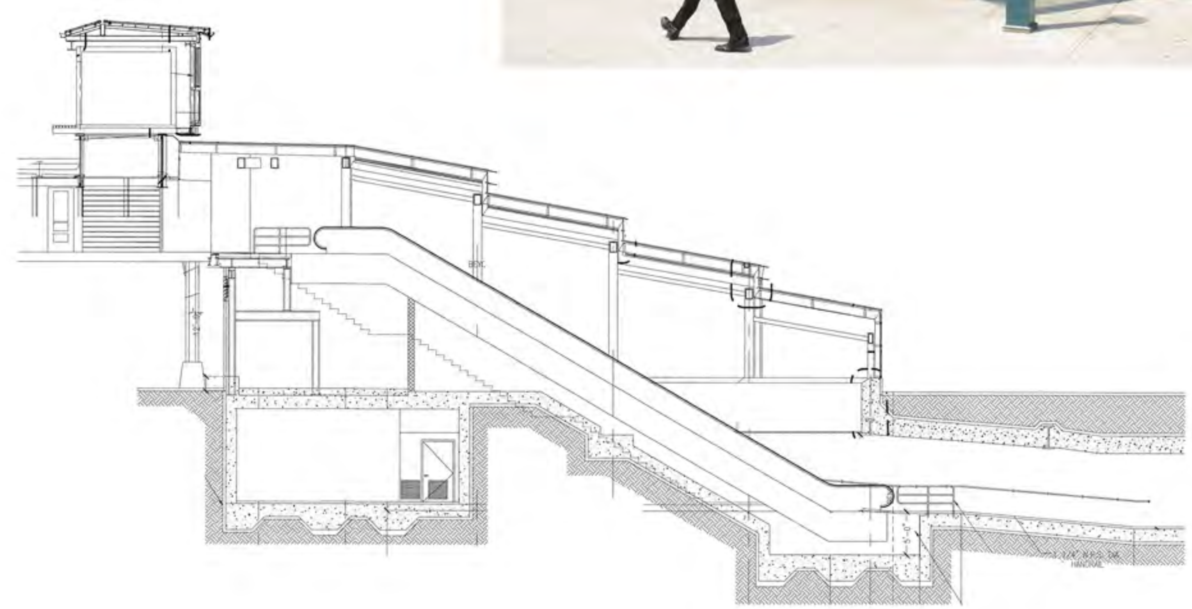
According to John Pachuta, an architect and partner with the project's curtain wall consultant, R.A. Heintges and Associates, "The studies show that the interior temperature will never be any higher than 5 degrees Fahrenheit above the exterior temperature."

Given the stringency of current seismic codes, and the rigid support required by the aluminum curtain wall and roof assembly, Stantec's choice of an HSS with welded steel frame for the pavilion's substructure was a natural one. "You can see how much the elevated station sways when a train enters the station. It moves a lot," says Ariola, as he points out the rubber-gasketed expansion joints that isolate the rock-solid pavilion from the oscillations of the elevated train structure.

The most difficult connections to design and fabricate occurred where the sloping rectangular aluminum rafters and horizontal purlins intersect with short pieces of vertical aluminum extrusion to form the dormers, and where these in turn are fastened to the steel structural system.

"The purlins and rafters are extruded aluminum sections, not aluminum-wrapped steel tubes," says Pachuta. "Notice that rather than having a straight aluminum rafter that spans between the steel tube supports, the rafter is made up of three mitered pieces that when attached together form a step. The purlins are also detailed this way. And, because we wanted to celebrate the joints," he says, "the aluminum sections were fastened together on-site using either exposed 300-series stainless steel countersunk screws or button-head socket cap screws. Even something simple like had to be worked out on its own."

The glass roof also extends over an exterior stairway that leads from the plaza to the



Previous page: Timothy Schenck; top: MTA; left: Timothy Schenck; facing from top: liqcity.com, Timothy Schenck, Stantec

The glass pavilion protects stairs and escalators that lead from an underground link between the E, G, and M subway lines and an elevated station that serves the New York City's 7 train.

Timothy Schenck

turnstile lobby on the elevated platform. To maintain a sense of playful openness, three of the HSS12x12x⅝ columns on the outside of the stair are skewed in two directions, one is as much as 42 degrees from vertical. Referring to himself, Ariola joked, "It blew the structural engineer's mind. Columns should be straight!'"

Although building information modeling was not used on this project, Donovan says that three-dimensional AutoCAD renderings were freely exchanged and, "extremely useful for both explaining the design to the stakeholders who needed to sign off, and the fabricators. The 3D drawings shortened meetings that would have dragged on for hours."

The steel was given two coats of polyamide epoxy primer with a metallic acrylic polyurethane finish coat, and the aluminum extrusion received two coats of mica-pigmented polyvinylidene fluoride paint. These finishes rendered the dissimilar metals a matching light gray that is almost pearlescent in appearance. "The idea was to have the steel and aluminum look anodized, or galvanized, and to share the same relatively neutral color palette," said Donovan. "Given the heft of the structural frame we still wanted it to feel as transparent as possible."

The elevated 7 train line that serves Court Square Station is almost 100 years old, and as busy as ever. But, as the businesses it serves are gradually changing from industrial lofts to commercial offices, the new structure, supported by traditional steel but framed in high-tech glass and alloy aluminum extrusions, is perhaps an appropriate expression of what is taking place in Queens: a transition from the past to the future.

COURT SQUARE SUBWAY STATION

Location: **Court Square, Long Island City, Queens, NY**
Owner: **MTA New York City Transit Authority**, *New York, NY*
Client: **NYC Transit Authority/Citigroup**, *New York, NY*
Architect and Structural Engineer: **Stantec**, *New York, NY*
Mechanical Engineer: **Geri Goldman Engineering**, *New York, NY*
General Contractor: **Turner Construction**, *New York, NY*
Development Manager: **Tishman Speyer**, *New York, NY*
Curtain Wall Consultant: **R.A. Heintges and Associates**, *New York, NY*
Structural Steel Erector: **Capco Steel Corporation**, *Providence, RI*
Miscellaneous Iron Erector: **Capco Steel Corporation**, *Providence, RI*
Curtain Wall Erector: **Tower Installation, LLC**, *Windsor, CT*

A double-height gymnasium occupies a former mechanical court in the landmarked building.

26 Broadway Educational Campus

The landmarked building in Lower Manhattan gets a second life as a school thanks to its steel structure and an innovative adaptive reuse plan.

FOR THE PAST SEVERAL YEARS, the landmarked Standard Oil Building at 26 Broadway has been transformed from the oil giant's Carrère and Hastings-designed headquarters into a lively academic complex for secondary students in Lower Manhattan. The third academic institution to be located in the building, it occupies 104,000 square feet of space on the first, mezzanine, and second levels and adds nearly 700 high school seats to what SCA calls its Broadway Educational Campus. The entire complex, which also includes the Urban Assembly School of Business for Young Women (on the 4th and 5th floors) and the Lower Manhattan Community Middle School (on the 6th and 7th floors), was designed by New York-based architecture firm John Ciardullo Associates, who has worked extensively on projects with SCA for several decades. Perhaps this longstanding relationship is why Ciardullo was allowed to have a bit of fun with the campus, transforming an underused mechanical courtyard into a dramatic double-height, steel-framed gymnasium.

The original building at 26 Broadway was built in three stages in 1885, 1899, and 1921. Because most of the building's existing structure is steel, Ciardullo knew it afforded the latitude to tie framing for a gymnasium into the columns already in place. "With steel, you have flexibility," he says. "You can literally put the beams anywhere within the steel structure. If you had a concrete structure, you'd have a problem analyzing it structurally because you don't know what reinforcing steel is in the concrete frame. You would have to drill into the concrete to find out."

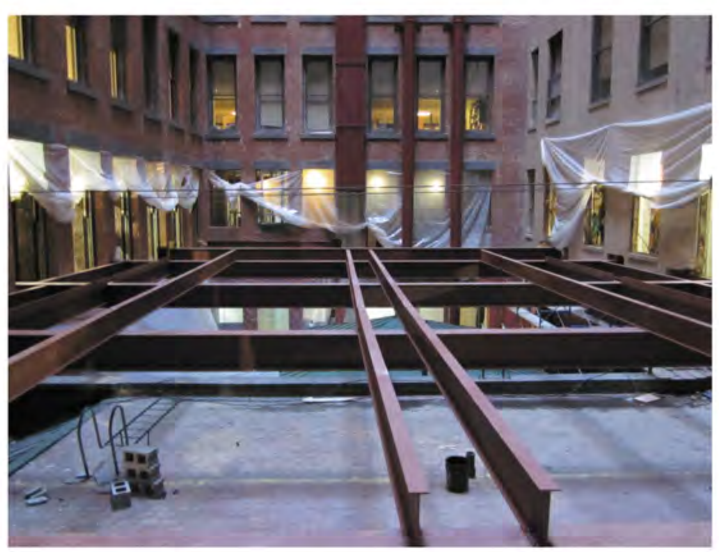
"I suggested that if we filled the center core of the building, we could create a large space that could function as a gym and we could bring in light through a skylight," says Ciardullo. Though the idea of giving Manhattan students an indoor gym was a novel one, the execution of it proved relatively straightforward says Ciardullo. Crews guided five W18x86 wide-flange beams through the building's window openings two stories above street level, carefully maneuvering them across the floor and into the open courtyard space. There, the beams were welded at one end to existing steel columns on the portion of the building built in 1921. At the other end, they were set into 1-by-1-foot, 10-inch-deep pockets cut in the 1890s masonry bearing wall, resting atop a bearing plate attached with non-shrink grout to an existing granite sill. The roof structure is cross-braced by W12x22 and W14x22 members, which are bolted to the W18s.

Ciardullo designed the roof to give the space a lofty feel, moving the connection of the peaked skylight to the roof beam 6 feet away from the wall to create a steeper pitch. "We wanted a flat roof section so we could frame the skylight; that also reduced the moment on the steel beam that supported

Left Steel framing for the gymnasium roof is lifted through the third-story windows of 26 Broadway and carried through the building into the courtyard. **Below** Five W18x86 wide-flange beams are welded to the building's original steel columns to create the roof of the gymnasium.

“The contractor and the steel fabricator and erector came up with the solution of how to bring the steel into the building and put it in place…That's where the experience of the unions came into play.”

John Ciardullo, John Ciardullo Associates



Opening spread: Anna-Marie Kellen; This spread: John Ciardullo Associates

This page The gymnasium's peaked roof structure is framed with HSS round sections and finished with Kalwall skylight panels. By moving the connection of the peaked skylight 6 feet away from the wall the architect created a steeper roof pitch and a higher ceiling.

a three-hinged arch. So we were able to reduce the depth of the beam, and by reducing the depth, we were able to have a higher ceiling,” he says.

The skylight structure is created with W14x43 members, which were preassembled into five roof sections and delivered to the site to be lifted through the historic building's windows and into the courtyard. The remainder of the skylight is framed with ASTM A500 Grade C 46ksi HSS. Elsewhere the project's structural steel is ASTM A992 Grade 50.

“The contractor, along with the steel fabricator and erector, came up with the solution of how to bring the steel into the building and put it in place,” says Ciardullo. “The architects and the engineers really don't talk about how everything gets constructed; we just lay it out in its final position. They came up with the idea, and the way they did it was really quite interesting.” As each piece was moved into position, the erection crew from Midtown Heights hung it with cables from steel beams above, so as not to damage the existing floor below. “That's where the experience of the union ironworkers and the steel contractor and erector came into play,” adds Ciardullo. A design that utilized heavier material would have been impossible, he observes: “If this were concrete they'd have to put formwork in, and they'd have to wheel the mix onto each floor. Steel is a lot lighter; we couldn't have done it in concrete.”

The SCA has long recognized the benefit of turning existing steel-framed structures into schools. As the city's need for classroom seats grows, existing buildings like 26 Broadway offer the flexibility to create new openings between floors—a crucial aspect of any vertical urban campus. At 26 Broadway, use of the elevators was restricted by a business agreement between the owner and SCA, so the architects designed a convenience stair connecting the school's four floor levels to limit elevator use. But creating the staircase required removal of a structural steel column to make room for the opening. The

Left The stair's top riser and tread are welded to a lateral beam with its flange removed. The construction allows the stair to function as the beam's top chord, creating a less bulky design.
Below In previously completed areas of the school, structural analysis revealed appropriate unsupported heights for existing columns, allowing the team to remove some lateral supports to create stair openings.
Facing Perforated carbon steel railings encircle the top of a convenience stair, one of many that cut down on the students' use of elevators in the multi-use building.

remaining column adjacent to the stair opening was supported laterally by steel beams at each level, so Ciardullo, also the project's structural engineer, had to calculate how many beams could be removed to create the opening.

"I knew the size of the steel column and I had the weight of the steel structure, so we did an analysis to determine the acceptable unsupported height of the column," says Ciardullo. "Since I had the size of the columns to calculate the buckling effect and column width by taking out the lateral support at one floor, we were able to then determine that the existing column could take the elimination of the lateral support beam and handle the buckling effect, the non-lateral support, at each floor."

Ciardullo also designed a solution to eliminate some bulk from the area where the top of the stair attached to a lateral steel beam. Normally, plates would be fastened to the top of a wide-flange beam to support the stair risers and treads. "It would create a very bulky structure," said Ciardullo. Instead, the team cut away the top flange of the lateral beam, welding the topmost stair riser and tread to the beam and thus allowing it to function as the beam's top chord. The stairs were fabricated in flights from Grade A36 plate and hoisted into the building through a window.

John D. Rockefeller might not have imaged that students would someday play basketball within the walls of his Beaux Arts edifice. But as the first leased space school in an existing office building to come under New York City's sustainable building mandate, 26 Broadway will set the standard for ongoing development under the NYC Green Schools Guide and remain as much a part of the city's progress as it has always been.

This spread: Anna-Marie Kellen

26 Broadway Educational Campus

Location: **26 Broadway, New York, NY**
Owner: **NYC School Construction Authority**, *New York, NY*
Architect: **John Ciardullo Associates P.C.**, *New York, NY*
Structural Engineer: **John J. Ciardullo, R.A.**, *New York, NY*
Mechanical Engineer: **DVL Consulting Engineers**, *Hackensack, NJ*
Construction Manager: **Pavarini McGovern**, *New York, NY*
Structural Steel Erector: **Midtown Heights, Inc.**, *Secaucus, NJ*
Miscellaneous Iron Erector: **Transcontinental Contracting**, *Newark, NJ*
Architectural Metal Erector: **Transcontinental Contracting**, *Newark, NJ*
Ornamental Metal Erector: **Transcontinental Contracting**, *Newark, NJ*

The centerpiece of the renovated building is a grand elliptical staircase rising from the lobby to the second floor.

NYU School of Continuing and Professional Studies

A new home for higher education presents a bold face to students with its high-performance curtain wall and deftly planned spaces for learning.

NEW YORK UNIVERSITY'S SCHOOL OF Continuing and Professional Studies (SCPS) gives its more than 5,000 full- and part-time students opportunities to advance their education while pursuing professional careers. In order to fulfill the unique needs of this high achieving group, the school sought a new facility and found it at 7 East 12th Street in Greenwich Village near the main NYU campus. Completed in 1948 as the Fairchild Building, it was originally designed by Harrison & Abramovitz for Fairchild Publications, publisher of popular magazine titles including *W* and *Women's Wear Daily*. NYU acquired the space in 1992 to house some of its administrative offices. It was understood from the start that while the location was ideal the building itself needed an overhaul, inside and out, if it was to project the forward-thinking image of this prestigious 77-year-old institution.

First on the list of challenges—if the renovation was to serve the school's image—was addressing the functional shortcomings of an outdated facade that no longer met energy code requirements. Constructed with corrugated limestone panels and horizontal strip windows, the original building front had outlived its natural lifecycle. Familiar with the firm's body of award-winning institutional work, the university hired New York-based Mitchell/Giurgola Architects to design a new south-facing enclosure and address the second major challenge—reconfiguring the existing office-style interiors to create an open learning environment that let students connect with mentors. Complicating both tasks were the constraints of a tight urban site, the inability to fully vacate the building during construction, and the requirement that work had to be completed without disrupting academic schedules.

A visit to the school today reveals their success. The new curtain wall achieves the architects' energy efficiency and aesthetic goals with insulated glass units incorporating a mix of glazing types: low-iron glass, clear vision glass, clear vision glass with frit on the No. 2 surface, and fritted laminated spandrel glass. Starting at the first floor, horizontal aluminum sunshade louvers span the entire frontage to temper solar gain in the interior spaces, while providing enough daylight to effectively reduce the amount of artificial lighting used within classrooms and lounge areas.

Achieving an efficient daylighting scheme went beyond retrofitting the building's facade. In the interior it was helped out by flexibility afforded by the building's

This page By creating openings in existing steel beams, the team was able to make room for ductwork and keep ceilings as high as possible. This move, in turn, allows more daylight into the building.
Facing top The building's steel structure made it possible to create an opening large enough for the elliptical stair.
Facing bottom Plans of the SCPS's first and second floors.

Opening page and top: Jeff Goldberg/Esto; left: Mitchell/Giurgola Architects

This page: Jeff Goldberg/Esto

original structural steel framing. "One of the most challenging aspects of the project was something that happened 'in the ceilings,'" says Carol Loewenson, project architect and Mitchell/Giurgola partner. Because the building was originally constructed as a printing facility, the steel beams throughout were very deep to account for heavy loads. The SCPS plan didn't need the extra floor loading capacity, but it did need to create high-ceilinged, light-filled spaces for students and administrators.

"The particular challenge this presented was finding ways to fit mechanical ductwork throughout the building without compromising ceiling height," says Loewenson. "The team came up with ways to open holes in the existing steel beams in over 100 locations to allow for ducts to penetrate them and thus allow for ceilings to stay as high as possible. This, in turn, allows the natural light at the facade to penetrate the floor plates as deeply as possible."

In addition to functioning well for building occupants, the curtain wall projects a dynamic, colorful face to 12th Street with a series of vertical anodized aluminum fins and vertical blue and yellow dichroic glass fins. Each curtain wall unit measures 4 feet wide by 13 feet tall. These were fabricated in a factory and sealed off-site before being shipped individually to the school for installation. The units are clipped to the structural steel with steel clip angles. In order to minimize the effect on the building's occupants, panels were installed over the course of a few days.

Beneath the colorful facade, a steel and glass canopy announces the school's entrance, its structure anchored into the curtain wall mullions with a custom-designed tab anchor. The canopy is glazed with laminated fritted glass.

While the building's new exterior focuses on projecting an educational face to the community, its interior is designed to build community within the school. The renovated interior's hallmark is a grand elliptical stair that begins in the building's new atrium-style lobby and rises to the second floor, encouraging students to meet and interact through-

This page The stair chassis is constructed with bent plate steel bearing on its landings. Landings are supported by tie-rods hanging from the structure above.

out the intervening light-filled spaces. The grand gesture was also made possible by the building's structural steel framing, which accommodated the removal of lateral beam segments to make room for the atrium space. The effect on the building's interior is transformative. "The movement activates the most important public spaces of the building and its shape is organic and inviting," says Loewenson.

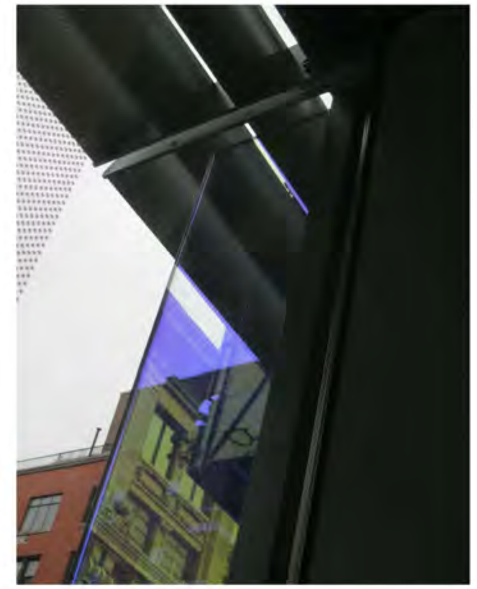
Additionally, she adds, architectural and ornamental metal fabricator and erector A-Val Architectural Metal played a key role in ensuring the project's design intent under very complex conditions. Each stair chassis is constructed with bent plate steel bearing on its landings, landings which are in turn are supported by three steel tie-rods that hang the stair by a bolted connection from the steel beams above. Oak treads are affixed onto the steel chassis, and a bent safety glass handrail sits in a stainless steel shoe supported along the edge of the stringer. Around the perimeter of each floor opening, glass balustrades are supported in a "chair," an L-shaped notch, at the foot of the balustrades with structural sealant.

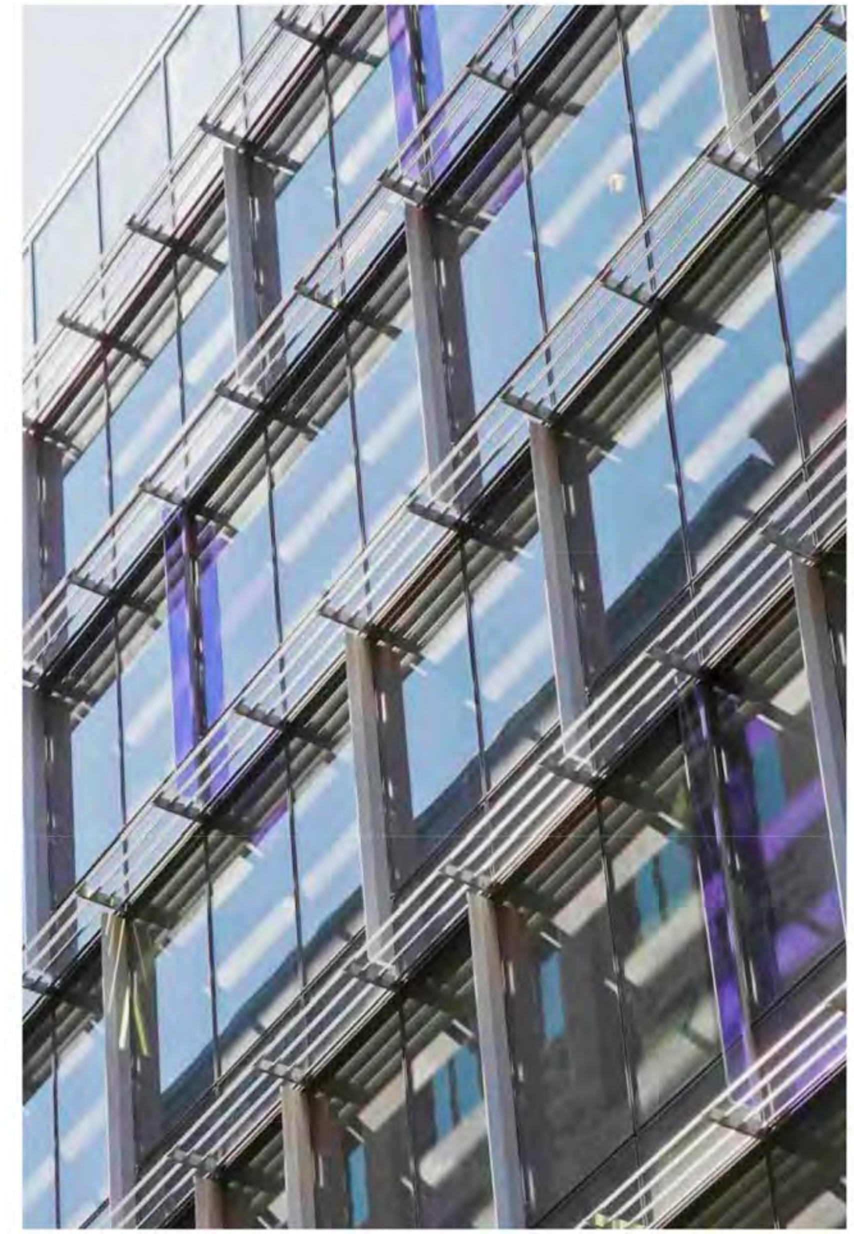
The bending of the double-curved steel stringer was a challenging customization process achieved by using a customized array of stair guides in the shop. Similarly, fabrication of the curved glass balustrade panels required extensive mock-ups and careful on-site coordination between trades to ensure the proper fit. The close attention paid to the intersection of the perimeter and stair railings was not only to confirm smooth transitions, but also to comply with code requirements for maximum permitted dimension of openings between panels.

Within the completed SCPS, the gracefully curving stair functions as sculpture and social hub, allowing students to get the most out of their interactions within the school so that they can rise to the challenges that wait outside its doors.

This page: Mitchell/Giurgola Architects

Left column: Mitchell/Giurgola Architects; right: Jeff Goldberg/Esto





Above The curtain wall's glazing includes low-iron glass, clear vision glass, clear vision glass with frit on the No. 2 surface, and fritted laminated spandrel glass. It is accented by vertical anodized aluminum fins and by vertical blue and yellow dichroic glass fins.
Left 4-by-13-foot curtain wall units are clipped to the building's structural steel.

This spread: Jeff Goldberg/Esto

Facing The building as seen from East 12th Street.
Above A steel and glass canopy announces the new school's entrance.

> "The movement of the stair activates the most important public spaces of the building and its shape is organic and inviting."
>
> Carol Loewenson, Mitchell/Giurgola Architects

NYU SCHOOL OF CONTINUING AND PROFESSIONAL STUDIES

Location: **7 East 12th Street, New York, NY**
Owner: **New York University**, *New York, NY*
Architect: **Mitchell/Giurgola Architects**, *New York, NY*
Structural Engineer: **Robert Silman & Associates**, *New York, NY*
Mechanical Engineer: **Joseph R. Loring**, *New York, NY*
Construction Manager: **Structure Tone Inc.**, *New York, NY*
Curtain Wall Consultant: **R. A. Heintges and Associates**, *New York, NY*
Structural Steel Erector: **Burgess Steel**, *Englewood, NJ*
Miscellaneous Iron Erector: **Burgess Steel**, *Englewood, NJ*
Architectural Metal Erector: **A-Val Architectural Metal Corp.**, *Mount Vernon, NY*
Ornamental Metal Fabricator and Erector: **A-Val Architectural Metal Corp.**, *Mount Vernon, NY*
Curtain Wall Fabricator: **Permasteelisa North America**, *Windsor, CT*
Curtain Wall Erector: **Tower Installation LLC**, *Windsor, CT*

Gateway Center

Left A 60-foot-tall tower framed in steel and clad with zinc panels anchors the facility's south wing.

Custom-designed architecturally exposed structural steel creates a welcoming environment for Westchester Community College.

AS PRIMARILY A COMMUTER SCHOOL, Westchester Community College long lacked a centralized hub on campus, a place both to welcome students and offer them a comfortable space in which to congregate. The school also needed to expand its overburdened facilities, particularly for its English as a second language and business departments. With an eye toward fixing this state of affairs, the institution hired Ennead Architects to design a new building that would include classrooms, offices, language and computer labs, an auditorium, and, most importantly, an architecturally inspiring public space. Working in close collaboration with structural engineers Leslie E. Robertson Associates (LERA), Ennead developed the idea of creating an entryway for the campus. In architectural terms, the concept addressed the theme of a threshold that would rest with a weightless quality atop the college's carefully landscaped grounds. In material terms, this led the team to one solution: architecturally exposed structural steel (AESS).

Another factor that played into the choice of structural material was cost. "This was a Wicks Law job where anybody could bid," explains Ennead design partner Susan Rodriguez. "To ensure that we would get good results no matter who won the contract we worked with LERA and created a modular system." The prefabrication possibilities of structural steel, as well as its relatively fast erection process, allowed the team to realize the project's design intent without greatly increasing its budget.

"On a conceptual level we wanted to build a bridge between a manufacturing process and a custom fabrication process," adds Dan Sesil of LERA. "Most of our buildings involve unique structural conditions that add time and money to a project. There's some of that here, but by creating a building block that leant itself more to manufacturing we were able to deliver a custom appearance without the fussy fabrication process. Steel was the natural choice for that."

At a total cost of $33 million, the Gateway Center is a 70,000-square-foot, three-story building with two academic wings that embrace a landscaped courtyard. At the convergence of the two wings is a 48-foot-tall glass pavilion that serves as the lobby and welcome center. It was here that the designers put into play their modular system: 233 AESS boxes stacked one atop the other and forming a slim profile grid structure that supports the glass volume.

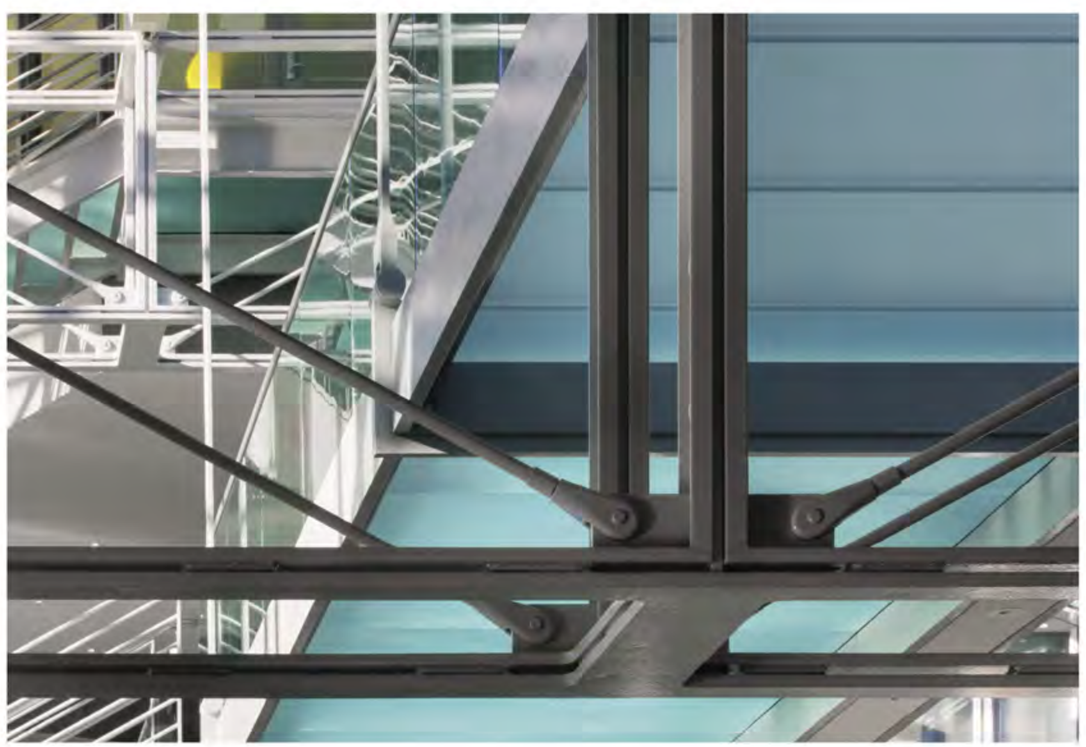
"We worked the system to reduce the number of members and small scale components that make up each box," says Rodriguez. "The boxes combined with low iron glass on both facades create a condition of near total transparency, reinforcing the symbol of the gateway as a threshold to the campus."

Left Steel framing for the west cantilever.
Center The east cantilever is supported by four steel trusses and projects more than 30 feet.
Below The project's transparent glass pavilion is composed of 233 architecturally exposed structural steel boxes.

Opening page: Jeff Goldberg/Esto; this page: LERA

This page: Jeff Goldberg/Esto

This page A custom-designed brise soleil facing the center's south-facing courtyard reduces solar gain for the LEED Gold certified building while preserving views of the campus for those inside.



Above The pavilion's stair and bridge enhance circulation between the center's two academic wings.
Left Steel hangar rods with custom pin and jaw fittings support the pavilion bridge at mid-span.

Above LERA's collaboration with the project's steel fabricator reinforced Ennead's design concept of a building that sits lightly on the land.

This spread: Jeff Goldberg/Esto

Constructed with 4-inch channels and 1-inch-thick plate, each box measures 8 feet 11⅛ inches long by 4 feet 7¼ inches high by 3 feet deep. They were prefabricated in the shop and then trucked to the campus with a temporary internal bracing element that kept them from deforming during shipping and installation. At the site, a crack team of ironworkers stacked the boxes and connected them. Most connections are made with shims and ⅞-inch-diameter type A325 bolts. This system optimized erection time by limiting the amount of field welding necessary. The curtain wall connections are steel plate tabs that were welded to the boxes in the shop. All of the primary members used in the project were fabricated from Grade 50 structural steel and the connection plates from A36.

An AESS stair and bridge spans the pavilion's volume, connecting the second floors of the two wings. Both are fabricated out of PL 1¾-inch-by-12-inch structural steel stringer plates and channels. The treads of the stair and floor of the bridge are made from laminated glass panels that keep daylight moving freely through the space. At mid-span, two steel hangar rods connect the bridge to the pavilion's main stringers via custom pin and jaw fittings designed by LERA.

The building's two academic wings, also framed in structural steel, are built with a typical wide flange, post-and-beam construction with floors of concrete over metal deck. To reinforce the effect of the building's appearance of weightlessness, the designers cantilevered the third floor out over the base on all sides from six to 30 feet. The east and west ends of the structure feature the most significant of these cantilevers. The larger of the two, the east cantilever is supported by four trusses on the roof made up of wide flange sections that range from W14x120 to W14x283 with double-angle diagonals that range in size from 2L6x4x½ to 2L8x6x1, the volume projects more than 30 feet out over the grass below. The trusses provide other services as well, forming parapet walls that disguise the roof's mechanical systems. A 40-foot cantilever for the west end was included in the original design, but was eliminated during value engineering. The designers came up with an alternative solution of supporting the protrusion with an AESS inverted tripod element. The tripod reduces the cantilever to 24 feet. The tripod is built up from parallel PL 1¼-inch-by-7½-inch plates stitched together at regular intervals with 3-inch diameter round spacer bars. The resulting member resembles

a ladder in construction. Each leg terminates in a steel pin detail that eliminates bending forces in the tripod. A plate assembly at the base ties the 4-inch-diameter pins together, transmitting gravity and lateral forces to the foundation.

"The Gateway Center marks the entrance to the campus visually as well as functionally," says Rodriguez. While the building elements described above fulfill that functional role, the team wanted something to anchor the south wing of the facility. For this they again turned to structural steel, using it to construct a 60-foot-tall tower designed for that purpose. The tower tapers from 10 feet wide at the base to less than 3 feet at the top. Clad with zinc panels, it is built up from two interconnected 1-inch structural steel plates into an 18-inch overall cross-section. Equipped with a full-height LED array, the tower is easily identifiable from anywhere on campus day or night, helping to orient students and creating an iconic symbol for the school. It also stands as a monument to the design flexibility of structural steel in its ability to serve the needs of architecture regardless of the size of the budget or the ambition of the design.

Above The atrium joins the 70,000-square-foot facility's east and west wings with a three-story day-lit atrium.
Above left An inverted tripod of architecturally exposed structural steel supports the projecting volume of the west cantilever.

This spread: Jeff Goldberg/Esto

GATEWAY CENTER

Location: **Westchester Community College, Valhalla, NY**
Structural Engineer: **Leslie E. Robertson Associates**, *New York, NY*
MEP Engineer: **Thomas Polise Consulting Engineer**, *New York, NY*
Construction Manager: **STV**, *New York, NY*
General Contractor: **Worth Construction Co. Inc.**, *Bethel, CT*
Structural Steel Erector: **Cross County Contracting Inc.**, *Pinebush, NY*
Architectural Metal Erector: **Cross County Contracting Inc.**, *Pinebush, NY*
Ornamental Metal Erector: **Cross County Contracting Inc.**, *Pinebush, NY*
Curtain Wall Erector: **Cross County Contracting Inc.**, *Pinebush, NY*
Metal Deck Erector: **Cross County Contracting Inc.**, *Pinebush, NY*

The view inside one of the eastbound bridge's box girders.

Paerdegat Basin Bridge

The City of New York uses High Performance Steel, for the first time in history, in the first phase of a massive overhaul of the Belt Parkway.

WHEN NEW YORK'S BELT Parkway opened in 1941, its daily traffic flow averaged 20,000 vehicles per day. Since then, with the opening of JFK International Airport, the growth of suburban communities on Long Island, and construction of the Verrazano-Narrows Bridge, demand has dramatically increased on the parkway, which now sees nearly 150,000 vehicles each day. Time and traffic have taken their toll on the seven bridges serving the parkway, many of which received poor ratings in biennial inspections by the New York State Department of Transportation (NYSDOT) in the past years. In 2009, after determining that replacement of the aging structures was the most cost-effective solution to alleviating their flaws, the New York City Department of Transportation (NYCDOT) began their extensive reconstruction. The five-year project involves instituting wider lanes, safety shoulders, median barriers, as well as super-elevation of the roadway around curves and realignment of the approaches to each bridge to improve sightlines. This work, along with improvements to drainage on the bridges, is designed to reduce accidents. Additional projects along the Belt Parkway will enhance bicycle and pedestrian access and restore some historical character to the Robert Moses-era route with new landscaping, railings, lighting, and stone elements. (The entire Parkway project won a Design Excellence award in 2006 from the NYC Art Commission.)

The first phase of the undertaking includes the Belt Parkway bridge spanning Paerdegat Basin, the redesign of which was assigned to NYCDOT's In-House Design (IHD) team. Due to damage to one of its twelve cast-in-place concrete bents and to long-term structural deterioration of its primary members and concrete deck, the Paerdegat bridge has been under continuous monitoring and a 5-ton weight restriction since September 2004. Still, nearly 150,000 vehicles use the 70-year-old structure daily, many on their way to JFK, so the project team was required to keep three lanes of traffic flowing

during peak hours and allow pedestrian access at all times.

In order to accomplish this, the IHD team first considered building a six-lane bridge to one side of the existing structure. However, limited right-of-way on either side of the old bridge restricted them to a split design that alternated travel direction so that three lanes remained open for east- and westbound traffic during the customary periods of heavy volume.

Maintaining traffic flow was but one of the project's principal concerns. Durability of the structure was another, and the solution to this represented one of the project's most exciting aspects. For the first time in the city's history, High Performance Steel (HPS) with a yield strength of 70 ksi was being used to build bridges. Although HPS has been used in hundreds of bridges elsewhere in the United States, NYCDOT needed to explore how it could take advantage of HPS girders without sacrificing strength, durability or tried-and-true economical designs. Developed nearly two decades ago, HPS has become increasingly popular for bridge projects due to the cost and weight savings it can provide. The material also resists atmospheric corrosion, eliminating the need to coat steel bridges in most environments.

Construction of the Paerdegat bridge project began in April 2011 with erection of a new eastbound bridge, south of the existing bridge. (The westbound bridge to the north is scheduled for erection in the summer of 2012.) The eastbound bridge was designed as a five-span structure with spans of 60, 80, and 90, 80 and 60 meters in length. Due to the new bridge's curved shape and increased span lengths, both east- and westbound designs incorporate three HPS 70W steel trapezoidal box girders to resist torsion. Weighing more than 900 metric tons each, box beams for the eastbound bridge are 2.4 meters deep, 3.6 meters wide at the top, and 370 meters long. Box beams for the three-span westbound bridge, at 2.5 meters deep, 3.6 meters wide at the top and 250 meters in length will weigh approximately 600 metric tons, reflecting the 120-meter difference in length.

In order to eliminate what the DOT called "substandard" sight distances on the original bridges and accommodate the new,

Above For the first time in New York City's history, the NYCDOT opted for High Performance Steel (HPS) to construct the bridge's box girders.

Opening spread: NYCDOT Division of Bridges; this page: Northeast Structural Steel

Top: Northeast Structural Steel; right: NYCDOT Division of Bridges

Right Box beams constructed with Grade 70 HPS for the five-span eastbound bridge are lifted into place.
Below A worker from steel erector Northeast Structural Steel.

longer spans, the team had to raise the roadway elevation by nearly 2.2 meters. Because a large amount of fill was added behind the bridge's new abutments to achieve this, the approaches to the bridge were preloaded with surcharge and equipped with weep drains to resolve the settlement of organic soil layers. Seismic isolation bearings distribute forces on the bridge's substructure. Eliminating joints at the piers created a smoother driving surface, but also decreased the likelihood of leaks and deterioration in the future.

In addition to a design that will withstand the test of endurance faced by all NYC bridges and improve conditions for drivers, the southern structure also makes the crossing easier for pedestrians and bicyclists. They will have a dedicated path separated from traffic by a concrete barrier on the bridge and by a 15-foot-wide grass mall on the roadway. With less than half the number of piers, the size of the navigation channel beneath the bridge has also been increased, a boon to those who prefer to travel by boat.

As with any project, not to mention one that will serve most of the city's population at one time or another and must be erected over water, the bridge required a high level of coordination between trades. "The contractor and fabricator were instrumental in developing all procedures from fabrication through erection and final splicing," says Anil Vyas, deputy chief engineer of the Bureau of Engineering Review and Support for NYCDOT's Division of Bridges. Members of the NYCDOT Fabrication Engineering Unit stayed in close contact with the steel subcontractors via weekly technical teleconferences that kept work flowing smoothly and on schedule.

Though the structural steel fabricator had experience in fabricating tub girders of Grade 70 HPS, this was their first time fabricating a non-hybrid girder

Above The completed eastbound crossing has less than half the number of piers as the older bridge, increasing the size of the navigation channel beneath.

consisting of Grade 70 HPS webs and flanges. (A hybrid steel girder is a welded girder with different steel grades in flanges and web. Though the bridge's internal stiffeners and connection plates are Grade 50 steel, its girder structure is not considered a hybrid.) Because of the variety of steel grades used, with their varying thicknesses and associated welding processes, the fabricator performed a series of preliminary tests to ensure the strength of each weld, identifying the procedure for each weld detail on specialized shop drawings. New York State's Steel Construction Manual (NYS SCM) does not address HPS 70W, so welding and fabrication were performed in accordance with the AWS D1.5 and the AASHTO Guide Specification for Highway Bridge Fabrication with HPS 70W Steel.

The welding process presented other challenges requiring special procedures. Not only is it more difficult to predict High Performance Steel's reaction to heat from welding, it is also more difficult to blast clean because mill scale adheres more tightly to the surface. For this reason, Grade 70 HPS web plates were blasted separately, before stiffeners were welded on, in order to ensure a uniformly clean finish.

Contributions from the project's subcontractors didn't stop at the fabrication shop; once girders were trucked to the site, structural steel erector Northeast Structural Steel proposed installation of temporary work trestles adjacent to the new bridge location in order to erect the steel over the water. The materials used for erection of the eastbound bridge will be recycled and relocated to the north side of the project for erection of the westbound roadway. Almost all of the erection was performed with a single Liebherr LR1400, 440 Ton Crawler Crane, but certain maneuvers, including erection of the centermost girders, required two cranes to work in tandem. Northeast also erected temporary falsework supports to prop up individual tub girder segments between piers; once splices were complete, these were removed.

Because the Paerdegat Basin bridges are located in the tidal wetlands of the Gateway National Recreation Area, mitigation of environmental impacts has been and continues to be a priority for the project. But once work is complete the new structures with their corrosion inhibiting coating will require little maintenance, instead offering commuters—an estimated 200,000 per day by 2029—an improved Jamaica Bay crossing and a glimpse of the many modernizations coming to the Belt Parkway in the years ahead.

Above The existing Paerdegat bridge (top) and renderings of the new east- and westbound crossings, scheduled for completion in the summer of 2012.

This spread: NYCDOT Division of Bridges

PAERDEGAT BASIN BRIDGE

Location: **Belt Parkway, Brooklyn, NY**
Owner: **NYCDOT Division of Bridges**, *New York, NY*
Architects: **NYCDOT Division of Bridges In-House Design**, *New York, NY*
Structural Engineer: **NYCDOT Division of Bridges In-House Design**, *New York, NY*
Geotechnical Engineer: **Earthtech**, *New York, NY*
Environmental Engineer: **AKRF**, *New York, NY*
Construction Management: **NYCDOT Bureau of Bridge Capital Design and Construction**, *New York, NY*
General Contractor: **Tully/Posillico Joint Venture**, *Flushing, NY*
Construction Program Management: **GPI/CTE Joint Venture**, *New York, NY*
Construction Support Services: **URS Corp. in conjunction with NYCDOT In-House Design and Fabrication Engineering Unit of NYCDOT Quality Assurance**, *New York, NY*
Resident Engineer and Inspection Services: **GPI/CTE Joint Venture**, *New York, NY*
Environmental Compliance: **Environmental Engineering Unit of NYCDOT Quality Assurance**, *New York, NY*
Structural Steel Erector: **Northeast Structural Steel**, *Mt. Vernon, NY*

Campbell and Salice-Conley Halls

Though a less common building material for residential structures, the new halls' structural steel framing enabled a unique openness.

Structural steel provides flexibility and open spaces at Fordham University's Rose Hill campus.

Boston-based Sasaki Associates has no shortage of experience using structural steel to create instant architectural classics for academic institutions across the country. But their recent commission to design Campbell and Salice-Conley halls, undergraduate dormitories on Fordham University's Rose Hill Campus in upper Manhattan, came with a couple of idiosyncratic constraints.

One of those was aesthetic. Fordham's campus is full of heavy Gothic halls, centered around a cathedral; school administrators wanted to ensure the new dormitories would simultaneously fit in with the older buildings yet also feature a light, modern architecture that opened up the campus visually to the surrounding city. Sasaki developed its proposal around strategies of uniting those seemingly opposed goals.

Elements of the facade design cleverly pay homage to the older buildings. Eleven-inch-deep mullions in the curtain wall extend all the way up the height of the four seven-story towers that comprise Campbell and Salice-Conley, such that the windows are recessed 6 inches, while major curtain wall elements are recessed up to 24 inches back from the face of masonry, giving the masonry a Gothic sense of solidity and shadow. A band of ⅛-inch-thick aluminum break metal painted grey in the shop extends 12 inches above the top of the masonry and creates a parapet, the metal lending a crisp shadow line with intermittent breaks to suggest the crenellated parapets of Fordham's older architecture. Two cantilevered canopies over the first floor entrances jut out 15 feet from the exterior wall, with the canopy over Campbell Hall a particular visual focal point as a recessed metal trellis allows sunlight to filter onto the entry terrace. "It's intended almost like a clearstory opening set into the canopy," says Sasaki's Vinicius Gorgati, principal architect on

Left The buildings' four seven-story steel-framed towers offer an opportunity to bring daylight into student spaces.

Right First floor spaces are designed with airy, column-free plans that encourage student interaction.

the project along with Ricardo Dumont and Victor Vizgatis.

While a slate curtain wall echoes the look and feel of the older campus buildings' load-bearing masonry, the four seven-story towers are actually constructed with a steel frame, making it possible for the building to realize the desired openness and porosity of the first floor.

The 1,100 tons of structural steel used in constructing the final plan played a large role in making possible other design features that Sasaki, and structural steel engineers Lemessurier Consultants, considered important.

Aside from the first story, which is an airy 14 feet in height and includes a café, classrooms, and laundry rooms, each residential floor is 10 feet high and anchored around a shared lounge connected to lounges on floors above or below via a balcony. Eight or more suites per floor are each organized into a grouping of sleeping rooms, kitchen, and living space connected by a corridor. Within the walls separating suites are steel columns, ranging in size from W12x40 to W12x106 and in length from 20 to 50 feet.

Because of the sheer number of rooms—116 suites, each with a kitchen, a living and dining space, bathrooms as well as a mix of single and double bed configuration bedrooms—all of which need to be fed exhaust and supply air, a significant amount of ductwork had to run below the beams. "We were limited to a depth of not more than 12 inches for the beams so that we could have mechanical systems running below, rather than going through deep penetrations that would be needed if we used W16s. We had to thin up the structure in order to make the W12s happen," says Gregory Shreve, the project's structural engineer from Lemessurier.

A similar design pressure came from the architectural side of planning, with the high windows Sasaki wanted for each floor leaving little vertical room for deep beams. "The 14-inch-deep perimeter beams were engineered to strike a balance between carrying the load of the exterior masonry wall assembly and maximizing window height to allow for optimal daylighting and views," says Justin Finnicum, another Sasaki architect managing the project. Steel rebar reinforcement of the concrete slab edge coupled with a sizeable bent plate, welded continuously to the top of the perimeter beam, worked together with the perimeter beams to carry the imposed loads to the steel columns. The payoff, however, was the sense of openness achieved by being able to look through the windowed lounge areas from one wall of the dorm to the other—not to mention its contribution to Fordham's first LEED Gold certification.

The other constraint shaping Sasaki's design and execution of Campbell and Salice-Conley halls was a geographical one. Fordham's campus directly abuts the Metro-North rail line, a major artery of transportation between New York City and neighboring cities in New York and Connecticut. For years, a parking lot on the campus' Western edge had formed an unsightly, uninviting buffer between the rail line and the rest of campus to the east. Fordham's administrators hoped to kill two birds with one stone by building new dormitories on that lot, improving the image they presented their neighbors to the west, while adding desirable new living space to entice upperclassmen who might be eyeing a move off campus.

The choice of this lot for the building site presented some challenges. A steep 12-foot-high slope down from the campus level to the adjacent railway tracks meant that a 1,000-foot-long retaining wall had to be constructed before work could begin on the dorms themselves. Constructing the wall had to be done quickly and be as carefully planned out as possible. "The MTA had someone supervising our construction the whole time, making sure we didn't do anything that could threaten or interrupt the train line," says Joe Scaltro, Fordham's senior project manager. The nearby tracks even dictated the movements of the steel erectors and their machinery. "There are many rules regulating

Opening spread and this spread: Robert Benson Photography

Above Perimeter steel beams were engineered to strike a balance between supporting the exterior masonry wall assembly and maximizing window height. **Below** The site's adjacency to railroad tracks necessitated strict coordination between steel erectors and the MTA.

Above: Robert Benson Photography; left: Sasaki Associates

Right The buildings' architecture references the historic campus while visually uniting it with the surrounding city.

crane use adjacent to the rail line, so erectors couldn't lift up a piece of steel and carry it over the 'no-fly zone,'" Finnicum explains.

To expedite the dormitory erection process, all primary connections were field bolted, rather than field welded, which would have required a safety supervisor and foreman in addition to a welder. Welding would allow very clean connections between crossbraces and gusset plates, but since the team decided to use bolting instead, elements of the bracing system had to be increased in size. Larger gusset plates were needed to allow sufficient spacing between the bolts required on each side. Using larger gusset plates, in turn, required tighter overall engineering and coordination between mechanical, electrical, and plumbing systems in order to avoid the clashes that can mean rework losses in terms of both time and cost. "Dealing with the shallowness of the structural sandwich we were allowed to use, while keeping the tonnage reasonable, was a challenge," Shreve says.

Campbell and Salice-Conley halls are now an established part of campus, but were there any early bumps in the road? When asked if students had any complaints about the design of their new dormitories, Scaltro replied, "Well, some people complained that the TV in the laundry room is always turned to ESPN." If hundreds of college students can't come up with a stronger criticism than that, it's safe to count the project as a success for Sasaki, Lemessurier, and the construction team, and a strong addition to Fordham's expanding campus.

Robert Benson Photography

CAMPBELL AND SALICE-CONLEY HALLS

Location: **Fordham University Rose Hill Campus, Bronx, NY**
Owner: **Fordham University**, *New York, NY*
Architect: **Sasaki Associates, Inc.**, *Boston, MA*
Structural Engineer: **LeMessurier Consultants**, *Cambridge, MA*
Mechanical Engineer: **Cosentini Associates**, *New York, NY*
Construction Manager: **Gotham Construction Co.**, *New York, NY*
Curtain Wall Consultant: **Frank Seta & Associates**, *New York, NY*
Structural Steel Erector: **A.J. McNulty & Co., Inc.**, *Maspeth, NY*
Miscellaneous Iron Fabricator and Erector: **Post Road Iron Works**, *Greenwich, CT*
Architectural Metal Fabricator and Erector: **Enterprise Architectural Sales, Inc.**, *New York, NY*
Ornamental Metal Fabricator and Erector: **Post Road Iron Works**, *Greenwich, CT*
Curtain Wall Erector: **Enterprise Architectural Sales, Inc.**, *New York, NY*

2012 *Metals in Construction* Facades Conference

Metals in Construction Facades Conference and Workshops

On Thursday, February 16, 2012, the Ornamental Metal Institute of New York co-hosted the *Metals in Construction* 2012 Facades Conference at McGraw-Hill Auditorium. Culminating with a keynote address by Patrik Schumacher, director of Zaha Hadid Architects, more than 250 architects, engineers, fabricators, and students were in attendance for a day of discussions and presentations by some of the world's most respected curtain wall designers. Bill Zahner, president of A. Zahner Company, kicked off the day with a presentation based on the event's theme, "Creating the 21st Century Facade."

The morning's program also included presentations by Mic Patterson of Enclos, Jonathan Mallie of SHoP, and Edward Peck of Thornton Tomasetti's Building Skin Practice. Architectural journalist Sara Hart moderated presentations by Robert Anderson of Firestone Building Products, Ann Smith of Cambridge Architectural, and architect Michael P. Johnson. The morning concluded with a discussion between *The Architect's Newspaper*'s executive editor, Julie V. Iovine, and Dirk Meyer, building enclosures advisor for the U.S. General Services Administration.

The afternoon's lineup began with presentations and a panel discussion by Philip Anzalone of Columbia's GSAPP, Anna Dyson of CASE, and Erik Verboon of Buro Happold, which were introduced by Brad Bell of Digital Fabrication Alliance (DFA) and moderated by Andrew Vrana, of MetaLab and DFA. Dennis Shelden of Gehry Technologies, Federico Negro of CASE Design, and Reese Campbell of Method Design presented project case studies before the day's keynote address by Patrik Schumacher and a Q&A session led by Julie V. Iovine.

The Institute also co-sponsored the event's second day during which five digital fabrication workshops organized by DFA were led by Gil Akos and Ronnie Parsons of Studio Mode, Skylar Tibbits of SJET, David Fano of CASE Design, John D. Cerone and Hashim Sulieman of SHoP, and Kevin Patrick McClellan and Brad Bell of DFA.

Louis F. Geschwindner

Louis F. Geschwindner seminar

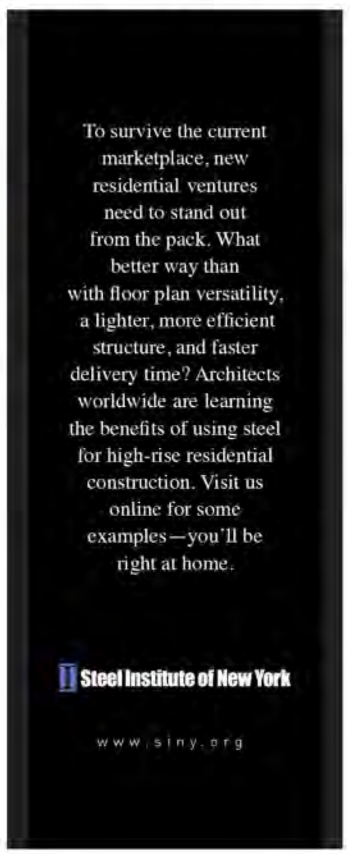
On May 2, 2012, in New York, the American Institute of Steel Construction (AISC) and the Steel Institute of New York co-hosted the AISC's new Louis F. Geschwindner seminar on the 2010 AISC Specification for Structural Steel Buildings and the 14th Edition Steel Construction Manual. The new annual seminar series has been named to honor AISC's immediate past Vice President of Engineering and Research, Louis F. Geschwindner, Ph.D., P.E., and to emphasize the importance AISC places on providing valuable continuing education programs to the steel design and construction community.

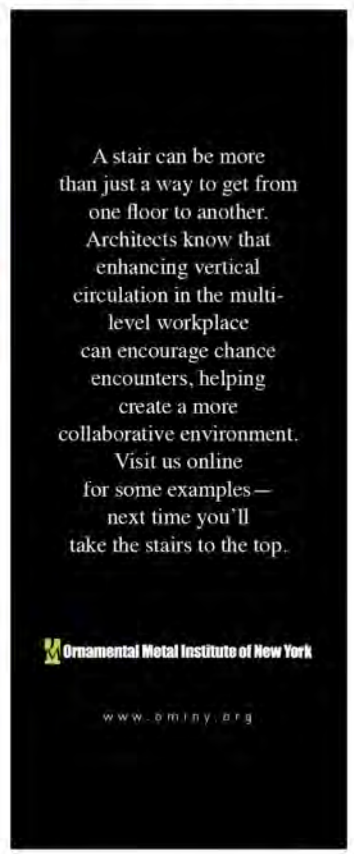
Craig Schwitter Lecture

On Monday, March 5, 2012, at Pratt Institute's Brooklyn Campus the Steel and Ornamental Metal institutes of New York sponsored a lecture by Buro Happold's North American managing director, Craig Schwitter. With decades of experience in the engineering design of complex buildings and large-scale developments, Schwitter spoke of using integrated engineering and appropriate technology to achieve engineering innovations, especially in the field of low-energy, high-performance buildings.

For more information about upcoming Institute-sponsored events, visit WWW.SINY.ORG and WWW.OMINY.ORG.

Institute ads appear regularly in New York-area industry publications to let readers know that we can help turn their design aspirations into realities.





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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:

- Consultations extending to the preparation of preliminary design and construction cost analyses for alternative structural systems
- 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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