METALS IN CONSTRUCTION

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3 WORLD TRADE CENTER / JOAN WEILL CENTER FOR DANCE / MILSTEIN CENTER AT BARNARD / NYU LANGONE KIMMEL PAVILION / KOSCIUSZKO BRIDGE: PHASE I / EMMA AND GEORGINA BLOOMBERG CENTER AT CORNELL TECH / ELECTRICAL INDUSTRY TRAINING CENTER / NASSAU VETERANS MEMORIAL COLISEUM

The training center's circulating stair is enclosed with a fire-rated glass wall, allowing it to double as an exit stair.

Electrical Industry Training Center

At the new home of Local Union 3, design and engineering (not to mention a little historic research) combine to transform a former factory building into a high-tech educational center for electricians-in-training.

A CITY'S LIGHTS DON'T RUN on their own—neither do its power supplies, train signals, and high-speed internet connections. Behind New York's humming streets and brightly lit buildings (and even the New Year's Eve ball drop in Times Square) is a legion of electrical engineers, many of whom have trained at the home of Local Union 3, the Electrical Industry Training Center (EITC) in Long Island City. The center's new home evokes the energy of its mission to train the best in the field thanks to a renovation, led by the Educational and Cultural Trust Fund of the Electrical Industry and designed by Gensler, that added a new event-space level to a former T-shirt screening factory's concrete structure and sliced the building open at its northeast corner to create a double-height atrium and glass-enclosed circulating staircase. Now, the training center has an outward face that represents the forward-thinking culture of the union and the innovative profession it represents; it also stands as an example of the ways in which existing concrete buildings, notoriously difficult to retrofit, can be updated with structural steel architecture.

Built in the 1970s, the original 30,000-square-foot structure was essentially two stories with a cellar that was partially below-grade. "One of the things we addressed right away was the fact that they wanted to add onto the building, but there wasn't a lot of additional FAR," says Peter Wang, the project's design director for Gensler. In order to achieve the client's wish of adding a third-story event space for large meetings and galas, they were able to discount the portion of the building that was partially below-grade, as well as a portion that was reallocated for parking, which allowed for the addition of a third level over more than 50 percent of the building footprint—a strategy that was verified and approved through the help of a land-use attorney.

The rooftop addition is framed in structural steel. "We always consider steel because it's lightweight and it's flexible, so later on if you needed to do any reconfiguration it would be much easier to deal with," says Wang. But before plans could be finalized, structural engineers at Shmerykowsky Consulting Engineers had to determine whether the existing structure could withstand the load of an additional floor.

With a new building, "The design team can relatively easily move things around to make the collective result work," says Marco Shmerykowsky. "With an existing building, which has limited or no existing drawings, the challenge is deeper and greater. Not only do you have the typical new-construction challenges, but you must adapt the solutions to mesh with something that already physically exists. Existing elements cannot always be moved to make way for new elements. Everything has to fit, live, and work together. Also, before you can modify the existing, you must understand how the object was originally designed and constructed. You must be a historian, an archeologist, and an engineer."

Because a comprehensive set of original drawings was unavailable, Shmerykowsky put on his historian-archaeologist hat and consulted the building's original column schedule and certificate of occupancy, which indicated that all levels, including the roof, had been constructed to handle live loads of up to 200 pounds per square

Top Steel framing of the training center's new multipurpose level.
Above Structural steel framing for the rooftop beacon tower.
Facing top A steel canopy shades outdoor space on the center's rooftop.
Facing bottom The new multipurpose space faces views of Manhattan.

foot (psf). This is typical for the building's original industrial use, and left ample load capacity to work with after meeting the 50 psf required for a commercial space like EITC. The third-floor addition could move forward.

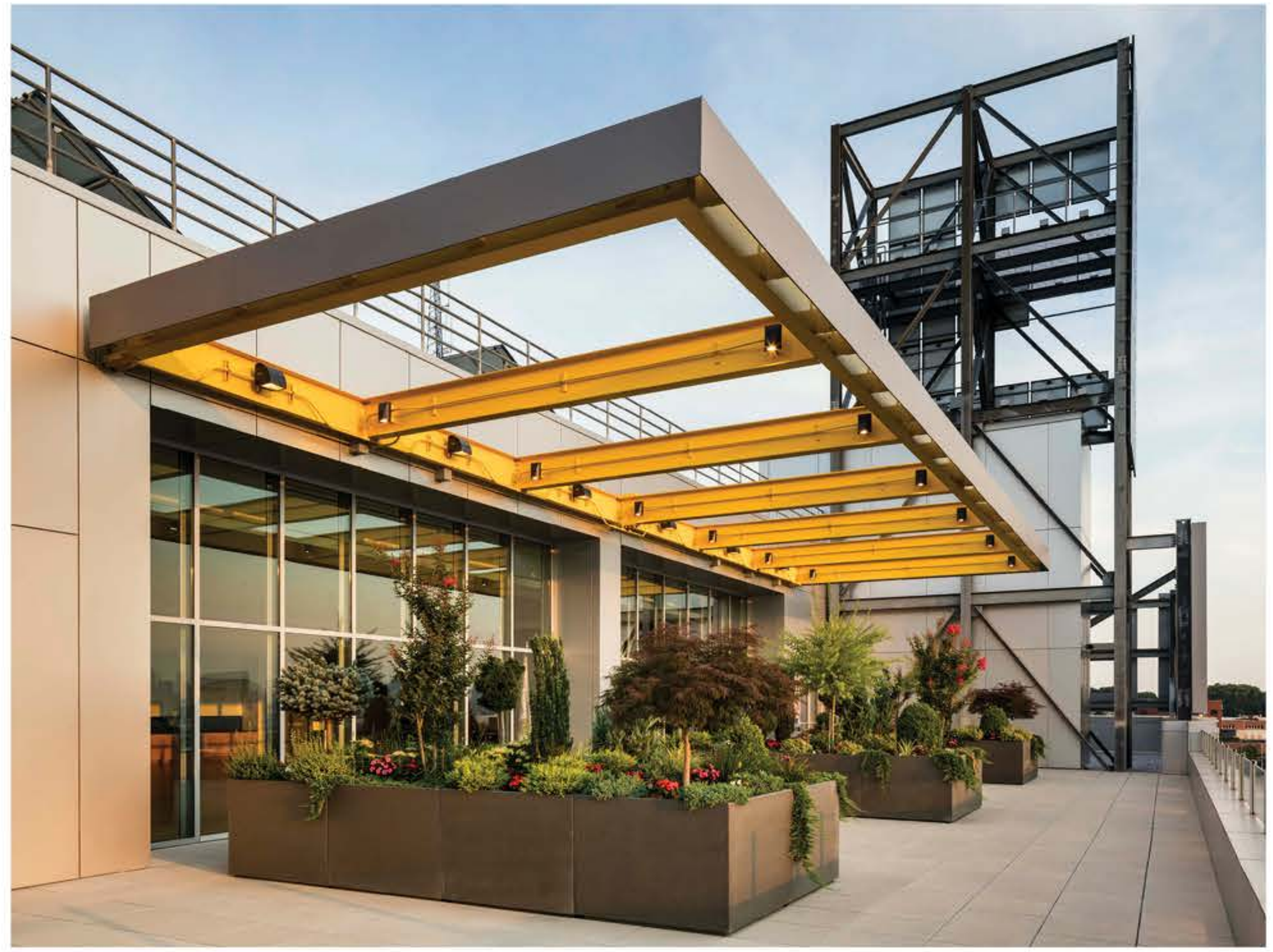
New steel columns are located directly above existing concrete columns below and secured to the waffle slab with expansion anchors. To create the open event space envisioned by the client and architects, the structural team chose W30 girders spanning approximately 60 feet across the floor, with the lateral load-resisting system created with braced frames and supplementary moment frames.

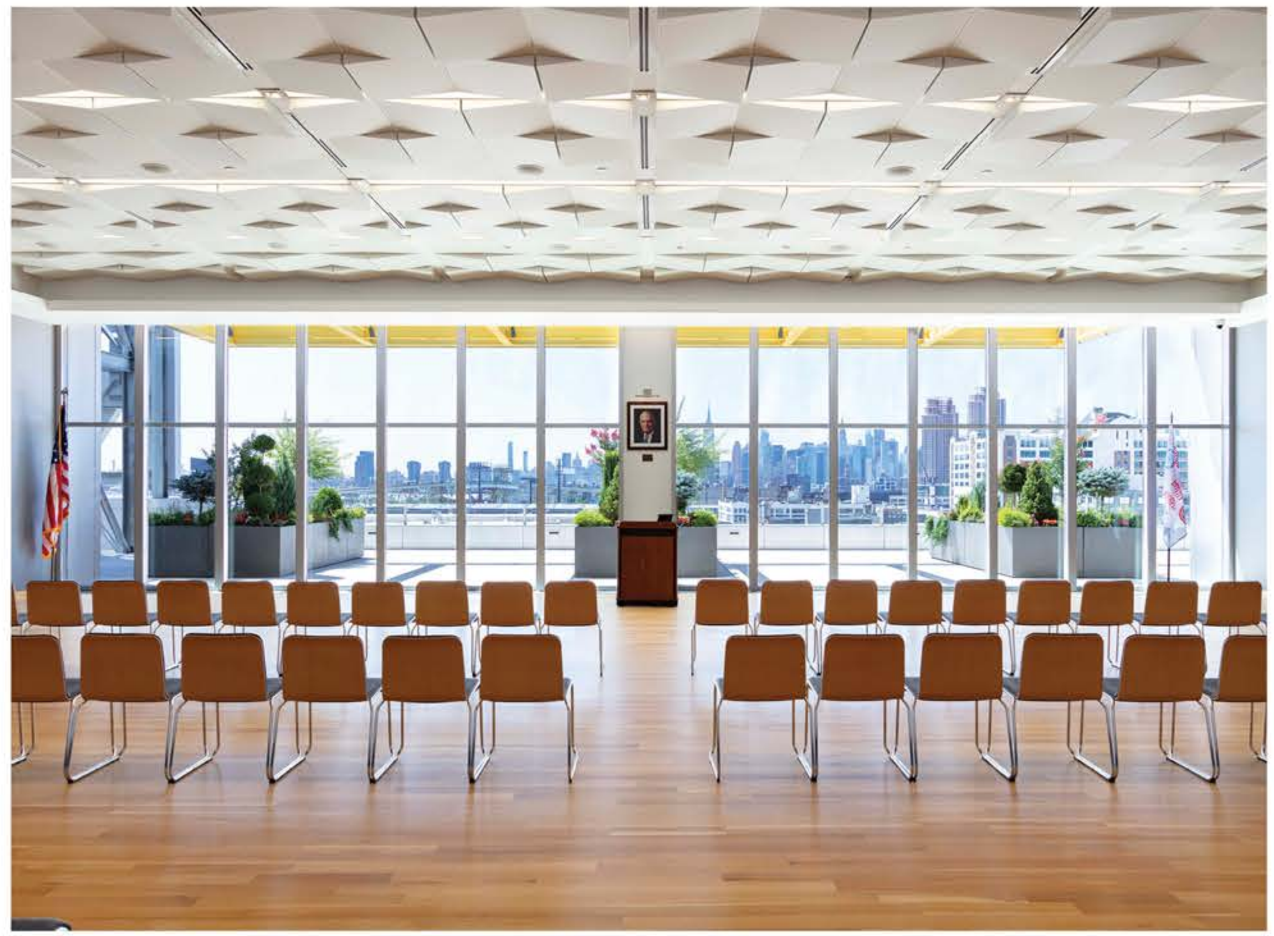
The new space sits atop the building with expansive glass and an open-air deck facing west to the Manhattan skyline. Because the addition shares the rooftop level with new mechanical equipment, the architects designed a concealing decorative screen of perforated yellow metal panels for the east and south sides of the rooftop. On the eastern elevation, W8 vertical diagonal members, which brace the screen, were designed to terminate above the existing concrete columns so that their vertical reactions would be transmitted into the columns below; this configuration avoided having to reinforce the existing waffle-slab structure. Due to the layout of new mechanical equipment on the remaining roof area, an alternative bracing system was required: W8 steel members connect horizontally from the screen wall to an intermediate W10 column and then to another W10 column that is part of the new level's framing system, thus bridging over the equipment.

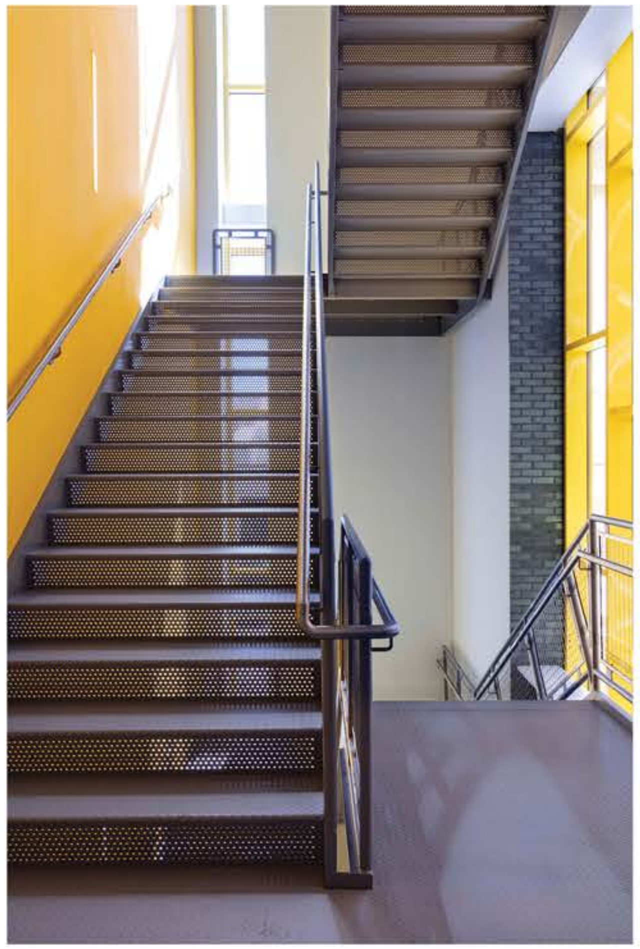
A steel beacon tower at the building's southwest corner is clad in photovoltaics, giving a glimpse at the energy-conscious electrical education being presented within. The 60-foot-tall tower posed a structural challenge, however, because of a staircase bulkhead at its base. The tower is composed of three steel vertical X-braced frames running north-south, spaced 12 feet, 6 inches apart, and two vertical steel chevron frames running east-west, spaced 12 feet apart. While X-braced framing would have also been an ideal lateral-support solution for the short-spanning direction of the tower as well, the X-braced framing for the westermost side of the structure is the only north-south frame which is not interrupted by the bulkhead and which extend to the main roof level. For the other two braces, an alternative system was required. The engineers designed what they call an "external superbrace" made of a diagonal W10 brace running down from the southwestern W12 tower column to one of the W12 columns that supports the decorative screen wall. At that point, another W10 brace connects to the existing roof slab above one of the building's existing columns. Shmerykowsky describes the overall effect as an unobtrusive structural support system that maximizes the architectural impact of the beacon tower on the rooftop.

While the rooftop interventions perhaps had the most impact on the building's presence in the neighborhood, another structural update at the building's northeastern corner has drastically changed the

Opening: Chris Leonard; this page: Marco Shmerykowsky; facing top: Paul Rivera; facing bottom: Chris Leonard







"The entire building has become a tremendous recruiting tool."

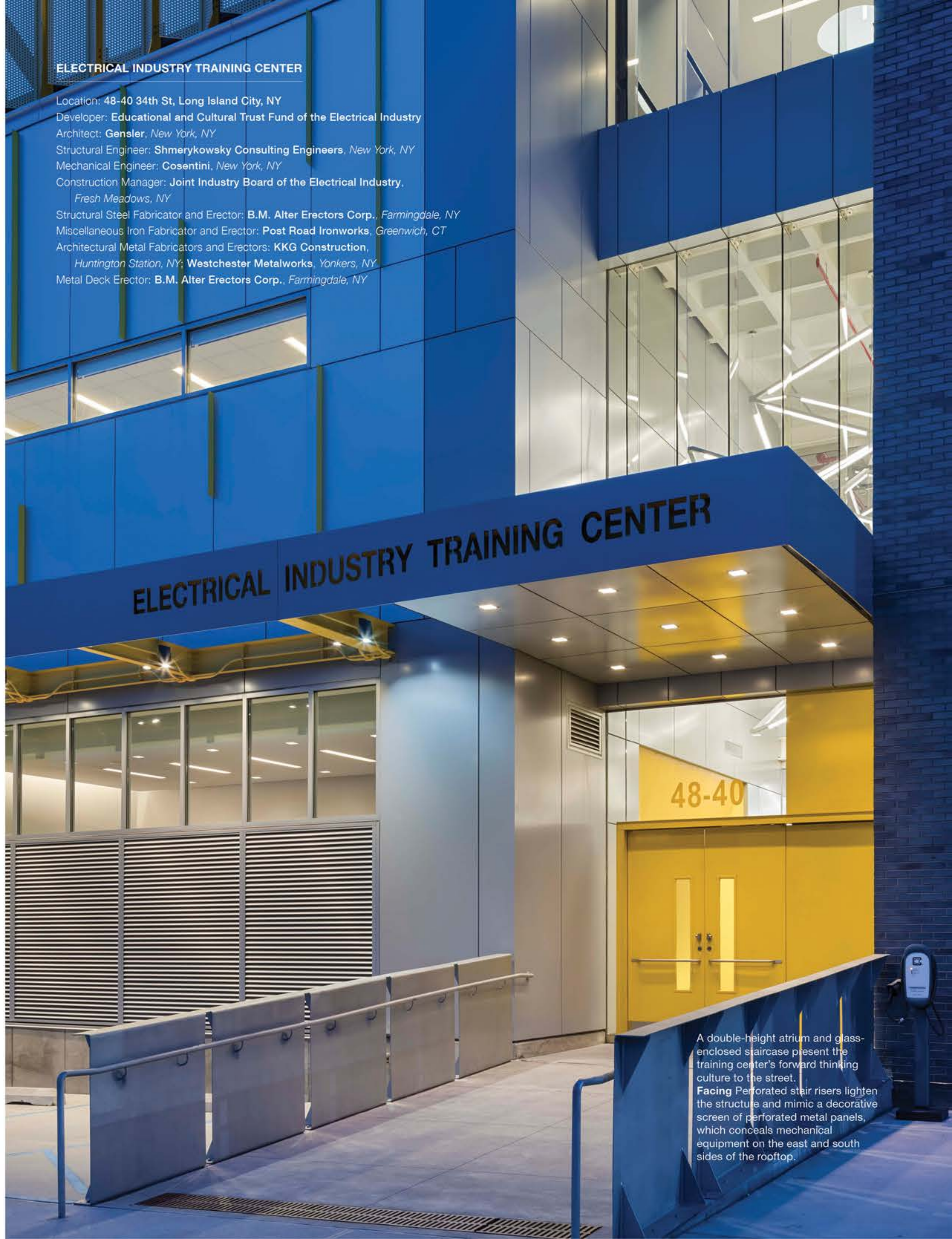
Peter Wang, Gensler

experience of those entering the school. Where a nondescript door once led into the facility, a two-story glass atrium now invites apprentices and instructors inside. A brick-clad volume represents a new core for the building; the architects replaced an oversized cargo elevator with two passenger elevators and four bathrooms and reimagined an existing fire stair as a light-filled circulation staircase with views to the street. The double-height glass wall that separates the staircase from the atrium is made possible, from a code-compliance standpoint, by fire-rated glass, which allows the stair to do double-duty as a fire exit. "It's not the cheapest thing," says Wang, "but it was fantastic to be able to open up the stair like this."

To create the atrium space, the structural team removed a rectangular portion of the existing waffle slab on the second floor and the roof level and shored the remaining slab. The resulting openings were reframed with W14 steel beams framed into new steel columns. "To accommodate the new stair, existing openings were widened and reframed with heavy W14 and Hollow Structural Section (HSS) members designed to span between supports without the benefits of a braced top flange (HSS sections were used in locations where torsional rigidity was required)," says Shmerykowsky. These members frame into new steel columns that were installed along the perimeter of the stairway opening. Elements of this framing system also function as support for the stair's stringers. Underneath the stringers at the second and third floors, north-south-spanning W12 beams frame into the foundation wall.

The stair's exposed structure hints at the openness and high-tech aesthetic the renovation brought to the rest of the training center, where classroom and workshop space was also fully renovated. In some hallways, overhead ductwork and electrical conduit are exposed behind mesh ceilings, allowing them to become real-world examples for apprentices. "The entire building has become a tremendous recruiting tool," says Wang. Because the existing brick facade was deteriorating and uninsulated, the architects elected to use two-tone aluminum composite panels (ACM) to reclad most of the facade. "Using ACM panel on the facades was not only cost-effective and provided a visual contrast to the surrounding context, using it on insulated stud wall framing was a lightweight facade solution that also allowed us to make the building energy efficient," he says. As reducing energy consumption becomes more of a priority across all professions, it's an important lesson for any training program to impart on its students.

Top: Chris Leonard; bottom: Paul Rivera; facing: Paul Rivera



ELECTRICAL INDUSTRY TRAINING CENTER

Location: **48-40 34th St, Long Island City, NY**
Developer: **Educational and Cultural Trust Fund of the Electrical Industry**
Architect: **Gensler**, *New York, NY*
Structural Engineer: **Shmerykowsky Consulting Engineers**, *New York, NY*
Mechanical Engineer: **Cosentini**, *New York, NY*
Construction Manager: **Joint Industry Board of the Electrical Industry**, *Fresh Meadows, NY*
Structural Steel Fabricator and Erector: **B.M. Alter Erectors Corp.**, *Farmingdale, NY*
Miscellaneous Iron Fabricator and Erector: **Post Road Ironworks**, *Greenwich, CT*
Architectural Metal Fabricators and Erectors: **KKG Construction**, *Huntington Station, NY*; **Westchester Metalworks**, *Yonkers, NY*
Metal Deck Erector: **B.M. Alter Erectors Corp.**, *Farmingdale, NY*

A double-height atrium and glass-enclosed staircase present the training center's forward thinking culture to the street.
Facing Perforated stair risers lighten the structure and mimic a decorative screen of perforated metal panels, which conceals mechanical equipment on the east and south sides of the rooftop.