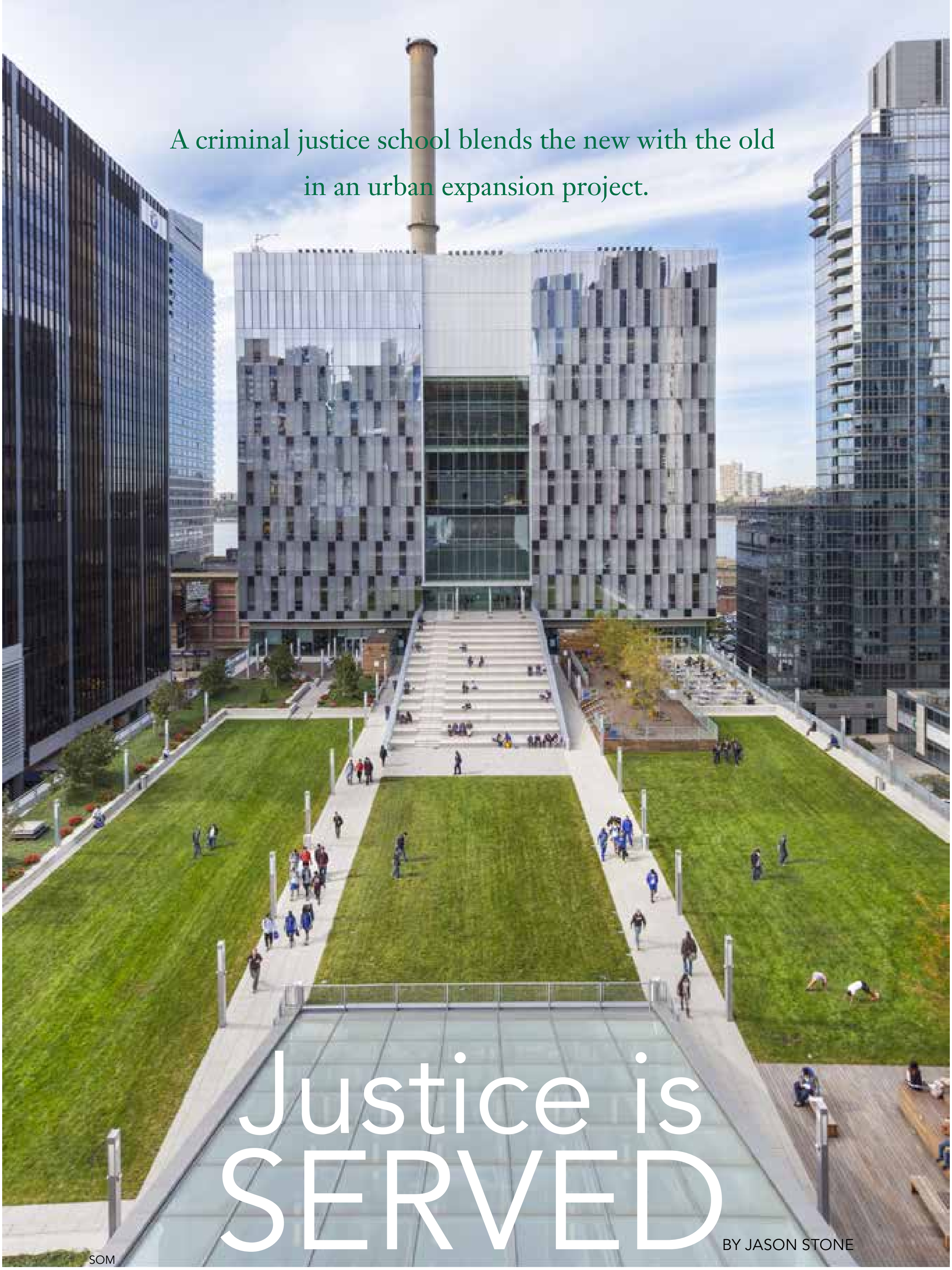


A criminal justice school blends the new with the old in an urban expansion project.

Justice is SERVED

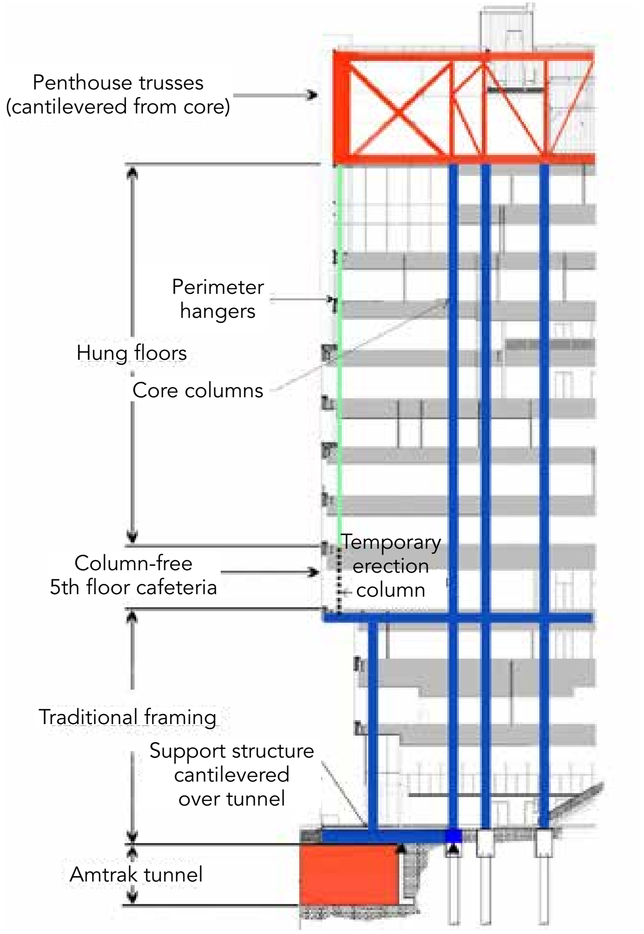
BY JASON STONE

SOM

THE YEAR FOLLOWING the attacks of September 11th initiated a sudden boom in the popularity of criminal justice careers.

As the trend continued over the years, this led one of the country's most highly esteemed criminal justice schools, the City University of New York's (CUNY) John Jay College of Criminal Justice in Manhattan, to eventually expand its campus.

The result is a new 625,000-sq.-ft academic building, comprised of a 15-story tower on 11th Avenue and a four-story podium with a garden roof that connects to the college's existing Haaren Hall, which dates back to the late 19th century, on 10th Avenue. The building doubles the existing facilities and unifies of the campus into one city block.



A partial section view from 11th Avenue at the Amtrak tunnel (the structural system is highlighted).

Careful detailing at the train tunnel was required to isolate members supporting the precast tunnel enclosure from the main building structure.

Abadan Mustafa of Skidmore Owings and Merrill, the project's architect, explained the design concept thusly: "Criminal justice is not something that should be hidden away. Glass makes the relationship to inside and outside clearer. It relates to our ideals of transparency and justice, the way justice is applied to everyone equally and openly."

The new facilities offer traditional college campus amenities including classrooms, offices, research laboratories, theaters, lounges and flexible collaboration spaces. In addition, unique features specific to educating future investigators and law enforcement officers include a ballistics room, areas for chemical storage and analysis, space for mock trials and an emergency control center simulation lab.

Over the Tunnel

There are many challenges to construction in Manhattan, not the least of which are the countless train tunnels below the streets, and a shallow Amtrak tunnel cuts through a corner of the project site. To effectively isolate the building from the train vibration and noise, two layers of structure were provided. The train tunnel was enclosed with a hollow core precast plank ceiling and concrete crash walls, and the main steel-framed building structure spans over and behind these elements (the columns were mostly W14, with the largest being W14×665, and the beams were typically W14×22 that frame to W18 and W36 girders at the long spans). At points of convergence, creative detailing was required to maintain the load path and necessary separation.

However, accommodating the almost two-story change in grade between 10th and 11th Avenues would pose a challenge, as would a second main entrance to the building that occurs along 59th Street and negotiates this steep slope. To design for these conditions, the perimeter columns, which are in an area that supported heavy loads from the rooftop garden, were eliminated and the entrance was pulled back to allow room for the necessary steps and ramps. One-story-deep trusses were fit inside the walls of the fourth-floor classrooms to efficiently accomplish the 40-ft cantilever out to the tip of a V-shaped tapering canopy.

The interior architecture also responded to the sloped grade with a series of cascading staircases and escalators that complicated the structure but still facilitated circulation to all parts of the campus.

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With the temporary columns removed, the load path for the hanging structure is clear.

Setbacks in the façade of the main entrance at 11th Avenue were an important aesthetic feature that also reduced the impact of the load on the shallow train tunnel below.

The rooftop truss hanging system supports the 26 perimeter hangers.

"The cascade replicates a miniature Manhattan, with the 'travelers' passing through different building functions and academic departments rather like the squares—Madison, Herald and Times, among others—that bisect Broadway and function as independent nodes within the city," said Mustafa. Additionally, a large skylight supported by narrow architecturally exposed narrow HSS20×4×½ provides natural light into these main circulation areas and offers views in from the garden roof.

Hanging System

Accommodating the necessary two layers of structure around the train tunnel mandated a practical limit to the weight that could be supported. After exploring numerous options, a hanging solution, distinguished by a grid of rooftop trusses that hang the perimeter of the eight floors below, was favored by SOM and the Dormitory Authority of the State of New York (DASNY) and was adopted for numerous reasons. One of these was achieving the series of distinguishing setbacks that frame the west façade's main entrance along 11th Avenue. The hanging system was continued around the full perimeter to balance the weight, complete the column-free aesthetic and take advantage of the thin plate hangers that could fit inside a standard partition wall instead of traditional column enclosures. The hanging system was stopped where the structure over the tunnel could accommodate conventionally framed floor weight to maintain efficiency. The fifth floor was chosen for this transition, allowing the transparent column-free floor to align with the podium roof garden, and providing views of the Hudson River for the full 195-ft width of the building.

The primary challenge was to achieve approximately level floors as well as a 2-in. stack joint in the curtain wall at the transition floor between the conventionally framed original building and the new hung structure. (The steel that frames between the hanging perimeter—increased for anticipated deflection—and the down-to-the-ground supported core steel sloped upward until the temporary support columns at the sixth floor were distressed/removed.) To simplify the steel frame erection, the design accounted for temporary columns at the fifth floor around the tower perimeter and temporary angles bolted to the plate hangers above the sixth floor to stiffen these elements during erection. This allowed the construction process to proceed similarly to conventional construction and maintain the project schedule. Once the truss assembly was finished, jacks at the temporary columns slowly lowered the building and engaged the trusses. At this point, the temporary columns and angles could be removed and concreting of the tower could begin.

Calculating the required amount of vertical cambering of the steelwork (or how much to super-elevate the perimeter steel at each of the 26 hanger/column locations to account for the anticipated deflection during construction) proved to be a challenge as well. Design estimates were based on the assumed construction schedule, estimated construction loads and realistic modeling of the structural behavior. During construction, continuous surveying verified whether the perimeter was behaving as we anticipated. Once shop drawings were available for the nonstructural elements, a full reanalysis was done incorporating what was being learned from the surveying. This reanalysis revealed that it was likely the perimeter would not come down as much as originally thought (one reason being the curtain wall was 30% lighter than assumed in design) and field adjustments were made to lower the steel frame prior to starting the truss erection. Based on the last survey data received, this adjustment proved effective as the perim-

➤ Construction over the Amtrak tunnel was done at night and coordinated around the train schedule. Noise and vibration were controlled by isolating the tunnel enclosure from the tower structure.

eter settling and final stack joint were tracking closely with the predicted behavior and targeted final thickness.

Future Expansion

During the expansion, the college decided that flexibility for future generations was important. A design was considered that allowed for an additional ten floors over the podium to raise this section to the height of the new tower. When the decision was made, the podium structural steel was already mostly fabricated and the caisson foundations were actively being drilled in some of the affected areas.

It was then agreed upon to only reinforce the foundations up to the slab-on-ground and take advantage of a hanging structural system similar to the one used in the tower; this would reduce the affected area to the interior core and limit the financial and schedule impacts as much as possible. Additional elevator pits with knock-out slabs were provided along with significantly reinforced foundations, based on the anticipated future circulation and structural weight needs. Instead of increasing the column and vertical bracing member sizes for the expected future loads, the additional capacity is intended to come from a high-strength composite concrete encasement, allowing the already fabricated vertical members to still be used.

Up on Top

The 65,000-sq.-ft roof terrace atop the podium serves as a new, outdoor gathering place for students and faculty. The planted green roof is landscaped with large grassy zones, full-sized trees and decked outdoor dining areas, which students have immediately embraced and nicknamed "Jay Walk."

To preserve the dramatic views, the hanger spacing was increased to nearly 50 ft at the middle of both the east and west faces for the hung tower floors. These long-span conditions created a problem for the laboratories on the sixth, seventh and eighth floors, where strict vibration criteria needed to be met; stiffening the floor resulted in deeper and heavier members than could be tolerated in the ceiling package. The solution, which saved material and depth in the floor members, was to remove the problematic excitation by adding an isolation joint in the floor between the labs and the adjacent main circulation corridor.

The John Jay College Expansion project exceeded the expectations of owner and client, giving the students and faculty a new state-of-the-art home they feel proud of, along with the flexibility to adapt to whatever the future holds. ■

SOM

➤ A cross section of the building. The 15-story, 625,000-sq.-ft facility sits atop a four-story podium and is connected to the college's existing Haaren Hall.

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Dormitory Authority of the State of New York

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John Jay College of Criminal Justice

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