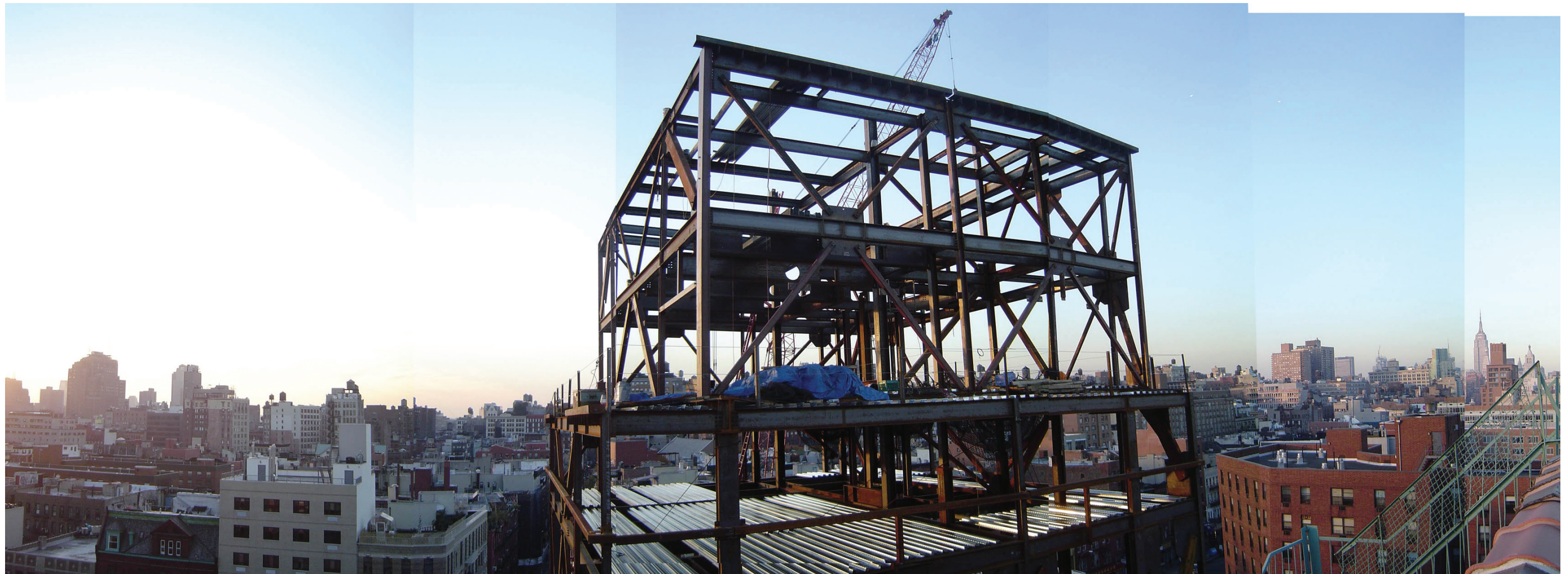




NEW MUSEUM OF CONTEMPORARY ART

Steel Balancing Act

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Rising from a rough-and-tumble stretch of restaurant-supply shops and the odd flophouse, the New Museum of Contemporary Art is a nine-story balancing act on the Bowery. A series of shifting rectangular volumes, like messily stacked children's building blocks, the structure balances not only gravity loads, but the Bowery's tough reputation and the museum's public-minded mission. The building marks a brawny presence while drawing the life of the city—people, prospects, views, and art itself—through the museum: This architectural feat would not have been possible without the strength and lightness of the sophisticated steel structure.

Designed by Kazuyo Sejima and Ryue Nishizawa of the Tokyo-based partnership SANAA, the 60,000-square-foot building, located prominently at the head of Prince Street, is the 30-year-old museum's first home to be built specifically for its use. Due to open this December as the culmination of a \$64 million capital campaign, the structure evolved from an invited architectural competition in which SANAA early on wanted the museum as open and porous as possible—an "anti-monument," they called it. Yet an ambitious program needed to squeeze onto a tight Bowery site.

Enter Guy Nordenson and Associates, along with Tokyo-based structural engineer Mutsuro Sasaki. Both firms had worked on SANAA's startlingly transparent Glass Pavilion at the Toledo Museum of Art, which opened last year. As in Toledo, thinness was a key concept on the Bowery, where the architects aspired to keep perimeter walls light. The engineers, too, knew that shifted boxes would require load transfers from volume to volume—and therefore the lighter the structure, the better. "The thinness of the walls and the lightness of the structure," Nordenson says, "led everyone fairly immediately to choosing steel."

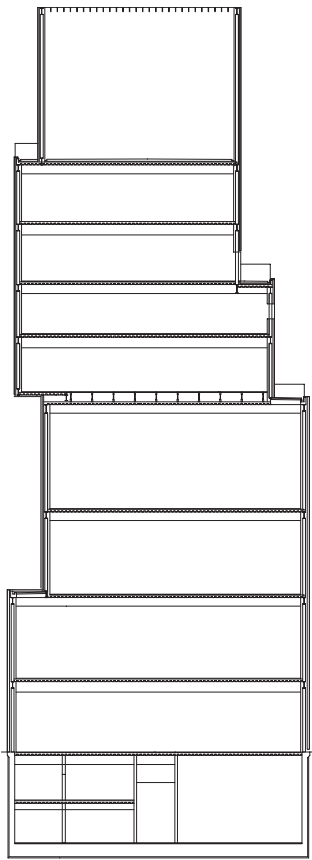
What evolved from Sasaki's initial concept was a braced-frame steel system using the walls themselves as story-deep trusses. These trusses provide setback transfers and most of the building's lateral resisting system. They also provide column-free interiors for exhibition spaces, as well as skylights at each setback, letting



PREVIOUS The New Museum's shifting volumes creates a brawny presence on the Bowery.

OPPOSITE The museum's walls act as story-deep trusses, accepting most of the building's lateral forces.

RIGHT This section shows some of the shifting load patterns that the structure has to contend with.



natural light into galleries. Truss bracing is limited to a width of eight inches in both the exterior and core. "The thinness was critical," says Florian Idenburg, SANAA's project associate for the building, "so at an early stage we decided to only work with W8 in the walls to keep it thin."

That perimeter bracing proved the most complicated part of the project, according to Kevin Poulin, senior project manager for Simpson Gumpertz & Heger (SGH), the building's structural engineer of record. The staggered boxes posed significant challenges for controlling lateral seismic and wind loads. In the final scheme, diagonal bracing consists of hollow structural sections of varying dimensions, including 8x8x3/8 on the ground floor and 20x8x5/8 at the second floor, with some sections under hefty loads of up to 500 kips. Wide flange steel for vertical and horizontal truss sections also varied in size, including W8x18 in the fourth-floor trusses and W12x190 at the cellar level. Steel plate shear panels are applied in two locations between the fourth and fifth floors, where the aspect ratio of the bay is too narrow to allow diagonals.

Moment connections transfer loads horizontally across the skylights, where the boxes shift laterally. For bolted connections in shear or tension, minimum 1-inch diameter A325 bolts were specified. All other connections were pin-type for brace frames or trusses. The structure's wide flange shapes are all ASTM A992 Grade 50, while the angles and channels are A36, and the HSS sections are ASTM A500 with a yield strength of 46 ksi.

The steel structure also accepts the loads of the building's east and west faces. That allows the ground-floor entrance to have a glass storefront with no interfering supports. Similarly, a ground-floor gallery space on the east side features a glass wall inviting visitors through to the rear of the space.

The shifting boxes create dramatic "floating corners," a flourish Nordenson credits to William LeMessurier, who devised a similar truss

ABOVE TOP TO BOTTOM Wide flanges, HSS, and gusset plates come together in a myriad of connections.



system for the 1977 Citicorp Center in Manhattan. “The whole idea is that you just wrap forces around the corners like wrapping a Christmas present,” Nordenson says. “We were just learning from the master.”

Much of the structural steel is exposed to view, including the floor assemblies of gallery spans, where 24-inch-deep composite beams are visible from the floor below. Diagonal truss sections peek from behind several windows. “The exposed steel very much fits with the attitude of the institution,” says Idenburg, referring to the New Museum’s former home in a SoHo loft building. Components are detailed down to the steel’s spray-on fireproofing, which took multiple rounds of mock-ups to satisfy the client. Intumescent paint, used to fireproof a portion of the exposed steel structure, received the same exacting review. Gensler specified A/D Firefilm, an intumescent paint produced by A/D Fire Protection Systems, which has a 3-hour rating.

Though the architects had considered an exposed concrete core to save space—combining structure and fireproofing in a compact volume—the expense of two separate contractors, one for concrete and one for cantilevered steel boxes, proved daunting. An all-steel structure also saved several months it would otherwise have taken to schedule and pour a concrete core. And that time savings paid off in other areas as well, giving the designers extra time and capital to invest in the carefully considered finishes that help make the New Museum a flagship for the future of the Bowery. Speaking about the steel structure, Burke-Yigeland says. “It allowed us to open up the box.” ■

ABOVE AND OPPOSITE The steel structure creates long open span spaces and cavernous volumes.

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NEW MUSEUM OF CONTEMPORARY ART

Owner: **New Museum of Contemporary Art** *New York, NY*
 Design Architect: **SANAA** *Tokyo, Japan*
 Architect of Record: **Gensler** *New York, NY*
 Structural Consultant: **SAPS/Sasaki and Partners** *Tokyo, Japan*
 Structural Engineers: **Guy Nordenson and Associates**
Structural Engineers LLP *New York, NY*;
Simpson Gumpertz & Heger, Inc. *New York, NY*
 Mechanical Engineer: **Arup** *New York, NY*
 Facade Consultant: **Simpson Gumpertz & Heger Inc.** *New York, NY*
 General Contractor: **Sciame** *New York, NY*
 Structural Steel Fabricator: **SteelCo./Metropolitan Steel Industries, Inc.** *Sinking Spring, PA*
 Structural Steel Erector: **Midlantic Erectors, Inc.** *Roselle, NJ*
 Miscellaneous Steel Fabricator and Erector: **P. I. I.** *Waterford, NY*
 Architectural Metal Fabricator and Erector: **Competition Architectural Metals** *Plainview, NY*
 Ornamental Metal Fabricator and Erector: **Competition Architectural Metals** *Plainview, NY*
 Metal Deck Erector: **A. C. Associates** *Lyndhurst, NJ*