





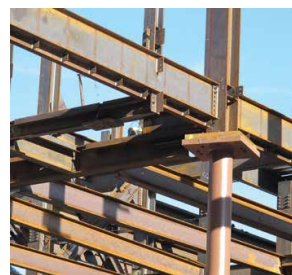
**Left top** Interior view of a west-facing gallery space.

**Left center and bottom** An 18,000-square-foot, column-free space is the largest open-plan museum gallery in New York City.

writers to a ship, the Whitney's steel-framed conglomerate of volumes and containers does look like it came into port from the Hudson River. Renzo Piano Building Workshop (RPBW), which worked in collaboration with Cooper Robertson, chose to hang the eight floors of galleries and supporting spaces off of the north and south sides of a massive, exposed precast concrete core containing elevators, circulation, bathrooms, and labs. The building's steel frame—part of the 28,000 tons of steel used in the building—is composed of hollow and solid columns, I-beams, and double tension cables fastened to cast stainless steel pressure plates designed by RPBW.

"The building is meant to be a little bit rough and tumble," says Nat Oppenheimer, executive vice president and a principal at Robert Silman Associates, which served as the structural engineering consultant. He added that Piano has called the Whitney "feral." "That's why there's so much metal involved. It's in the Meatpacking District, it's hugging the High Line," says Oppenheimer. At the same time, it's an incredibly refined building, with rigorous details and a strict adherence to a ten-foot grid.

The architects used the concrete spine as the dividing line in their plan and placed galleries to the south and offices and curatorial spaces to the north. Most of the façade—other than some floor-to-ceiling glass-walled galleries using a stick system and high-transparency, low-iron glass—is clad in 3½-foot-wide, ¾-inch-thick steel panels hung on an aluminum, unitized curtain wall system. In most places, the panels span the length of one floor, but on the south and west elevation where the façade of the upper galleries tilts inward, some of the panels are 66-foot-long (with meticulous welding so that seams are almost invisible). "They actually had to custom-make a suction cup machine to lift them up and tilt the panels. It was



**Clockwise from top** View from the lobby looking west before interior finish-out. The lobby under construction looking east. A detail of lobby cross-bracing. A column detail.

wild watching them put them on," says Christopher Payne, who is now a project architect for Gensler but was the exterior envelope job captain for Cooper Robertson's Whitney team.

Oppenheimer adds that creating steel panels of that length was a major feat, but curtain wall fabricator Joseph Gartner was up to the task. On the museum's eastern façade, an exterior staircase connects outdoor terraces on floors five through eight, providing spectacular birds-eye views of the High Line and allowing visitors to bypass the elevators or interior stair to circulate through the galleries. The external stair "was a main component of the design from the

outset," says Oppenheimer. Its metal grating mitigates ice in the winter, and potentially allows for year-round use.

The terraces extend the gallery space of the museum by allowing for large works of art to be anchored to the floor or suspended from 7-inch-thick precast concrete panels, some of which weigh more than 20,000 pounds. Cooper Robertson helped create a custom system of vertical and horizontal anchor points (they did so on portions of the west and north façades, too) for the installation of screens, canvases, or freestanding sculptures. The system is comprised of a dense pattern of stainless steel bolts providing attachment points in the façade panels, which can be tethered to or removed and replaced with eyehooks or other hardware. Additional local structural frame engineering from Silman accommodates the addition of a 600-pound pullout load.

On the terrace floors, to anchor art and prevent lifting during heavy winds, Cooper Robertson bolted a grid of cylinders typically used for yacht rigging to base plates, which in turn are fastened to the structure below. The cylinders sit flush with the roof surface, their screw mechanism allowing them to be raised as needed for anchoring. (Although inaccessible to visitors, Piano treated the museum's roof like a ninth exhibition space, celebrating five cooling towers by elevating them 14 feet and placing them on a galvanized, grated platform).

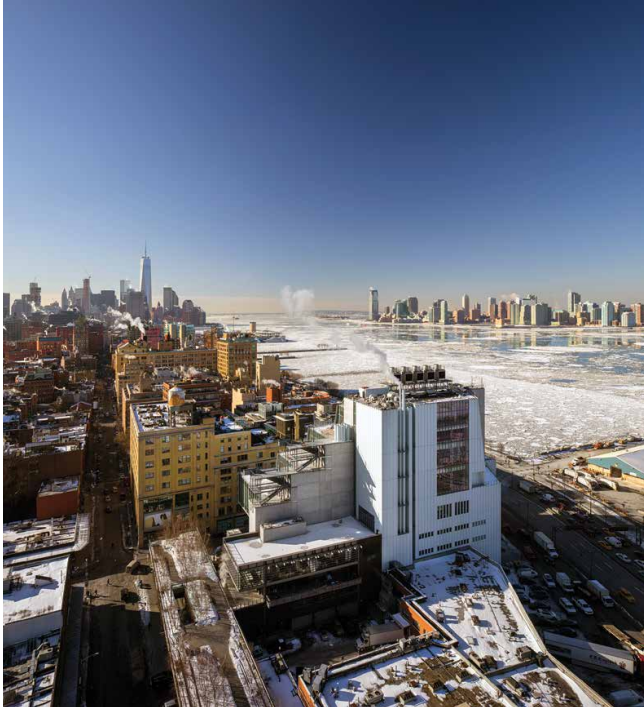
First encounters with the new Whitney begin in RPBW's glass-walled lobby on Gansevoort Street, with a restaurant, gift shop, and galleries open to the public and free of charge. Double-glazed window-walls are held in place by a tensioned cable system secured in the structural beams. Delicate columns inside the lobby and out are 15 inches thick. The ones

used inside are hollow structural sections (HSS). "They are solid on the outside because there are 2 million pounds of horizontal load, but the architects wanted to keep them slender," says Oppenheimer, referring to the fourth floor cantilever that extends over the plaza. Oppenheimer recalled that at a certain point, there was no column planned for that southeast corner. "These are pipes they use in nuclear power plants. They are not standard steel," he added.

To make their way to galleries or other spaces above, visitors have the option of riding the elevators, or climbing a delicate, suspended interior stair. The stair is supported off of brackets that extend from the steel structure through the precast concrete, and is hung on cold drawn carbon steel rods. The rods connect to springs in the basement to account for deflection on every floor. "We've done stairs like this where they are free, but we would

This page: Nic Lehoucq opening spread (photo: Nic Lehoucq, sketch: Renzo Piano ©RPBW)

This page, top: Nic Lehoucq; bottom row: Kevin Schom ©RPBW



**This page top** An aerial view of the museum taken in February 2015.

**This page above** The museum's north elevation, showing proximity to the Hudson River that necessitated planning for extreme weather.

**Facing** A view from Gansevoort Street into Untitled, a restaurant located in the museum's ground floor.



have had to use bigger, chunkier stringers," says Oppenheimer. Instead, the simple plate stringers were an aesthetic choice. "The intent was to keep the tread and the underside very clear."

Some of the Whitney's most extraordinary interior spaces are its column-less gallery floors, which run the length of the building. The fifth floor is the largest column-free gallery in a museum in all of New York, at 18,000 square feet. "With enough money and time, it can be accomplished," says Oppenheimer. "The concern, which was mitigated, was whether we'd have enough room to fit the structure and the mechanicals." The solutions took

two years to work out, he adds. "The original part was worked out in three months." The solution, in part, was to have big brace frames—trusses, really—on the office floors to pick up the load on the floors above.

The steel-framed gallery ceilings are rigged with custom yokes and wide-flange W5s, enabling curators to hang substantial loads from the gridded structure—up to 10,000 pounds from the meat of the beams.

On the Whitney's 8<sup>th</sup> floor, where visiting artists will hone their craft, serrated, north-facing skylights span between the ceiling beams and bring in daylight to enhance the apex of

the museum experience. The structural fins of the saw-tooth windows, developed by Heintges & Associates and Joseph Gartner, belie intricate detailing. "All these beams are coped like crazy to get ductwork in," says Oppenheimer.

Moving the Whitney downtown, to the edge of Chelsea's blocks of galleries and the Meatpacking District, and the start of the High Line's trail, is a strong statement about where the city's "cool" capital is currently clustered at its densest. Thankfully RPBW's museum is fastidious in its construction and design, making it a classic that can withstand the city's changing winds. □

Photo: Nic Lehoucq; drawing: GRPBW

Nic Lehoucq

#### WHITNEY MUSEUM OF AMERICAN ART

Location: 99 Gansevoort Street, New York, NY  
 Owner/Developer: Whitney Museum of American Art, New York, NY  
 Architect: Renzo Piano Building Workshop, New York, NY, in collaboration with Cooper Robertson, New York, NY  
 Structural Engineer: Robert Silman Associates, New York, NY  
 Mechanical Engineer: Jaros, Baum & Bolles, New York, NY  
 Construction Manager: Turner Construction, New York, NY  
 Curtain Wall Consultant: R.A. Heintges & Associates, New York, NY  
 Structural Steel Fabricator: Banker Steel Company, Lynchburg, VA  
 Structural Steel Erector: J.F. Stearns Co., Pembroke, MA  
 Miscellaneous Iron Fabricator and Erector: Post Road Iron Works, Greenwich, CT  
 Architectural and Ornamental Metal Fabricator and Erector: Jonathan Metal & Glass, Jamaica, NY  
 Curtain Wall Fabricator: Josef Gartner GmbH, Gundelfingen, Germany  
 Curtain Wall Erector: Tower Erectors, Windsor, CT