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PIERPONT MORGAN LIBRARY

Landmarked Complex Reconnected with Steel and Glass

When the Morgan Pierpont Library hired Italian architect Renzo Piano in 2000 to renovate and expand its facilities, it placed a complex and delicate task in his hands. Not only did his design have to accommodate storage vaults for the library's collections, a 299-person auditorium, a new public entrance, a temporary exhibit space, and a new reading room, while integrating the institution's existing buildings, but it had to do so in a manner that remained respectful of the fact that the buildings are all landmarked. These include the original collection's 1906 McKim, Mead & White neo-Renaissance quarters, a 1928 building called the Annex, and the Morgan House, a nineteenth-century townhouse in which Morgan's son once lived. It was by selecting structural steel, with its unique lightness and strength, that the architects were able to construct a delicate, airy enclosure that expands into the midst of the campus, deftly outlining the interstitial spaces between the original buildings and introducing a new character to the complex.

The central feature of Piano's design is a soaring, low-e glass- and steel-enclosed atrium that houses a new entrance on Madison Avenue and replaces Voorsanger & Mills Architects' 1991 garden court. The new "piazza" ties together all of the surrounding structures, its curtain wall coming within inches of their facades. For almost all of the structure, engineering firm Robert Silman Associates specified dual-certified ASTM A992 structural steel with a yield strength of 50 ksi. Providing primary support for the atrium is one of the piazza's most striking structural elements—a series of six 12-inch-by-12-inch, cruciform, exposed-steel columns, built up from four 1-inch angles with solid 1-inch plates in between that create a slight reveal. One of these columns, at 85 feet long, reaches three stories down to the third basement level and was fabricated in one piece to eleminate splices, traveling down from Toronto by a flatbed truck. Together, the six columns create a "table frame," over which the "table cloth" skylight of the atrium is draped.

Fifty feet above ground level, a diaphragm of built-up, 11-inch-deep purlins at 3-foot spacing act as an exoskeleton that supports the skylight. An exception to the ASTM A992 steel used elsewhere, the purlins are ASTM A36 steel at 36 ksi. The skylight itself is composed of several sandwiched layers, starting at the top with an aluminum grill—nicknamed the "flying carpet"—that doubles as a maintenance walkway. The grill's panels flip up allowing workers access to clean the 3-foot-square glass panels below. Beneath the glass are posts, and then square 2-inch-by-2-inch steel bars running east-west, with steel joists below them—3/4 inch thick by 11 inches wide, and spaced 3 feet apart—running north-south. Below this is a final layer of translucent woven fabric. The steel purlins and the 2-inch-by-2-inch bars create a "mesh" that braces the tall cruciform columns and helps resist wind loads on the glass facades. Meanwhile, the Madison building braces the skylight against wind loads.

Also helping to brace the skylight is the steel panel-clad "cube," a 20-foot cubic art gallery constructed of rectangular tube, which stands in the piazza. Supporting the cube are 10W112 wide flange steel columns, reinforced with 1-inch-thick plates

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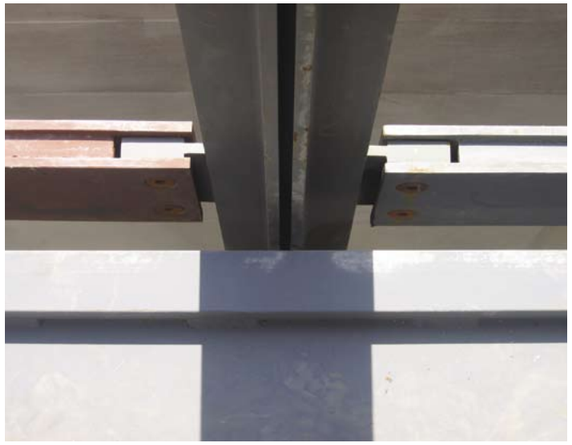
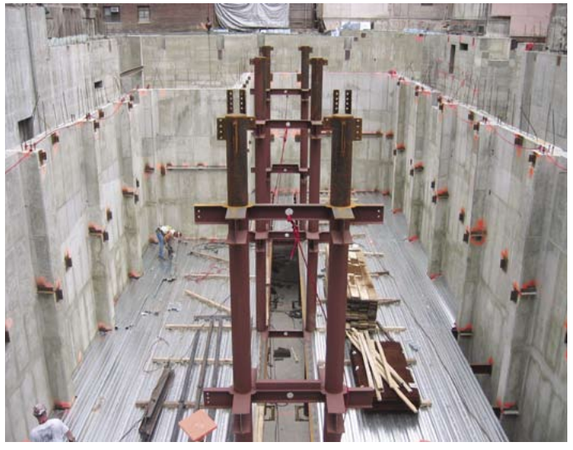
OPPOSITE The piazza's skylight hangs from steel cruciform columns, each fabricated in one piece to eliminate splices.

ABOVE 3/8-inch-thick steel panels, coated with intumescent paint, clad the southern elevation of the cube gallery.

The structural steel enclosure expands into the midst of the campus, deftly outlining the interstitial spaces between the original buildings.





OPPOSITE Steel framing above the vault braces the lobby floor.

TOP LEFT Cruciform column supporting the egress stair

TOP RIGHT Steel plates, cast into the shear wall, facilitated the quick erection of steel members.

ABOVE LEFT Moment connections to a gusset plate bracing the cube gallery

ABOVE RIGHT Nodes shop welded to circular columns in the vault allowed clean connections to wide flange members.

TOP A 6-foot-wide-by-30-foot-long section of skylight, prefabricated in Germany, is lowered onto supporting steel girders.

ABOVE A grid of steel posts, bars, and purlins create an exoskeleton that holds the glass.

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that are welded to the sides of the flanges. The cube is braced with 9-by-5-by-5/8-inch tubes, and its A36 plate steel cladding is coated with white intumescent fireproofing paint and finish coated with an off-white architectural paint to echo the stone facades of the existing buildings.

As with the cube, steel cladding on the piazza's Madison Avenue facade is configured in 6-foot modules, with 3/8-inch-thick panels and 3/4-inch-thick ribs. The curtain wall was fabricated in Germany and shipped to New York on barges in 6-foot pieces, which were then daisy-chained together and hung on site. Beside the main entrance, elegant steel egress stairs—encased in a wall of 2-hour fire-rated glazing and supported by fire-rated girders constructed of built-up plates—empty onto the street.

Despite all of the library's structural and programmatic additions, the street view of the historic exteriors remains largely undisturbed, thanks to Piano's strategy of digging down 50 feet into the Manhattan bedrock rather than building upward and dwarfing the existing buildings. "The pit," as project architect Robert Tse of executive architecture firm Beyer Blinder Belle, refers to it, "is like a fully waterproofed bath tub." With a 299-person auditorium at its uppermost levels, the pit also contains a storage vault comprising a three-story, 1-foot-thick concrete box, with 6-inch slab floors, 12W19 steel joists and 14W68 steel girders (both ASTM A992, 50 ksi), and 9-foot-6-inch-high exposed stainless steel columns made of 10-inch diameter pipe sections with 1 1/4-inch-thick walls, finish coated with intumescent paint.

While Piano's scheme allowed the Morgan to fit a demanding program into a tight space, none of it could have been done without the choice of exposed steel for the structure, relays engineer Scott Hughes of Robert Silman Associates. "At the beginning," he recounts, "steel was an [aesthetic] decision; Piano likes clean, thin lines and lightness." But the material—roughly 1,000 tons of which were used on the project—also made possible the long spans and cantilevers, and eased installation in the constricted site, where a crane picked pieces of steel into place "like a Tinker Toy kit," jokes Hughes. The end result achieves Piano's poetic vision, according to Hughes: "He wanted the building to look like a safe—stable, strong, and impenetrable." ■

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RIGHT Moment connections bond the cruciform columns to the girder beams, while the skylight is attached to this structure by way of adjustable clips.

PIERPONT MORGAN LIBRARY

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Executive Architect **Beyer Blinder Belle Architects and Planners, LLP** *New York, NY*
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