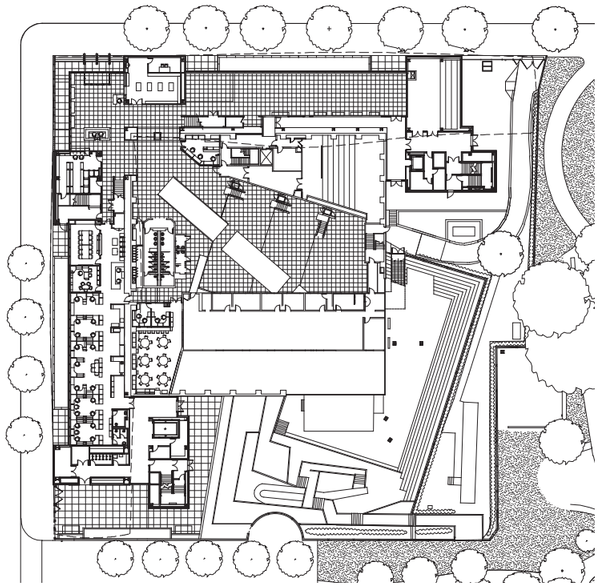
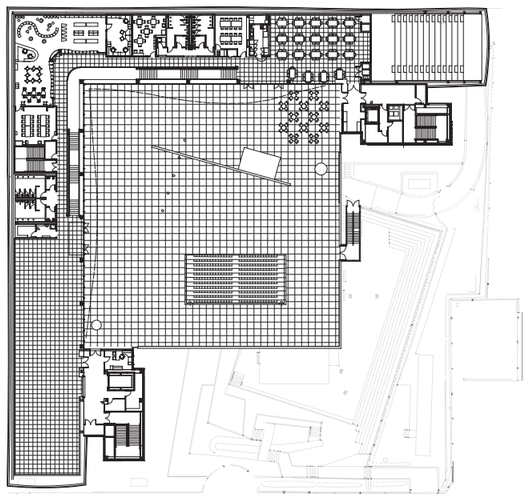




# BROOKLYN CHILDREN'S MUSEUM

## Lesson in Long Span Space

**Facing** These ground and second floor plans show how the addition wraps around the existing structure, creating a strong street presence.
**This Page** The "Big Bird yellow" facade announces that the building is for kids.

This and facing page: © Rafael Viñoly Architects PC

**Above** A truss on the second floor creates long column-less spans for unbroken windows along the facade.

**Passing under the deeply** cantilevered corner entrance of the Brooklyn Children's Museum, five-year-olds with a budding grasp of gravity might have their curiosity sparked: Hey, what holds the roof up? More than most institutions can claim, this museum's mission has been neatly embedded in its architecture, highlighted by its effortlessly floating daffodil-yellow facade that demonstrates the properties of structural steel.

Founded in 1899 as the world's first museum for kids, the Brooklyn Children's Museum has embarked upon a transformative project: a $46 million expansion and renovation that doubles its size to 102,000 square feet and boosts capacity from 250,000 to 400,000 visitors annually. Located on Brower Park in the Crown Heights section of Brooklyn, the museum had outgrown its 1977 home, designed by Hardy Holzman Pfeiffer Associates, and found it wanting in charisma for such an innovative institution. That structure, with only one of two stories above grade, was largely concealed from the street by planted earth berms, an energy conservation feature popular in the 1970s. "The existing building was concrete, and it was very mute," says Lee Washesky, project manager for Rafael Viñoly Architects. "Our goal was to reinstate the street presence. Using steel allowed us to create long truss spans and cantilevers that provided space for expansive glass openings along the street front, which appear inviting to the neighborhood."

With 38-foot cantilevers floating at the corner entrance, the new composition offers an elementary lesson in steel truss construction. Where berms once stood, a two-story, L-shaped structure now wraps around the north and west sides of the museum's existing building—almost like two intersecting bridges that meet at a cantilever. This new structure is clad in 8.1 million one-inch ceramic tiles that give the exterior walls an undulating appearance, pierced by playful porthole windows.

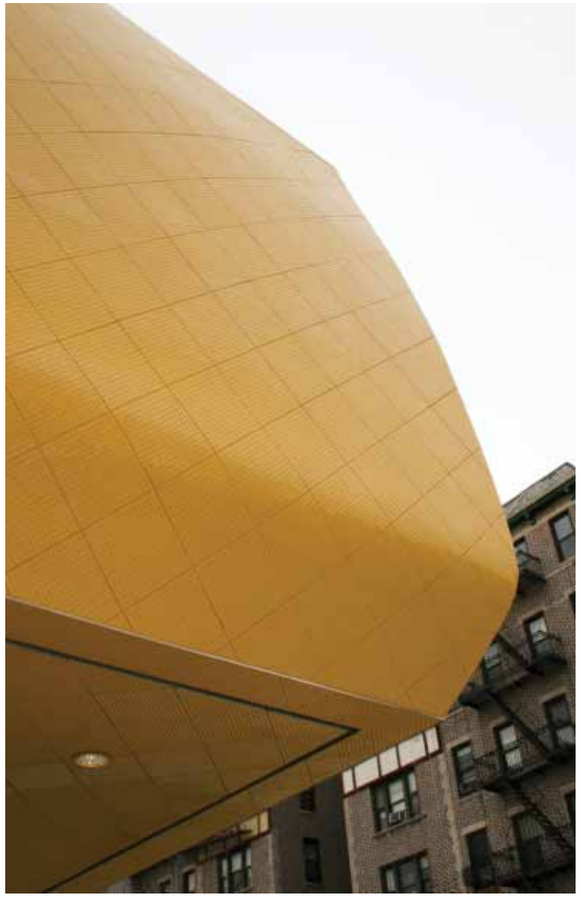
Tightly integrating the old and new volumes was a principal design challenge. "We wanted to get very close to the existing facility so they would act as one building, instead of two separate structures," explains Anton M. Nelson, associate at structural engineer Dewhurst Macfarlane and Partners. To site the new building close to the 1977 structure without impinging on its foundation, engineers designed two sets of trusses. On the inside walls of the new building, closest to the original structure, 120-foot-long trusses run along the first floor to provide a foundation-free span along most of the existing building. On the second floor, another set of 120-foot-long trusses runs along the outside of the building, providing abundant open gallery spaces. The second-floor truss also allows easy access to the original building's rooftop terrace, which formerly was accessible only via an external staircase. The sweeping space now offers a large outdoor venue for cultural performances and future exhibits, as well as outdoor seating adjacent to the museum's new café.

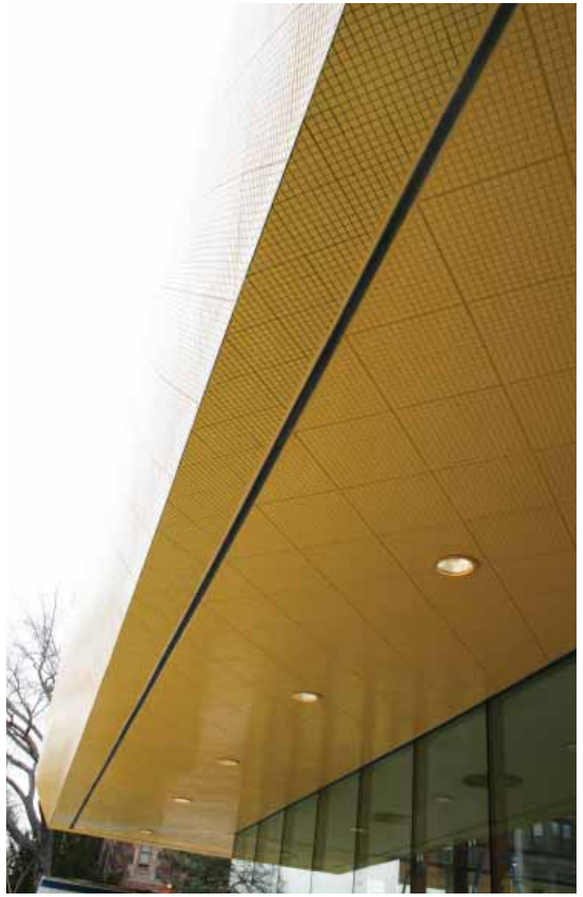
The full-story-height trusses are built of wide flange steel. The second floor trusses are made up of W14x90 cords and diagonals ranging between W14x61 and





**Above** The properties of structural steel allowed the designers to create dramatic open-span spaces and drastic cantilevers.





**Above** The floating, cantilevered corner makes for an inviting entry sequence.

W14x90. The first-floor trusses use similar sized diagonals, but heavier cords: One is composed of W14x120s, while the other uses a W14x159 top cord and a W14x145 bottom cord. The first-floor trusses are approximately 14 feet high, but due to the structure's arcing shape, the second-story trusses vary from approximately 11 feet in height at the cantilevered tips to a maximum of 26 feet at the center. Floor structures were typically built of W14x22, W16x26, or W18x35 members that intersect with larger W30x90s and W24x76s. The lightweight roof structure is built mainly of bar joists, except at locations where columns run through to the ground. Those spans are crossed by a curved W33x118 beam at column locations. These airy, upper-story spaces belie the structure's brawn. "It looks dainty and elegant," says Nelson. "When you have these great open spaces on the second floor, it hides the fact that these trusses get quite deep."

Most column and truss connections are bolted, with ⅞th-inch-diameter A490 bolts used for main truss joints, while the floor framing only needed smaller ¾-inch-diameter A325 bolts. Floor assemblies featured 2-inch, 18-gauge composite metal decks. The main structure used predominantly A572 Grade 50 steel.

The new spatial flexibility helps correct the original building's awkward circulation, which forced visitors to retrace their paths to the entrance. By contrast, the new structure offers corridors, staircases, and vertical circulation cores with several options for moving through the museum. In addition, the structure contains more than 15,000 square feet of new exhibition space, doubling the area for science and cultural exhibits. (The building is also set to be the first LEED-certified museum in New York City, earning a Silver rating from the U.S. Green Building Council.) Most dramatically on the ground floor, the structure allowed 90-foot clear spans along each principal street frontage, created by the second-story trusses above. These column-free expanses house office space and the museum's early-learning program, where descending pools of water invite preschoolers to explore shell structures and fill vessels while brushing up on their volume computations.

The next generation's engineers may well find a home under that bright, beacon-like roof, whose porcelain color, unofficially, is "Big Bird Yellow." "Many people underestimate the interest that children have in the architecture around them," says museum president Carol Enseki. "We're excited that this building looks like it's a building for kids." M





**Above** The building's form and color stand out among the brick and brownstone expanse of Brooklyn.

**"Using steel allowed us to create long truss spans and cantilevers that provided space for expansive glass openings along the street front."**

**Lee Washesky, project manager for Rafael Viñoly Architects**

**BROOKLYN CHILDREN'S MUSEUM**

Owner: **New York City Department of Design and Construction**, *New York, NY*
Architect: **Rafael Viñoly Architects PC**, *New York, NY*
Structural Engineer: **Dewhurst MacFarlane & Partners**, *New York, NY*
Mechanical Engineer: **ARUP**, *New York, NY*
Construction Manager: **Koch Skanska**, *Carteret, NJ*
Structural Steel Fabricators and Erectors:
**SteelCo./Metropolitan Steel Industries, Inc.**, *Sinking Spring, PA*
Miscellaneous Steel Fabricators: **Transcontinental Steel**, *Newark, NJ*
Architectural Metal Erectors: **W&W Glass Systems, Inc.**, *Nanuet, NY*
Ornamental Metal Fabricator and Erector: **Transcontinental Steel**, *Newark, NJ*
Curtain Wall Erector: **W&W Glass Systems, Inc.**, *Nanuet, NY*
Metal Deck Erector: **A.C. Associates**, *Lyndhurst, NJ*