

Marpillero Pollak Architects • Staten Island, New York

2012-08-28



The new "Meadow Structure" pavilion at the Staten Island Children's Museum, in Staten Island, New York was designed by Marpillero Pollak Architects. Photo: Courtesy Marpillero Pollak Architects

Visitors to the Staten Island Children's Museum, in Staten Island, New York, will learn about renewable energy from a new 2,200 square-foot tensile structure featuring a translucent, photovoltaic fabric roof. Designed by Marpillero Pollak Architects, the exterior pavilion (the Meadow Structure) uses thin photovoltaic strips affixed to its fabric cover to produce electricity.

A rooftop vertical-axis wind turbine also powers an exhibit inside the museum, and a skylight wind scoop passively ventilates the building's main stairwell.

The Meadow Structure's tensile roof combines photovoltaic film panels with a PTFE-coated fiberglass membrane, both fabricated by Birdair, Inc. Electricity generated by the photovoltaic film is sufficient to illuminate the pavilion for nighttime events.



The "Meadow Structure" pavilion features a tensile fabric roof with photovoltaic film attached to its upper side. Photo: Courtesy Marpillero Pollak Architects

The structure's main (northern) segment is a fanfold plate formed into shallow ridges and valleys. Electrical wiring for the panels is threaded through the structure's hollow steel supports. During storms, the canopy's ridges direct rainwater through strategically placed funnels, creating miniature waterfalls around the structure, which enter the ground through circular/oval dry wells.

"One challenge of this project was to balance the lightness, strength, and aesthetics of the structure with the need to maximize sun exposure for the photovoltaic panels," said Weidlinger Project Manager Gregory Freeman. To achieve this, Weidlinger engineers worked with the architect to shape the roof, originally designed with only small portions facing the sun, into a slightly flatter contour, accommodating the resultant loss of structural efficiency by using heavier steel beams.

Another structural challenge was to anchor the structure's roofing cables around its massive concrete foundation without causing damage to the roots of adjacent trees. Weidlinger engineers addressed this challenge by minimizing the width and maximizing the depth of the excavation.



A vertical wind turbine replaced an existing skylight of the Staten Island Children's Museum building. Photo: Courtesy Marpillero Pollak Architects

In addition to the construction of the new pavilion, an existing skylight over the museum's elevator was replaced with a lightweight vertical-axis wind turbine, which powers an exhibit demonstrating how wind and sun can be used as sources of energy. The turbine is virtually silent, safe for birds, and can begin energy production in winds as light as two to three meters per second (miles per hour) in any direction. Weidlinger engineers designed the installation, for which the age and composition of the 1930s building, as well as the dynamics of the turbine itself, presented structural challenges.



A second skylight was retrofitted with a skylight windscoop that provides ventilation as well as daylight.

Photo: Courtesy Marpillero Pollak Architects

A second existing skylight was also replaced with a new wind-scoop skylight, comprising a rotating cowl and a colorful, translucent rotating drum that uses stack-effect air circulation to passively ventilate the building. The drum extends down into the museum, providing an animated display that indicates the direction of the wind. Weidlinger engineers also designed a viewing platform and descriptive signage for the exhibit.

Data from all three structures are transmitted to an interactive display that teaches museumgoers about energy consumption and conservation.