Thirty-foot-tall ribbed, precast concrete panels attach to the exterior of the interior building enclosure. Unlike a traditional brick wall with masonry ties puncturing the air and vapor barrier every 18 inches, this uninterrupted rain screen is free of thermal breaks.

P.S. 62

Officially named the Kathleen Grimm School for Leadership and Sustainability at Sandy Ground, the steel-framed, precast panel-clad P.S. 62 is the first net-zero-energy school in New York City and one of the first of its kind worldwide.

IN OCTOBER, THE NONPROFIT New Buildings Institute released its 2016 List of Net Zero Buildings in North America, which showed a whopping 74 percent increase from 2015 of buildings that have either achieved or committed to the goal of producing as much renewable energy onsite as they consume in a year (from 191 to 332 buildings).

As more cities and states take on stringent energy codes, zero energy buildings are becoming an increasingly popular way for homeowners, businesses, and municipalities to lower environmental impacts, improve energy security, and buffer their resilience against power outages and natural disasters.

New York City is no exception to these trends. With the city's 1,600 public schools representing 37 percent of municipal greenhouse gas emissions, it made sense to test out a zero energy strategy, which is what the New York City School Construction Authority (SCA) did when it built the Kathleen Grimm School for Leadership and Sustainability at Sandy Ground, on Staten Island. Located on an L-shaped, 3.5-acre site in a residential neighborhood, the school is named after its location, Sandy Ground, home to one of the nation's oldest surviving communities established by free blacks.

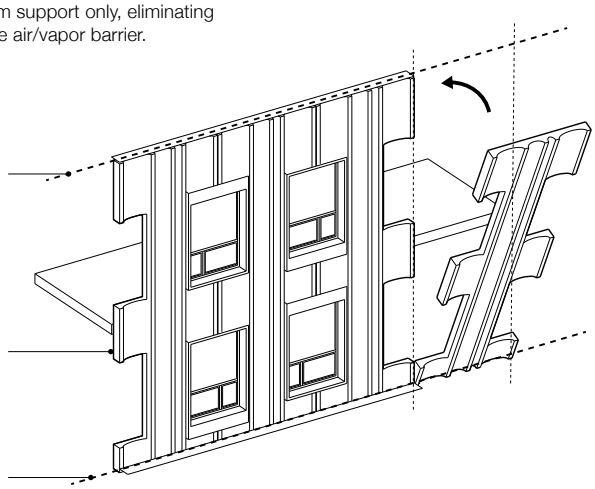
Designed by Skidmore, Owings & Merrill (SOM), the 38,000-square-foot, two-story school serves around 450 students from pre-kindergarten through fifth grade and is the first in the city—and one of the first worldwide—designed to achieve zero-net-energy. SOM, which won the SCA's invited competition, was asked to deviate from the authority's design standards. "It's a very small school, but this was the SCA's opportunity to experiment," says Jon Cicconi, SOM's senior design architect on the project. "They called it their 'lab.'" A team will meet for three years to review the building's performance and incorporate lessons learned into the SCA's guidelines.

This was also a first-of-its-kind challenge for SOM, whose designers couldn't have come up with a scheme for the building without help from sustainability and net zero consultants In:Posse and

structural engineer Disimone. To begin, the team had to maximize daylight and passive energy strategies while also creating a highly efficient thermal envelope. This led to the school's rectangular shape, with an interior courtyard. A steel-frame structure allowed efficient design of several double-height and long-span spaces that let daylight into the space. The typical steel dimensions within the structure are ASTM A992 (Fy = 50ksi) W18x35 shapes. All of the academic spaces are oriented to the north and south, where 30 percent of the façades are glazed, as opposed to the service spaces that are oriented to the east and west and are only 7 percent glazed.

But, most striking to any visitor to P.S. 62, as the school is also known, is the 1,600 panel photovoltaic array that—like a cresting wave—begins on the south façade, where PVs are angled 70 degrees, and flows over the roof to cantilever roughly 50 feet over the north façade, shading part of a running track. (The PVs were needed, in part, because the school wanted to be able to use the building at night and in the summer, doubling its energy use, says Cicconi. With the PVs, the team was able to reduce energy use by 50 percent per square foot. Energy modeling shows that the array produces 658,000 kwh annu-

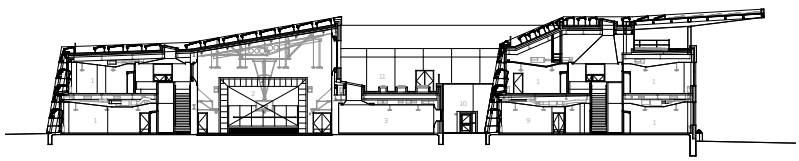
Above In order to take advantage of passive methods of energy savings, the architects shaped the interiors around daylighting, painting walls white and sloping the ceilings to amplify skylights and clerestories.
Below A diagram of precast façade panels with a 30-foot vertical span and top and bottom support only, eliminating puncture of the air/vapor barrier.



Photos this spread and opening spread: James Ewing; diagram: SOM

The cantilevered roof shades punched windows in the north-facing façade and part of the running track.

Right Sixteen hundred photovoltaic panels—treated as a single panel and spaced tightly together—wrap the south façade and the roof of the school, generating energy and simultaneously reducing the school's energy consumption.
Below A north–south section of the school.



ally, which is much more than the school consumes. Another 400 panels cloak a parking lot.

For P.S. 62's façade, SOM needed to conceive a much tighter envelope than typical brick masonry because masonry ties puncture the thermal barrier every 18 inches. Instead, the team conceived an efficient window wall system with a precast concrete rainscreen composed of 30-foot-tall ribbed panels; from footer to roof, nothing punctures the air and vapor barrier. The pre-cast panels are notched to sit around the triple-glazed windows.

Figuring out how the façade and structural steel system would be constructed was a major challenge in such an uber-sustainable project, says Desimone's Natalie Bazile, the project engineer: "Because this was a green project and there were a lot of systems that needed to be tested in different stages, we decided to fully install part of the façade to test for leaks." Doing so led the team to realize that they had to create a secondary structural system. "Because we closed out the interior first, we had to come up with the system that didn't rely on using the beams and columns that were already there." This separate system, made of custom box girders approximately 3 feet deep with typically HSS14x6 beams framing in between the girders, supports the PVs and allows for easy removal and replacement without disturbing the roof or building envelope. Where the PV array cantilevers, Bazile says the team tapered the girders for a more elegant wing-like aesthetic. "It's a heavily stressed member, so we wanted to eliminate the excess steel that isn't contributing to the support," she says.

Inside, SOM kept finishes bright and white, for the most part. "It really is a sublime interior space," says Cicconi. The architects placed classrooms along the building's south and north perimeters, and brought in daylight with clerestories and lower lines of ribbon windows, or large windows to the north. Classrooms also have glazing facing the double-height, offset corridors, and benefit from skylights and reflective ceiling panels. In the double-height gym, Bazile designed streamlined steel trusses. "We tried to not to waste anything, and make things as simple and straightforward as possible," she says. Indeed, 15 percent of the school's materials are from recycled content.

Other sustainable measures include a solar thermal hot water system, geothermal wells, and energy-recovery ventilators that pre-treat the air. Permeable

Photo: Stark Video Inc.; drawing: SOM

unit pavers for the parking lot, roads, and sidewalks allow for stormwater infiltration and retention tanks release it slowly back into the ground. A custom "Building Dashboard" provides real-time feedback on the building's energy use, providing moments to use the building as a teaching tool. And energy hogs like printers and kitchen appliances are grouped in staff workrooms, eliminating the need for teachers to each have their own.

P.S. 62 is also named after Kathleen Grimm, a deputy chancellor of New York City schools who died of cancer at 68 in 2015. She was known as smart and demanding, and a champion of students. She would probably be proud to be associated with an innovative building that serves as a testing ground to improve the design and construction of future New York City schools.

P.S. 62

Location: **644 Bloomingdale Road, Staten Island, NY**
Owner: **New York City School Construction Authority**
Architect: **Skidmore, Owings & Merrill**, *New York, NY*
Structural Engineer: **Desimone Consulting Engineers**, *New York, NY*
Mechanical Engineer: **AKF Group**, *New York, NY*
General Contractor: **Leon D. DeMatteis Construction Corporation**, *Elmont, NY*
Curtain Wall Consultant (Commissioning Agent): **Heintges & Associates**, *New York, NY*
Curtain Wall Erector: **Jordan Panel Systems Corp.**, *East Northport, NY*