



## Tankhouse and SO-IL develop sustainable luxury residence

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Brooklyn, NY The 450 Warren St. condominium building delivers integrative indoor/outdoor living. From the curved-glass shared entry into the planted central atrium and two open-air courtyards, to the open mesh-wrapped and curved concrete walkways on five levels, 450 Warren St. is one of the only luxury residences where sunlight and rainfall are welcomed by design.

Completed in 2022, 450 Warren St. marks a collaboration between developer Tankhouse and architecture firm SO-IL to create a living space that combines privacy and outdoor space in a densely built urban environment. The team achieved design, lifestyle, and sustainability with innovative building materials and energy-saving components such as insulated oversized windows and glass doors for increased daylighting, passive irrigation of common area gardens using rainwater, a thermally broken masonry support system, controlled water storage for flat roofs, and structural thermal breaks at balconies and along the elevated walkways to prevent heat transfer through concrete slabs.

Sandwiched between tight-knit row houses and a large housing project, the five-story, 18-unit 450 Warren St. building provides 52,479 s/f of residential space as well as some 4,000 s/f of ground-floor retail space. The building also offers indoor amenities including a package room, gym, dog wash station, co-working lounge, courtyard tables and seating, as well as some on-site parking.

Each unit has a minimum of two private and semi-private balconies, or at the top level, terraces. According to Tankhouse co-founder Sam Alison-Mayne, the abundant outdoor space in each unit “allows people to live in a different way along sustainability principles.” Designed to adhere to Zone Green, a New York City initiative to reduce carbon emissions by 30% by the year 2030, the multiple orientations of each unit help reduce energy use by maximizing natural light and allowing cross-ventilation to reduce the need for air conditioning.

Structural thermal breaks for energy efficient living:

Project structural engineer Jason Tipold of Silman Associates credits the advanced design for its distinctiveness as well as its challenges. “You’re erecting two different building units connected by walkways that bring them together. So, you’re balancing these systems as independent structures to be tied together. The thermal breaks are a huge part of that, as they connect the walkways to the apartment units on all five levels.”

Tipold explains that the team worked closely with Schöck North America, manufacturer of the structural thermal breaks. “We provided Schöck with the forces that the thermal breaks needed to resist and they specified which model works best. We used a variety of them at 450 Warren Street.”

Isokorb concrete-to-concrete structural thermal breaks consist of an insulation module penetrated by stainless steel rebar that is tied into the slab or wall reinforcement adjacent to the thermal break before concrete is poured conventionally. The stainless steel tension and shear force bars provide structural strength when tied to the rebar of the interior and exterior slabs.

According to the manufacturer, the thermal breaks reduce heat loss at balcony and similar penetrations by up to 88%, while eliminating the risk of condensation forming on adjacent interior surfaces leading to mold growth.

Using 11 different concrete-to-concrete thermal breaks on the project, KSK Construction Principal Ulgur Aydin estimates that his team installed approximately 1,000 linear feet (305 m) of them at the terraces, walkways and recessed balconies. The various modules thermally break the connections between balconies and interior slabs, while transferring bending moments and shear forces to provide the required structural resistance to support the exterior structure.

Aydin says that the 4,000 s/f of open-air elevated walkways held the greater challenge for installing the thermal breaks.

Thermally broken walkways facilitate design

While 8 in. concrete floor slabs remained uniform throughout the building floors, the concrete walkways varied between 9 in. and 11 in. thick, as they curve and pitch. As Tipold explained, thermal breaks provided the connection between the walkways and the two condominium structures. “The walkways are supported by the thermal breaks and rebar,” Aydin adds.

SO-IL architect Fabian Puller cites the unique walkway design with facilitating neighborly connection, as the bridges and pathways replace more segregating conventional indoor hallways and corridors. Puller credits thermal breaks for helping to make the design possible. “The thermal breaks gave us great freedom with the design intent and made things much easier. We use Schöck thermal breaks in our other Tankhouse projects as well.” But the walkways also presented construction challenges, as several elements had to be orchestrated sequentially and temporally. The thermal breaks were designed to integrate with these requirements.

First, Aydin and his team installed the thermal breaks. Next, they put in place the snowmelt system—required because the walkways are partially exposed to the elements—immediately before the concrete pour. Then, they added a retarder to the cement to delay immediate curing, allowing time to low-pressure power wash the concrete to create an “aged look.”

In addition, because the walkways have no walls, the designers deployed a floor-to-ceiling metal mesh enclosure for safety. Used in playgrounds and parks in New York City, the special metal mesh proved an innovative design and safety element. In addition to making the unique walkways safe, the mesh amplifies the indoor/outdoor fun of the design, bringing the open outdoors into the building.

#### Insulation from roof to façade

Designed to give the façade a “sleek and modern appearance,” over 50,000 CMU-sized concrete blocks, made in Turkey, clad the building’s exterior supported by a thermally broken shelf angle masonry system. “The insulation behind these thermal brackets remains continuous, providing a much better seal,” Aydin says.

The blocks required careful placement of the windows. Aydin explains, “We had to fine tune the openings because the windows—which were installed later—were right behind the stone. They had to be put in exactly the right place.”

Addressing traditional thermal weak spots—windows and doors—the team chose openable single-pane thermal insulation glass windows (R-4) that reflect heat back into the room, reducing the negative effects of cold outside temperatures. KSK’s Aydin adds, “That was good in terms of not having a stationary window with an extra mullion.”

The residential rooftops have been bolstered with 8 in. (203 mm) thick insulation. Aydin notes that the second-floor green roof with native plantings employs a controlled water storage system that stores rainwater to dispose or use later.

## Thermal breaks key to design and execution

The design and construction team went to great lengths to create a unique residence in the heart of a demanding Brooklyn neighborhood and market. By virtually every measure, they succeeded. But one element stands out as key to enabling those efforts. “Thermal breaks are probably the most important component in the structure,” explains Tipold. “In 2014, the New York City building code changed, requiring higher performing building envelopes. Before that change, a building like this would probably not have used thermal breaks, but the overall outcome is much better now that we use them.”

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