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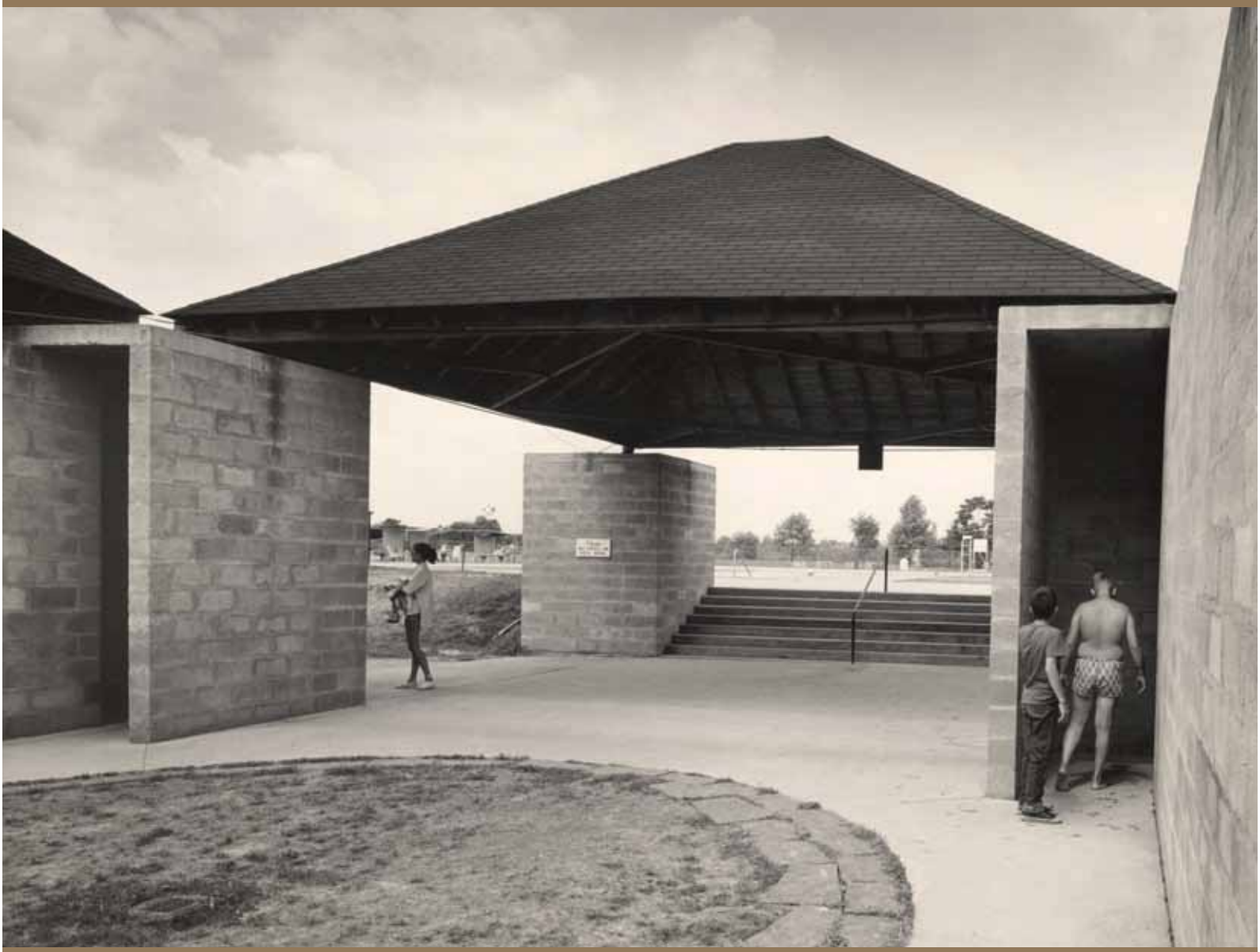
CMU HISTORIC PRESERVATION

Kahn Bathhouse



After a swim, 1955's Jewish Community Center members pass the structure's variegated block walls to enter its tranquil changing-rooms. Today, as the Ewing County Center for Seniors & Youth, it's a rare example of a restored landmark that still serves its original function.

WHO'D HAVE GUESSED THAT A TINY, DECREPIT CMU BUILDING NEAR TRENTON, NJ, WHERE SWIMMERS AT AN OLD DAY CAMP USED TO CHANGE THEIR CLOTHES, WOULD TURN OUT TO BE AN ARCHITECTURAL TREASURE?

Practically nobody, of course. Which may be why this starkly simple structure—designed by the late Louis Kahn, the subject of an Oscar-nominated documentary film, "My Architect"—was about to be demolished and replaced by high-density housing.

Built in 1955 as part of a Jewish Community Center, the Bath House marked the point at which Kahn turned away, forever, from trendy steel-and-glass buildings and toward more earthy, serene designs. Now the Jewish Community Center had decided to move to a new location, and its property was being eyed by developers in this heavily built-up region of New Jersey.

At first glance, the sturdy, unadorned Bath House might be a mini-temple dug up by an archaeologist. Just one story high, occupying less than 1/6th of an acre (0.07 hectare), it has no doors—just cleverly baffled doorways—and no windows, electricity, or heat. Its rough-surfaced block was ground from Delaware River rock that Philadelphia architecture critic Inga Saffron described as "the color of wet cardboard" (and she's an admirer!). But once you enter through the half-hidden doorway, you begin to sense Kahn's genius.

Built in the form of a Greek cross, the Bath House is composed of four equal-sized outer cubes (two changing-rooms, a storage room, and a covered porch facing the nearby Olympic-sized pool) with pyramidal roofs, all of which surround a central courtyard that's open to the sky. The roofs of the outer cubes "float" above their walls, leaving an open space that admits soft, indirect sunlight, and lets outside air flow freely through the building.

In a unique touch that also appears in Kahn's later works, all corner pillars are hollow and accessible. He called them "servant spaces." Some serve as baffled entries to the changing-rooms, others as closets or toilets. No space is wasted.

Inside, the Bath House is almost ethereal in its mood: quiet, calming, and infused with a gentle, flattering glow. By the mid-1990s, though, Kahn's Bath House was crumbling. A half-century of rain and snow, soaking the bare, unflashed block beneath the raised roofs, had caused serious damage. Inch-thick (25 mm) algae coated some walls, while cracks ran down their full height. The foundation-slabs were heaved and cracked. The mortar, which Kahn had directed his masons to apply in an oddly slap-dash fashion ("as if it had been applied straight from the tube," quipped Inga Saffron), was crumbling.

ARCHITECT
Farewell Mills Gatsch Architects LLC, Princeton, NJ
GENERAL CONTRACTOR
Wu Associates Inc., Cherry Hill, NJ
MASONRY CONTRACTOR
Jamison Masonry Restoration LLC, Oreland, PA
CMU PRODUCER
Clayton Concrete, Block & Sand Company, Lakewood, NJ.
MASONRY ACCESSORY SUPPLIER
Mortar Net USA, LLC, Burns Harbor, IN

Correcting Kahn's flashing omission with hidden 2010 technology, one of Cavalieri's masons grouts the flashing system into place.

Michael Mills, a partner in Farewell Mills Gatsch Architects LLC—an award-winning Princeton, NJ, firm—had run across the quirky Bath House 30 years before, while studying architecture at nearby Princeton University. "I didn't 'get' the building, back then," he laughs. But now, as a preservation expert and president of Preservation New Jersey (a statewide non-profit), he knew it was worth rescuing.

Donna M. Lewis, the visionary Mercer County, NJ, Planning Director, agreed, backed by County Executive Brian Hughes. They wanted to save the property as a much-needed recreational destination for the seniors and youth of Ewing Township, where the site is located. That would mean also repairing or replacing the pavilions of an old Day Camp, and constructing a new pavilion and snack-bar—adjacent to the Bath House—which had been proposed in Kahn's plan but never built.

These advocates all drew inspiration from Susan Solomon, a Princeton resident who had helped get the property placed on the National Register of Historic Places. In fact, Solomon literally wrote the book on it, titled "Louis I. Kahn's Trenton Jewish Community Center." The Bath House, she wrote, was "where Kahn established connections between structure and light."

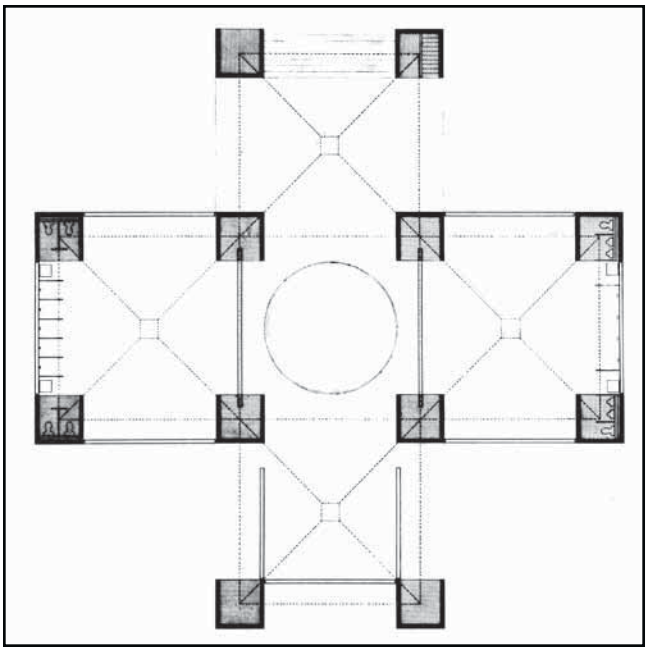
Then began a long and arduous trip through the money-maze. "Since one part of the $2.1-million project was historic preservation and the other was new construction," Mills recalls, "each needed separate funding sources." He managed to win a grant for restoring Kahn's original Bath House and Day Camp Pavilions, while Lewis sought funding to buy the land (another $8 million-plus) and to pay for constructing the new pavilion and snack-bar.

By the time the complicated financing was patched together, part of the team would technically be working for one funding-source and part for another. But the project could proceed. *Since none of the other portions of this project involved CMU restoration, the remainder of this article will focus exclusively on the Bath House.*

Wu Associates Inc., of nearby Cherry Hill, NJ—specialists in historical restoration—became General Contractor for this part of the project. Robert Rudolph would serve as its Project Manager. The masonry contractor was Jamison Masonry Restoration LLC, based in Oreland, PA, which also has a long record of historic restoration. John Cavalieri—the product of at least five generations of masons—was chosen to estimate and manage the masonry job.

In writing the property's Preservation Plan, Michael Mills needed to understand Kahn's original intentions and how the architect, who died in 1974, might have handled certain decisions now facing Mills. Luckily, Mills was able to interview two of Kahn's most influential advisers from that time. One of those sources was Anne Tyng, an artist who had been Kahn's longtime mistress and protege. Mills recalls her insights as being frank, witty, and supportive. She told him, "Louis would want you to do it your own way, rather than trying to fake his work." The other was Nick Gianopulos, a founding principal of Philadelphia's prestigious Keast & Hood Co. Gianopulos had been the structural engineer on Kahn's later projects. He was equally encouraging: "These were purpose-built buildings," he said, "and Louis would understand if you had to fix them." Gianopulos agreed to consult on the Bath House's engineering.

Armed with their advice—and blessings—Mills could design the restoration to meet modern building standards and prevent future deterioration, but without compromising Kahn's original vision. "The goal of preservationists," Mills says, "is to employ modern technology, but keep it invisible." As in all restoration projects, the teammembers couldn't be 100% certain what they were facing



This image shows the Bath House's classic "Greek cross" design. In two places, the edges of the suspended roofs are flush with the devising walls beneath them. Kahn envisioned rainwater pouring romantically down the unsealed, unflashed walls. It did—leading to premature wall-failure.

until they tore things apart. To get a better look, Cavalieri cleaned the walls with a pressure-washer, calibrating the pressure and the chemicals to eliminate the algae buildup without harming the wall-surfaces. "Our mockups were extensive," he recalls. "We debated which walls to demolish, which to patch, which joints to cut out, and a thousand other details."

Two 28 foot (8.53 m) long demising walls, located where rain-water had poured directly onto them from the gutterless roofs—perhaps to let it run down the exterior in a "poetic" manner—were in dreadful shape. The top course of block had crumbled, and the walls were cracked from top to bottom.. "Those two walls were painful," Cavalieri recalls. "Try as we might, very little of the original block could be salvaged." The walls would be demolished and rebuilt using reproduced block. Salvageable units would be used as patchwork in other walls.

Rudolph tackled the challenge of reproducing the original block: "After about six attempts—using several color-matching techniques and different types of block—we settled on a lightweight block, similar to what Kahn had used, adding a Delaware River rock aggregate into the mix as Kahn had done. Then we colored it so it would match his tones throughout." This time, the block was also given a clear, water-repellent coating.

Samples were taken of the mortar and sent away for laboratory analysis, to help duplicate its color and texture.

With the mortar under control, Cavalieri had to teach his masons how to apply it in Kahn's peculiar fashion. Kahn's wide joints, though struck flush, were smeared and brushed over the edge, onto the block itself. "Copying it took some practice," Cavalieri recalls wryly, "because these were craftsmen who had spent their lives making clean, consistent joints." (As Robert Rudolph later remarked with a chuckle, "John trained them great! But they may have to be un-trained before their next job!")

Since water had caused the Bath House's downfall, Michael Mills specified a couple of technologically advanced products (invisible, of course) to address those moisture-control problems. At the bases of the walls exposed to roof-runoff, Mills used a uniquely engineered proprietary flashing system. It consists of tough, lightweight "flashing pans" that are laid atop the first above-grade course of CMU and grouted into place. They intercept the water as it runs down the CMU's cores and expel it through integrated, unobtrusive drainage spouts. To capture mortar droppings, proprietary feather-light

mesh squares can be swiftly inserted into the cores of the next course of CMU, replacing awkward pea-gravel.

Mills also specified a high-tech thermoplastic coating to be applied to the tops of the columns supporting the roofs and on the tops of the demising walls that were directly under the drip-lines of the roofs. "Again, the modern technology is completely hidden," Mills says, "but it will prolong the building's life."

Mills planned the project's logistics like a military campaign. Still, as the demolition proceeded, the team hit its first—and only—major setback. "We knew we'd have to replace the warped and buckled concrete slabs beneath the building," Rudolph recalls. "But we thought that was just because they had been laid directly onto the ground. Once the slabs were removed, though, we saw the problem was far more serious—it was the high water-table!" The land is just a few yards above sea-level, and the Delaware River flows nearby. Work was halted while engineers put their heads together. After extensive analysis, they decided to undercut the soil then drill two wells to give the ground-water an escape route. A geotextile filter fabric was installed, and a more stable type of crushed rock was put down where the new slabs would be laid. New storm and drain trenches were also dug.

It took several weeks for the wells and trenches to be dug and covered by a new foundation. Afterward, Robert Rudolph observed, "Now when you walk through the building it looks 100% historical, but beneath your feet are some very creative ways of dealing with what Mother Nature threw at us." (Ironically, Susan Solomon's book says that Kahn "tried to create a synthesis between the wonder of nature and the ability of humans to control it.")

Making the building conform to today's ADA requirements turned out to be relatively easy: the doorways and bathroom stalls were spacious enough to accommodate a wheelchair. Not much was needed except some grab-bars and outdoor ramps.

The corner-supports that held the raised roofs were strengthened. A gutter—connected into the building's drainage-system—was carefully concealed along the tops of the demising walls, to capture and divert the rainwater that had previously inundated the top courses of block. In building the new demising walls and replacing the unsalvageable units in the other walls, Cavalieri's masons used about 1,000 of the reproduced block-units.

When they had laid the final course of block—slathering the mortar as if they were making a peanut-butter sandwich, and feathering each joint lightly, as per the eccentric Louis Kahn—their work was indistinguishable from the original. "Looking at it today," Rudolph says, "you can't tell the repro block from the original."

Back in 1955, Kahn worked in near-anonymity (the Bath House was his first independent project). "I discovered myself after designing that little concrete block bathhouse in Trenton," he recalled a few years before his death in 1974.

In 2010, though, Mills and his team had a huge audience looking over their shoulders. He lists some of them: "Grantors, grantees, the county, the township, many contractors, the architectural community—locally, nationally, and even internationally. There was also a great interest in Kahn among people who had seen the documentary. They were all watching our progress and our design decisions. It can be a tough crowd!" Then Mills says with a smile, "They seem generally happy with it." Inspecting the finished walls, masonry contractor John Cavalieri expresses the pride of a preservationist: "You'd never even know we were there." **CMD**

Images on pages 10, 12, and 13 from the Louis I. Kahn Collection, The University of Pennsylvania and the Pennsylvania Historical and Museum Commission

Typical Reinforcement for High Wind Areas

High winds subject buildings to large horizontal forces as well as to significant uplift. The critical damage to buildings in such events typically occurs due to uplift on the roof. Reinforced concrete masonry is well suited to resist these loads due to its relatively large mass available to resist the large uplift and overturning forces. Additionally, the grout and reinforcing steel tie the walls into a strong, cohesive unit minimizing the number of connectors needed and reducing the margin for error, as a structure is only as strong as its weakest link.

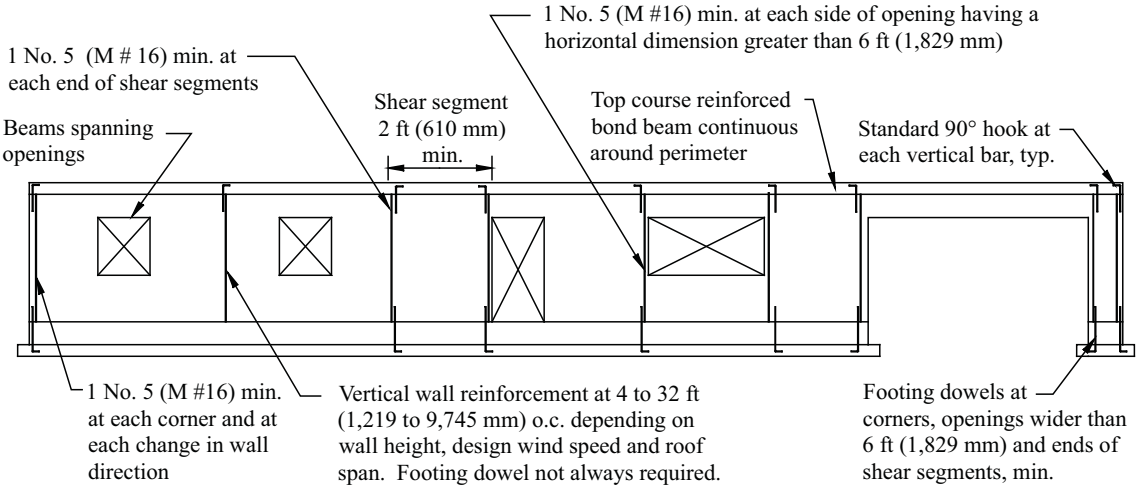
As with seismic design, connections between individual building elements—roof, walls, floors and foundation—are critical to maintaining structural continuity during a high wind event.

A primary goal for buildings subjected to high winds is to maintain a continuous load path from the roof to the foundation. This allows wind uplift forces on the roof to be safely distributed through the walls to the foundation, where they are dissipated into the ground. If one part of the load path fails, or is discontinuous, building failure may occur.

Proper detailing and installation of mechanical connectors is necessary for maintaining continuous load paths. Note that in order for connectors to provide their rated load capacity, they must be installed according to the manufacturer's specifications. In coastal areas, corrosion protection of the connectors is especially important due to the corrosive environment.

In addition, a continuously reinforced bond beam around the entire perimeter of the building with vertical reinforcement at strategic locations in the wall is needed to resist design loads. See the figure for recommended minimum amount of reinforcement.

More information can be found in TEK 5-11 Residential Details for High Wind Areas. TEK 5-11 and all other 140+ TEK are available free on line at NCMA member web sites sponsoring e-TEK. For a listing of sponsoring members and a link to their e-TEK sites go to www.ncma.org. **CMD**



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