Fixing Wright's Wrongs

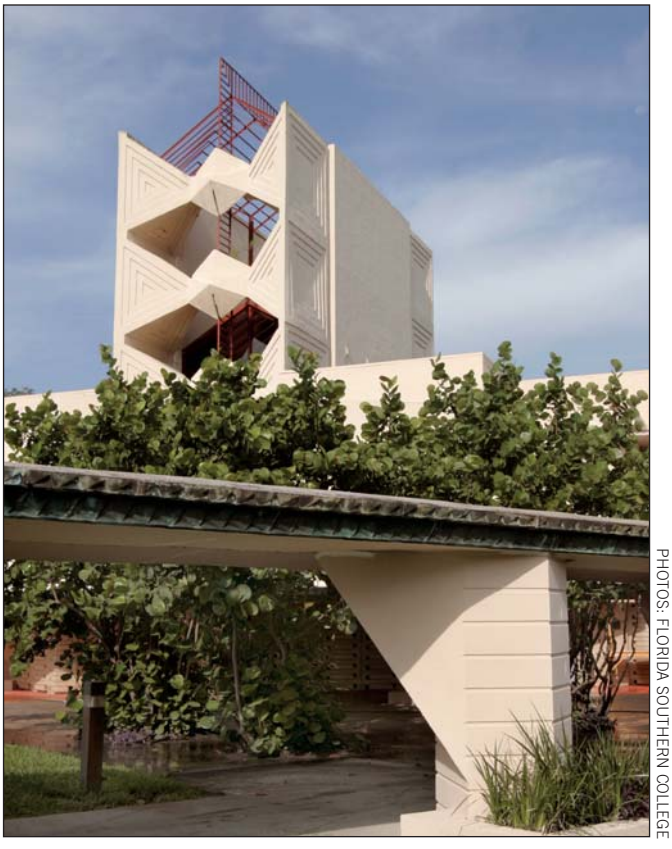
A master mason takes the architect to school

by Aaron Hoover

Few masons would call concrete block walls art, and Ken Uracius is no exception. But Uracius, who specializes in historic masonry preservation, feels the word squares up nicely with the main structural elements of the buildings in his latest project: a little-known Florida college campus designed by Frank Lloyd Wright.

"Usually when you get into block work, it's just unitary, nothing fancy," says Uracius, of Holden, Mass., who travels the nation restoring old masonry buildings. "This block work is actually making a statement." (See "The Remaking of Wright's Blocks," page 16.)

But as sometimes happens with art, Wright's unique system of grooved block and rebar composing a dozen buildings at Florida Southern College in Lakeland, Fla., has proved more aesthetic than practical. A half-century after they were finished, the nation's largest single collection of Wright-designed buildings is crumbling.



PHOTOS: FLORIDA SOUTHERN COLLEGE

Lesson for architects: A stellar design, such as Frank Lloyd Wright's for a series of buildings at Florida Southern College, must still contend with practical reality. In this case, the harsh Florida climate has taken a toll out of the elaborate masonry, requiring the down-to-earth attentions of mason Ken Uracius.

BUILDING A LEGACY

Wright is known for his low-slung Prairie-style homes in the Midwest. But when then Florida Southern President Ludd Spivey sent Wright a telegram in 1938 seeking a meeting about "plans for a great education temple in Florida," Wright didn't hesitate.

"I think he was excited about leaving a legacy for himself in terms of a fairly large composition of buildings," says Jeff Baker, an Albany, N.Y.–based architect in charge of the Florida Southern restoration. "But I think he was also attracted by the opportunity to leave his mark on future generations."

Spivey's telegram to Wright led to 12 signature structures completed between 1941 and 1958. Perhaps the most spectacular is the Water Dome, a circular pool ringed with jets that create a dome of water. The dome never functioned as Wright intended — until October, when it became the first major project completed in the estimated $50 million restoration. The chapel, with its elaborate iron tower and covered walkways, which Wright called Esplanades, is among the other items getting attention.

MATERIAL MATTERS

Wright liked to use indigenous materials — a concept that is making its way back into the industry via the green building movement — and he tapped coquina from the site in some of the first buildings, Baker says. But he relied far more on another Florida resource: sand. Trucked south from St. Augustine, the sand was the prime ingredient in the three-and-a-half-inch "textile blocks" used to face all the buildings. Workers built the blocks on site with a concrete mixture and wooden molds.

The design was unique, and as it turns out, uniquely flawed. Each block has smooth faces and sides, but is indented with beveled squares or half-round circles at the edges where a block

The Remaking of Wright's Blocks

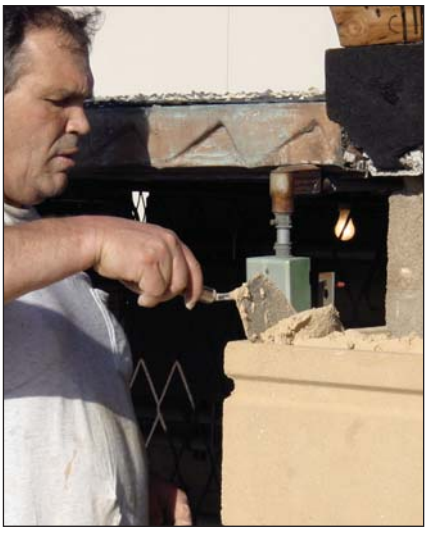
Using a pneumatic ram, Haley Mills tamps the coquina, sand, and cement mixture into Wright's original molds. A key to the performance of the blocks is a graded aggregate — a range of sand particles that allows for denser packing, ultimately leading to a more impervious block.

In accordance with Wright's belief that each structure should be composed of inexpensive local materials that grow out of the ground, the blocks used in the 12 buildings at Florida Southern College were formed from coquina and sand — both from Florida — and cement. Their dimensions, 3 feet by 9 inches, were, like all the measurements in Wright's campus design, divisors of 18, the standard number of feet between orange trees in the groves surrounding the college at the time. The indents in their surfaces and the colored glass inserts in some of the buildings blocks call to mind origami folds and textile patterns, alternating light and shadow in motifs that carry throughout the collection.

According to master mason Ken Uracius, the blocks failed because the material science of the day hadn't caught up to Wright's design criteria. The first flaw was in the recipe itself. Wright used a sand mix that was evenly graded, allowing for bigger air pockets and greater vapor permeability. We learned 50 years later the importance of sand gradation, said Uracius, explaining that when sand includes more grain sizes, smaller grains fill in the interstices between larger ones. The new mix includes a wide range of sizes and a higher percentage of cement.

More detrimental was the use of iron rebar. Because the architect wanted no visual separations between his blocks, he embedded iron rods in the walls to hold the wall together in lieu of mortar. An ineffective grouting technique contributed to the problem: where there was no grout, water collected in the grooves, corroding the reinforcing. Wright had no way of knowing that iron would rust like that, said Uracius. It was supposed to last forever.

Uracius said that the biggest challenge was that without mortar joints, builders lose a key method for keeping walls even: adjusting the amount of mortar between blocks. It's hard to cover up errors when you're running block to block, says Uracius. With no mortar, any variations in block size must be adjusted in the blocks themselves. Because Wright's design calls for several different molds for each wall, variations are common and a challenge that adds days to the job of building a wall. Uracius is still experimenting to find the best technique for assembling the blocks. — *Cathleen Drake Nelson*



Master mason Ken Uracius grouts blocks on a test wall of a campus pumphouse, taking care to pack the grout evenly to avoid pockets where water can collect.

butts against its neighbor. Rather than mortar the blocks atop each other in the long tradition of masonry, Wright stacked them with no mortar at all, relying instead on a gridwork of horizontal and vertical grooves to accept rebar, and filling the cavities around the rebar with grout.

That seemed to work fine, but not for long, Uracius says. The wet grout typically failed to flow down the grooves between courses or the narrow cores within the blocks, resulting in pockets where the rebar remained exposed. As time passed, water found its way in, sometimes by soaking directly through the porous block. As the rebar rusted, it expanded. Because the grooves were so narrow, this was enough to dislodge the grout and crack the block, exploding the walls from within.

Some fared better than others, but restoring all 12 buildings will require thousands and thousands of new blocks, Uracius said. After eight months tinkering with a large experimental wall (the pump room of the Water Dome, which

Water intrusion into the porous block caused the high-iron steel rebar specced by Wright to corrode, and the expansion of the iron in the narrow cores blew apart the block over time. In his day, steel was a new, wondrous material that was supposed to last forever, but material science had yet to catch up to the architect's innovations.

Wright's design called for seamless joints between blocks. Wright referred to the bricks as "textile blocks" both for their textures and for the method by which they were "woven together" with steel. Uracius called for stainless steel reinforcing for the new walls, and given the importance of the rebar in the wall's design, this is hardly an extravagance.

has served as the mason's de facto laboratory), Uracius thinks he can stick to Wright's design, partly by building the blocks with more consistent and better materials. For the walls, he thinks he can use stainless steel rebar and a layer of silicon between each block. The seal the silicon creates, he says, will allow him to fill the grooves with mortar under pressure.

Uracius said that when he first arrived in Florida, he thought Wright was insane. "But they sort of grow on you, these buildings," he said. "Now I'm kind of interested in seeing what I can do."

Aaron Hoover of Gainesville, Fla., is a frequent contributor to Coastal Contractor.