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Digging Deep, Building Strong—Rammed Earth for the Ages
Ward+Blake's "Dirty Modernism" compresses dirt and design elements

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How Do You . . . adapt ancient rammed earth building techniques with contemporary post-tensioning?

Summary: Ward+Blake's TK Residence outside Jackson, Wyo., adapts rammed earth building techniques by grafting post-tensioning rods into the foundation's walls, thereby making them nearly as strong as pure concrete, a much more environmentally intrusive building material when compared to green-friendly rammed earth. The residence balances angular Modernism with a rustic Old West sensibility derived from the use of indigenous building materials.

The "million-dollar house made of dirt" by Tom Ward, AIA, of Ward+Blake Architects, is at once rustic and progressive; rural and modern. All these near-antonyms are made to

coexist through the TK Residence's unique construction method: an internationally patented process for strengthening ancient rammed earth construction with contemporary post-tensioned rods, which makes simple dirt as strong as concrete.

Ward and partner Mitch Blake, AIA, came up with the process after mulling over ways to make green, low-impact housing that is cheap yet durable and ideal for areas where there is little wood, steel, or traditional building materials. Rammed earth structures are light on formal construction substances and heavy on manual labor. This can be an expensive match for Jackson, where labor is scarcer, but an ideal method for the war-ravaged Sudan, where Ward+Blake's advances may provide homes for thousands of refugees. In January, Ward+Blake was contacted by Arkel International—a construction, life support, and logistics company that was interested in using post-tensioned rammed earth to construct 10,000 homes there. Ward says they are currently negotiating a contract with the Sudanese government and evaluating how to adapt this model for mass-produced affordability.

"It's being considered for just exactly the application that I think is the most appropriate," Ward says.

Ancient Chinese secret

Rammed earth is one of the oldest building techniques on the planet, and began appearing in China and Central Asia about 5,000 years ago. Portions of the Great Wall of China were made with rammed earth, and the ancient Egyptians were skilled practitioners as well. These basic recipes use native soil and about 3-5 percent of some kind of stabilizing agent, typically cement, but historically animal blood and lime were used. This mixture is then compressed to about half of its original size and left to dry.

Ward+Blake's patent embeds post-tensioning rods encased in PVC piping into the foundation wall, and then tamper-compresses the earth and cement mixture around them.

The PVC stops the cement and soil from adhering to the rod. New rods are coupled on top and the wall is extended until it reaches its full height. Then, a washer and nut assembly is attached to the rod. The nut is torqued to stretch the rod out and generate compressive strength. The entire process was done by hand. “All those components are off-the-shelf stuff,” says Ward.

Compression and tension integrity can vary wildly in soil, but Ward says his method can double the strength of dirt, making it nearly as strong as a block of concrete.

Dirt don’t hurt

Soil is a green-friendly building material that retains and releases energy and heat slowly and efficiently due to its high thermal mass. At the TK Residence, this helps to balance the energy transparency of the window-dominated south façade. Construction using soil also doesn’t fuel deforestation and call for high transportation costs, as any site not paved over is already stocked with material.

However, at 6,300 feet on a cliff in the Grand Teton Mountains two miles from the nearest arterial road check, Ward says transporting everything else to the site was a challenge, but he was paid off with a stunning view of the valley below when he moved in two-and-a-half years ago. The vaguely funnel-shaped house transmits even the lightest mountain breeze across the residence. “The place moves air all the time,” Ward says. “It’s intoxicating.”

There are only a few design elements to the simple,
two-story, 3,000-square-foot house, but Ward (and his interior designer wife Kathy) make them count. The interior walls are a set of vertical rectangles of the same width and of different depths that wrap around the house from the fireplace to the south façade, creating the illusion of complex geometry.

“I wanted it to be straightforward in construction and [still] offer you something stimulating visually,” he says.

The residence relates to its environment just as humbly. The burnished-gold walls of native dirt are an intuitive match for the looming sandstone cliffs above. In fact, environmental durability is the primary organizing factor for the TK ("Tom and Kathy") Residence's construction and other Ward+Blake projects. The harsh mountain climate where they do business sees temperatures rocket up during the day and crash at night. The buildings are often battered by rain and snowstorms and sit in a seismically active region. "Stuff that you might get away with in Southern California in terms of architectural expression will reduce you to your knees in 12 months here," says Ward.

Hence: no paint or finish, low-slung profiles, and sturdy, indigenous materials.

Ward calls it "dirty Modernism" and not because he builds with dirt. "We're not sleek, we're not slick, but we're definitely not traditional."

It's such native materials (rough-hewn columns of native log, refreshingly green prairie sod roofs, sun-dried blocks of compressed earth) that make the TK Residence and other Ward+Blake projects retain an Old-West sensibility even as dynamic perspectives and spaces take viewers into the future. In digging up old earth and putting it together in a new way, Ward+Blake have created a compromise favorable to both continuums.