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## Solarcrete

### A New Wall System Catches On

Back in the 1970s, masonry contractor Mark Graham thought there must be a better and faster way to build structures than by stacking bricks and cinder blocks one by one in mortar. He came up with a revolutionary idea that would become Solarcrete.

Known as an insulated concrete composite wall system, Solarcrete consists of a core of expanded polystyrene (EPS) foam insulation sandwiched between two layers of concrete formed by spraying shotcrete over steel reinforcing bars. A standard Solarcrete wall, which can have angled roof lines and cutouts for windows and doors, measures 12 inches thick, including seven inches of EPS foam and 2.5 inches of shotcrete on either side of the foam.



Photos courtesy Solarcrete

Solarcrete's energy-efficient wall consists of a foam core between two layers of concrete

Solarcrete gets its name from its ability to absorb and hold heat, an attribute known as thermal mass. This tells you something about the main advantage it offers. With an R-value of 36, the energy-efficient wall reduces heating and cooling loads. Its energy efficiency also comes from its seamless construction and the fact walls run continuously from footers below ground to the eaves with no gaps or voids.

But Solarcrete officials don't have to sell customers just on a return of investment from energy savings because they can also sell them on upfront cost savings, says Jim Glass, vice president of Tri-State Solarcrete. "Pricewise, we're very competitive as far as putting the buildings up because we're finding that masonry labor prices keep going up. With our building system, you don't need an experienced mason."

Part of the cost savings comes from Solarcrete's quick construction. The basic components serve multiple functions, including the structure, insulation, and finish, reducing the number of steps in the construction process. Using shotcrete eliminates conventional form work and enables design flexibility. Wall panels are mostly prefabricated at Solarcrete's facilities ahead of time, saving labor and time at the construction site.

Solarcrete stands poised for growth after establishing a track record, and it should provide another tool for architects and engineers in designing buildings. "It's been received very well. We

equipment to help people in developing countries process food.

**Profile**

**Jim Thompson:**

Has a passion for overseeing facilities and construction at a retirement home

**Company Profile**

**Mid-Penn Engineering:**

Fosters community development

have over 3000 buildings already built," Glass reports. "We have built in 19 states, and we're getting inquiries from all over the world on this technology."

In the beginning, Solarcrete buildings sprang up in Chicago, Ohio, and other midwest locales, but they've branched out since then. "Most of our buildings are industrial and commercial. We build them all across the U.S.," Glass states. Typical uses come in the form of water treatment plants, distribution centers, manufacturing centers, storage shelters, and hospitals. "The applications are unlimited for this wall system. We're getting more and more into residential because lumber prices are going up."



Workers affix steel reinforcing bar to a foam panel

Originally from Fort Wayne, Indiana, Mark Graham began developing his idea in 1974 during the energy crisis. As the system became available in the late 1970s, the company received dozens of patents for Solarcrete and built hundreds of buildings. But sales dwindled as oil became plentiful again in the mid 1980s and 1990s. A core group of Solarcrete

contractors continued to build and refine the Solarcrete wall system through that period and went on to form National Solarcrete in 2002, acquiring all patents, copyrights, and trademarks.

"We're a small general contracting firm, but we do big jobs," says Glass in describing the company's structure. It consists of Tri-State Solarcrete in Payne, Ohio and National Solarcrete in Huntley, Illinois, near Chicago. "We're in the process of merging everything between the two partners and getting down to a single entity." The company numbers about 100 employees between the two groups.

To carry out construction, Solarcrete has about 50 general contractors, roughly one in every state, trained and certified by Solarcrete. The company has seven distributors spread around the country, largely in the Midwest, that design and fabricate wall assemblies and prepare pre-engineered building packages for shipment to contractors.

The distributors fabricate most of the foam panels, reinforcing bars, and wall ties that hold the rebar in place. They do about 80 percent of it in-house, while contractors do the other 20 percent on site for irregular, customized shapes. The foam panels are erected within conventional steel framing on site, and then shotcrete is sprayed in continuous fashion to cover entire surfaces in what Glass describes as "a seamless process." Shotcrete, which doesn't have the aggregates normally found in concrete, adheres to the foam. After shotcrete is mixed at a local concrete company and then delivered to the site, contractors mix polypropylene fibers in it as a secondary reinforcement. A pneumatically-powered pump applies the shotcrete.



After erecting prefabricated panels at the construction site, contractors create the concrete layers by spraying shotcrete

Glass points out another advantage of Solarcrete: "We're very architecturally friendly." The wall system permits design freedom, as the insulation board can be cut and formed and the concrete applied to form arches and curved and serpentine walls at relatively low cost. Solarcrete walls allow for a wide variety of interior and exterior finishes, Glass goes on to say. "Architects like our wall system because we can duplicate any texture." Because shotcrete has less water than poured concrete, it forms easily. The most common exterior finish is an acrylic stucco, and paint finishes can be applied as well. The standard interior finish is an elastomeric or acrylic paint.

As a general contractor, Solarcrete typically contracts out engineering and architecture work, mostly to structural engineers and architects local to a building site. "If we general-contract a building, and the customer wants us to do everything, we'll find an architect or an engineer," Glass says. Sometimes the owner has their own, in which case, Solarcrete works with them. "We would like to market our wall system to architects and engineers." Glass gets a couple phone calls a day from them. "The word seems to travel fast when they hear of the energy savings. It's definitely a lucrative business for architects and engineers."

In expanding the Solarcrete market, Glass reveals, "We've been trying to get our wall system into public schools. I've done energy studies on our new schools, and they're being built more inefficient than the old schools. We can save those schools 60 to 80 percent on their energy bills." But it has proven a tough sell because of the politics involved. "The local people love it, but then you get to the architects and engineers. That's where we're trying to break into, the progressive architects and engineers."



Structures such as the Roman Inc. World Headquarters and National Distribution Center in Addison, Illinois result from the process

To keep its product improving, Solarcrete does research and development work, both in-house and through outside organizations. They use facilities like Oak Ridge National Laboratory, where they had a wall tested for K-value and R-value and a fire rating test

done on it. As an example of a new product variation, "We're developing a tilt-up panel where we actually shotcrete our foam walls and texturize them in-house and then take them out to the job site," Glass reports. "You don't have to worry about the weather or outside labor. Everything will be done inside. You just tilt it up and fasten it together." Contractors will erect the panels and then shotcrete the seams to create a seamless wall.

With innovations like this coming down the road, Solarcrete is expanding its network of distributorships and contractors and lining up investors to help market its wall system. The company looks to take off, and in the process, give engineers a new choice for buildings.

## Snapshot

**Company:** Solarcrete, consisting of National Solarcrete and Tri-State Solarcrete

**Type:** General contractor that erects buildings using an insulated concrete composite wall system they developed

**Location:** National Solarcrete is in Huntley, Illinois and Tri-State Solarcrete in Payne, Ohio

**Website:** [www.solarcrete.com](http://www.solarcrete.com)

**Phone:**

National Solarcrete, 815-923-2553

Tri-State Solarcrete, 419-263-1333

**How they use engineers:** When designing and erecting a building, they typically hire consulting structural engineers local to the site

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