

EARTH, WIND, WATER, FIRE

A NEW STUDCAST PRECAST WALL SYSTEM SURVIVES NATURE'S CHALLENGES.

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PHOTOS COURTESY ECOLITE CONCRETE

EDITOR'S NOTE

(In the Precast Solutions Winter 2007 issue, we spotlighted studcast precast, a class of hybrid wall system in which thin concrete faces are married to cold-form steel stud framing during the precasting process. In this issue, we continue our investigation into this rapidly growing construction method, sometimes referred to as "thin-shell precast," with a look at the newest configuration of the concept.)

"We build with one of the most powerful performance enhancement materials on the planet," says Brian Smith, CEO of Ecolite Concrete. "Air."

Ecolite's studcast precast wall system uses cellular concrete that is 50 percent air but, by definition, that's only half the story. Concrete containing millions of tiny air bubbles, working in combination with CAD/CAM-produced steel framing and expanded metal lath, creates strength, durability and insulating value that is unexpected from concrete only 2 inches thick. The product has been successfully lab tested for resistance to fire, hurricane winds and earthquake forces. It stops moisture, mold and termites. It also provides excellent sound insulation and thermal control properties. Moreover, it weighs just 12 pounds per square foot and is simple to produce. All this makes it an economical contender in regions where extreme natural forces are a major factor in construction cost.

The advantages of Ecolite will soon be meeting the ultimate field test, debuting in two of North America's toughest proving grounds for survivability. Florida is famous for hurricane winds and windblown rain. Southern California is known for earthquakes and firestorms. Both have very restrictive codes, and Ecolite is going to both.

LET IT BLOW

"The Florida code is designed to build hurricane-resistant dwellings," explains John Davis, president of Cadsteel Inc., Orlando, Fla., which will be supplying the panelized steel for Ecolite's Florida operation. "The

highest standard is the Miami-Dade County Windblown Missile Impact test. An air cannon fires a wooden 2-by-4 at the test wall. In most cases, that piece of 2-by-4 will go straight through a concrete block wall. With Ecolite, it just bounces off." Ecolite walls can be engineered to meet 160 mph hurricane winds as measured by the impact test. The composite strength of the concrete and steel also resists the wall being ripped away by wind and provides shear value to maintain the integrity of the structure.

Other major concerns in Florida and similar tropical regions are mold and termites. "Mold is a big issue here," explains Davis, "because everyone runs air conditioners 24 hours a day, seven days a week." Mold is also a damaging after-effect of flooding, as was recently demonstrated to devastating effect along the entire Gulf Coast after Hurricane Katrina. "Steel does not support the growth of mold, and neither does Ecolite concrete. Wood construction does." The voracious termites of southern Florida will find nothing to eat in steel and concrete panels, either.

With residential and light commercial construction in central and southern Florida dominated for decades by masonry block, Ecolite faces deeply entrenched competition. Yet even before the start of Ecolite production in the region, the product was already slated for use in a 450-unit townhouse project in central Florida. The developer explained, "I wanted to get away from concrete block construction, because it takes too long to build and the amount of labor is always an issue. I tried light-gauge steel framing, but I couldn't find a

◀ As the studcast wall panel is guided into place over the slab, anchor bolts in the slab are aligned with pre-punched holes in the bottom rail of the panel.



good cladding to enclose it that would work in this market. The Ecolite approach seems like just the thing.”

Davis, whose company has a worldwide clientele, understands this as a global phenomenon. “In markets that are traditionally masonry block construction, everybody is looking for an alternative for a multitude of reasons, not the least of which is finding qualified labor,” he says. “There’s a shortage of masons – the average age of masons in the U.S. is 56 years – and that’s reflected in the current price of building masonry structures now. Block is an expensive, time consuming and antiquated building system.”

Davis believes studcast can compete successfully in Florida. “Because it’s manufactured in the factory and delivered to the site, the speed of erection on site just leaves masonry construction a world behind. The wall’s better, straighter, more easily finished and stronger.”

STRENGTH UNDER FIRE

Across the continent, another steel man, J.D. Standridge, has been so impressed by studcast precast that he took a position as general manager of Ecolite’s first West Coast plant in Barstow, Calif. From his point of view, a studcast wall is “steel improved.”

“I initially thought of the steel having all the structural value, but I was proved wrong,” says Standridge. “An 8-foot-high wall of 33 mil-thick steel studs at 24 inches on center can bear an axial load of about 200 pounds per lineal foot, but when it’s paired with Ecolite concrete and expanded metal mesh, axial load capacity goes to more than 800 pounds per lineal foot – an over 400 percent gain.” Ecolite has passed all tests required by International Code Council (ICC) Evaluation Services AC208.2 – Acceptance Criteria for Thin-Shell, Cementitious-Coated Cold-Formed Steel Stud Wall Panels.

The system will soon prove not only its strength but its construction speed and economy. The Barstow plant’s first large project is a 57-building complex being erected at the U.S. Army’s National Training Center (NTC), Fort Irwin, Calif. The new facility, a MOUT (Military Operations in Urban Terrain) training ground, is being constructed by RQ Construction, also of Barstow.

NTC’s mission is to provide tough, realistic arms training, specializing in force-on-force and live-fire training for ground and aviation brigades. The project’s specifications called for very durable structures of one,

two and four stories. The project was originally designed for cast-in-place and conventional masonry construction, and scheduled to take one year to build. The Army Corps of Engineers decided the cost was prohibitively high and turned to private industry for alternative solutions.

RQ Construction proposed using precast Ecolite walls, which enabled the company to lower costs by one third and deliver the completed training facility in half the time. “The magic of the Ecolite system,” comments George Rogers, CEO of RQ Construction, “is that we’re building 57 buildings in six months, which is an incredibly fast project.” Precasting began while the contractor was still doing foundation work to provide just-in-time delivery of the wall. Once erection is fully underway, “We plan on putting up a building a day,” says Rogers.

The MOUT’s budget savings comes partly from the economy of producing studcast wall panels and partly from ripple effects of the system’s properties. The low mass of Ecolite walls makes reduction in foundations possible. In a Zone 4 seismic environment like Southern California, heavy wall systems impose an unusually stringent burden on foundations to resist violent shaking, since seismic loads are calculated as an object’s mass times the acceleration due to an earthquake. Ecolite’s cellular concrete is a perfect antidote for this problem. As Standridge quips, “We can’t do anything about the earth’s movement, but the light weight of the walls sure reduces the mass.”

In addition, the excellent shear resistance of the panels makes it cost effective under demanding earthquake codes. Instead of first framing a wall then adding bracing or plywood to resist shear, and finally having to apply an exterior finish, Ecolite is a one-step construction process. “Ecolite panels should go up very quickly and easily,” predicts Rogers, “yet we’ll still have a structurally robust system.”

OPERATION FIRESTORM

In addition to the live-fire expected at the military base, wildfire is a seasonal hazard in California, especially in the southern part of the state where there is usually little rain from April until October. Suburban and even urban residential communities are frequently built adjacent to dry wilderness lands, and homes are threatened by wildfires every summer and fall. The



◀ A lightweight forklift is all that is required to place the wall panels.

threat is so great that one of the largest insurance companies in the country recently announced that it would stop offering fire insurance in California due to the risk there of catastrophic fires.

“That’s where the air bubbles become heroes,” explains Smith. “They give Ecolite superior insulating properties. An Ecolite wall with just 2 inches of cellular concrete tested to an ASTM E119 fire resistance of two hours. With a 3-inch thickness, we tested to three

hours. That kind of fire resistance from such a simple, thin wall is not achievable with other similarly priced building materials. In addition to resisting fire storms, the fire ratings make Ecolite practical for party walls, exit corridors and stairwells.” He also points out that studcast construction is noncombustible, adding, “This makes it eligible for use in any class of construction under the building code and for lower fire insurance premiums.”

HOW ECOLITE IS MADE

Ecolite panels begin with the architect's CAD drawings, which are loaded into a computer that controls an automated steel roll-forming machine. The software breaks the plans down into discreet wall sections and designs each component of the wall frame with all details. Guided by the computer, the roll-former cuts, bends, notches, dimples and drills the steel, and spits out completely formed studs and rails, numbered and pre-drilled for assembly into framed panels. The steel even has openings for the wiring and piping that will eventually be installed in the walls. The roll-former produces framing at a rate equal to 60 lineal feet of 10- to 12-foot-high wall per hour.

A single worker can screw together the panels without special jigs or clamps. The pieces are highly accurate – to about 1/32-inch in more than 60 feet according to CadSteel's John Davis.

Expanded metal mesh is attached to the frame. The mesh serves a double purpose: It is the metal reinforcement for the concrete panel (a function usually fulfilled in conventional precast by welded wire mesh) and it creates the bond between concrete and steel framing. The panelized frame is placed into Ecolite's proprietary perimeter strip, which holds the steel in proper alignment with the expanded metal mesh at mid-depth in the mold. The perimeter strip also creates accurate edge detail in the precast wall.

Cellular concrete is generated by a proprietary process that was three years in development. Combining portland cement, fly ash, synthetic reinforcing fibers and millions of microscopic air bubbles, it produces a concrete foam that is very workable and sets up quickly. A two-worker team can pour more than 1,000 square feet of wall in about an hour.

Because of the reduced weight, overnight curing achieves sufficient strength for the entire assembly to be lifted out of the forms the next day, speeding up the casting beds' cycle time. The panels are moved to a storage position to continue curing before shipment.

Ecolite walls can be precast with a variety of finishes, including integral colors, thin-brick and form liner textures.



▲ *The automated roll-forming equipment assures panels are produced to tight tolerances for a perfect fit.*

Smith also points out that air bubbles improve thermal and acoustical performance. "A wall with 2 inches of Ecolite concrete on one side and one layer of 5/8-inch drywall on the other (without added insulation) achieves STC-52. STC, or Sound Transmission Class, is a rating of materials for their effectiveness in blocking sound. The greater the value, the more efficient the material is in blocking sound.) Just 5 1/2 inches thick overall, Ecolite outperforms an 8-inch-thick concrete masonry unit (CMU) wall with an STC 50 or less." The studcast wall, moreover, has a thermal insulation value of R-4 (without added insulation) compared with R-1.5 for an 8-inch-thick CMU wall. Additional insulation can be placed in the stud cavity of the studcast wall to

obtain any level of thermal or acoustic insulation required.

Ecolite rates high as sustainable construction and can help a project achieve credits under the U.S. Green Building Council's LEED program. "This is one of the greenest construction systems around," according to Brian Smith. "It contains up to 50 percent recycled material, including fly ash (a recaptured smokestack byproduct) and post-consumer recycled steel. Because of the thinness of the wall and the high air content, Ecolite concrete consumes less portland cement than conventional precast panels. This not only conserves resources, but it reduces the greenhouse gas emissions associated with portland cement production. The walls



are designed and prefabricated to reduce waste. The automated steel roll-forming system, for instance, is so efficient it produces almost no waste material." Other eco-friendly aspects of the product include the overall impact of such lightweight walls, minimizing the amount of construction materials necessary throughout the structure and reducing transportation-related pollution.

The first plants are the beginning of a projected nationwide network of licensees. "Ecolite could be adopted by any existing precaster," explains Smith. "If Ecolite was specified on a project located too far from one of our existing plants, a local precaster could be up and running on the system very quickly.



He would add one piece of machinery to produce the steel or use panelized steel supplied by a local steel producer. We provide training in the integration of steel and use of the concrete generator, to smooth entry into the system and ensure a top-quality result. It's a strong path for a precaster to expand his business, giving him the ability to offer his clients a more complete wall that's also a better wall. The system is so economical that it can compete for projects that would previously have gone to concrete block or even wood frame construction, such as multifamily residential or single-family subdivisions," he said.

"I see a big future for the product everywhere, all around the world," says Davis. "It combines the advantages of the lightest technology in light-gauge steel framing with the lightest technology in concrete. Where each of them is a great product in their own right, Ecolite combines them to form a product that's really greater than the sum of its parts."

The system's potential excited J.D. Standridge enough to induce him to change his career path. "It's the way of the future. That's why I joined the company. It's concrete that's better than concrete and steel that's better than steel."

For additional information, visit www.EcoliteConcrete.com.

▲ *Screws installed in the integral studs secure the adjacent panels.*

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