An elevated bungalow by the Canadian architecture firm Sustainable. TO Architecture + Building took first place for the New York division, featuring a "flood-proof" foundation and a split roof with clerestory windows for passive heating through solar gain. The house is also economical, says the firm, as materials for the building cost less than $50,000.

GOATstudio LLP designed the winning proposal for New Orleans based on a traditional "shotgun house" model. The home has an elevated finished floor seven feet (2.1 m) above ground and a steel roof that "turns and wraps the southern exterior wall for additional sun protection," helping to maintain livable temperatures in case of a power outage, according to AIA.

The tornado-resilient "Core House" by Q4 Architects won in the Joplin category for its safe house that is built inside of a larger perimeter house. The safe house is constructed of anchored concrete masonry units and includes a rainwater harvesting system designed to support a family for an extended period of time until rebuilding would be possible.

"All of the entries that are feasible to construct will go into production in the corresponding communities," according to an AIA press release—not just the winning designs. Partner organizers of the contest include Architecture for Humanity, Make It Right, the St. Bernard Project, and Dow Building Solutions.

USGBC Finds Earth's "Greenest Schools" in Hong Kong and Kenya

The two recipients of the "Greenest School on Earth" award both use innovative sustainability practices to serve disadvantaged schoolchildren.

By Candace Pearson

The Center for Green Schools at the U.S. Green Building Council (USGBC) recently deemed two schools winners of its "Greenest School on Earth" Award for 2013. The Uaso Nyiro Primary School in Laikipia, Kenya, and the Sing Yin Secondary School in Hong Kong have each been awarded $5,000 to advance a new or ongoing sustainability project.

Source: USGBC

Uaso Nyiro Waterbank School earned its "greenest school" award by using ceramic water filters and a 150,000-liter reservoir under the courtyard to provide clean water to 300 school children year round.

Located in an area beset by insufficient access to clean water and in which 25% of the community lives on less than $1.25 per day, the Uaso Nyiro school stores and filters clean water for 300 children year round with a rainwater system that harvests 350,000 liters per year. The building, designed by PITCHAfrica, utilizes local construction techniques and materials and was built for the same cost as the area's typical four-classroom bunker-style school, but it includes protected gardens for food cultivation, teacher rooms, and a courtyard theater. School attendance has risen from 70% to 90% since its start, while instances of waterborne disease have "dropped to zero," according to officials.

Sing Yin faces very different environmental challenges in its urban setting of Hong Kong, including dangerous air pollution levels and a severe waste-management problem. Programs such as low-carbon cooking and the importance of recycling are listed on the school's website for the largely low-income student body. The school also features two green roofs, an organic farm, and an aquarium, providing a connection to nature the students might otherwise lack.

"We selected both of these schools because of what they say about the scale and scope in the movement," said Rick Fedrizzi, founding chair of USGBC. "They demonstrate that, across the world, from community to community and from city to village, where we learn matters."

PRODUCT REVIEWS

Lighter, Lower-Carbon Concrete Decks with BubbleDeck

BubbleDeck's matrix of concrete, plastic spheres, and steel reduces the amount of concrete required in structural slabs.

By Brent Ehrlich

What if you could take a concrete deck and replace a lot of its material with air—getting not only a stronger, lighter, thinner deck, but also one that can be delivered to the jobsite for quick assembly? You'd have BubbleDeck—a matrix of plastic spheres, steel reinforcement, and concrete. It's not only capable of replacing a significant quantity of concrete and its high carbon emissions but also provides a

number of other performance advantages.

What is BubbleDeck?

BubbleDeck consists of hollow, high-density polyethylene spheres—typically made by local water bottle manufacturers—sandwiched between two structural steel mesh grids formed by welding rebar together. A thicker rebar is used on the bottom mesh and is welded to a specially designed lattice girder imported from BubbleDeck's parent company in Denmark; when the spheres are added, they settle between the grids, and a thinner grid is welded on top to form a "cage." The cage is then put in a concrete casting bed, where about three inches of concrete are added to the base to form a panel. All of this work is done at a pre-caster for quality control. The panels are then moved into place using the girder and tied off with rebar, and concrete is added to fill in the spaces between the spheres and cover them. After pouring, a BubbleDeck slab is indistinguishable from a conventional slab, but it is significantly lighter and thinner.

How does it work?

The combination of spheres, structural steel, and concrete work together to form, in the words of Jerry Clark-Ames, president of BubbleDeck North America, a "lightweight biaxial slab" that behaves like a solid slab. "If you focus not on the balls but what is between them, you have perfect I-beams going in both directions, with steel placed on the top and bottom of those I-beams," Clark-Ames told *EBN*. "You are creating a honeycomb where the balls are merely a void." Because of the unique construction, BubbleDeck transfers loads in all directions, unlike a solid slab where beams carry the loads primarily in one direction.

BubbleDeck can be used in slabs ranging from 9 to 36 inches thick. The slabs are custom-engineered depending on the job, but typical dimensions range from 8′–10′ wide by 27′–45′ long. The majority of demand, according to Clark-Ames, is for "12 to 17 inches [in thickness], especially if you don't want to use beams and drops, and want that flat ceiling."

Displacing 25% or more concrete

The company claims that BubbleDeck displaces 25% of the concrete that would be used by a comparable 12"-thick solid deck, and because each one-pound BubbleDeck sphere replaces 80 pounds of concrete, the dead weight is lowered enough that the deck thickness can be reduced to 11", saving additional concrete and bringing the concrete savings closer to 33%. (If you displace 25% of the concrete, that adds up to nearly 5 pounds of CO2 per cubic foot, depending on the slab, sphere size, and concrete). With less total weight, support columns and foundations can also be smaller, further reducing the amount of concrete used. Clark-Ames claims the total concrete savings from using BubbleDeck on a job can exceed 40%.

Photo courtesy of BubbleDeck

BubbleDeck's prefabricated panels made from plastic spheres, steel, and concrete can be used to offset 25% or more of the concrete used in building decks without any loss in performance.

Structural and construction benefits

For GRAEF structural engineer Dan Windorski, who also works as an engineer for BubbleDeck, many of the system's benefits come from it being prefabricated. "On a traditional project, you have to have a bunch of shoring and formwork delivered to the jobsite to be installed," Windorski said. "When the rebar comes in, an iron worker has to set every piece by hand, looking at the shop drawings, before they pour concrete." With BubbleDeck, "we eliminate almost all the formwork, and we are pre-tying about 70% of the rebar." This process produces less waste, saves labor, and helps provide better quality control since most of the work is done at a pre-caster.

BubbleDeck's slabs have other benefits:

- Less deflection in long spans
- Overall lower building height, leaving more room for mechanicals in the ceiling and even for another floor (due to thinner slabs)
- Reduced need for footings, leading to less excavation
- Reduced need for columns, providing more design flexibility and larger open spaces

Application speed, cost, and limitations

BubbleDeck has been used in Europe for more than 15 years and in Canada for more than five, and though relatively new to the U.S., the company has completed several large projects there. At the Watertown Regional Medical Center in Watertown, Wisconsin, a two-floor, 30,000 ft2 installation, Windorski said the process was about

four days faster than with conventional slabs, taking only two days to install the panels and three days to secure them with rebar; the concrete was poured within a week.

Bart Liesener, the project supervisor for Maas Brothers Construction, who worked on the Watertown project, said, "It [BubbleDeck] is very fast to install as long as the engineering is complete up front." His company worked with TURIS Systems and used BIM to coordinate the HVAC, plumbing, and other trades so the project would go smoothly. "It's really great if it is not a fast-tracked project," Liesener said, "but the reinforcing for the penetrations after it is cast was pretty difficult and takes a lot of time." In the case of the Watertown project, "there are thousands of penetrations, so I had to have every penetration x-rayed to core a hole." Despite the setback, Liesener claimed, "It works great. I am really impressed with it." Clark-Ames estimates they saved nearly 10% of the material costs at Watertown. Estimated savings of $3/ft2 on a 30,000 ft2 building adds up to $90,000—"and that is nothing to sneeze at," he said. According to Clark-Ames, contractors can supply conventional decks at lower cost when spans are less than 20' and thickness is 9" or less. At 9" thick, BubbleDeck is comparable in cost to conventional formwork, Clark-Ames claims, and it costs less when slabs are 12" and thicker.

BubbleDeck is not for every application. "You have to look at what structure fits the right job on a case-by-case basis," Windorski said. "As an engineer, BubbleDeck is another tool for the tool box"—especially since concrete remains such a big driver of pollution in buildings. Currently, there are few practical solutions that can reduce concrete's environmental footprint in buildings, so a tool such as BubbleDeck that can replace 25% of the concrete in a slab should be considered part of any green builder's toolbox.

Façade Retrofit Puts An Efficient New Face on Old Buildings

Schüco's ERC 50 Renovation Façade is a modular retrofit system that improves the looks and thermal performance of a building with minimal occupant disruption.

By Brent Ehrlich

What do we do with the large number of aging commercial buildings that have been built over the last half-century? These buildings often look dated, and they can be extremely inefficient; occupant comfort can be a problem, as can operating costs; and all these factors make it difficult to keep tenants. Demolishing these buildings is a waste (see "Retrofits (Usually) Greener Than New Construction, Study Says"), but bringing them up to date comes at a significant cost to owners and disruption to tenants. The ERC 50 Renovation Façade from Schüco, may help change this. This façade is a modular rainscreen system that incorporates windows and can be installed quickly without significantly disturbing occupants, while potentially delivering high levels of thermal insulation.

Installed on the building exterior

The ERC 50 Renovation Façade includes an aluminum load-bearing framework that is secured to the building structure using specially designed brackets. Installed on the building exterior at the ceiling level on each floor, these brackets can be adjusted in any direction to account for walls that are uneven or no longer plumb. The aluminum grid/frame is anchored to the brackets, and Schüco's windows are installed and sealed against the building (the original windows are left intact until the entire exterior façade is finished). Mineral wool insulation is then secured to the building, and the thin panels are mechanically attached to the frame using EPDM gaskets—and without the use of caulk, making it possible for the panels to be easily replaced if damaged. After the façade is in place, the original windows are removed, and the interior is trimmed out.

Designed to integrate multiple components

This system can be configured to provide different thermal performance levels and looks depending on budget and need, but it was designed to integrate several Schüco products, including the company's FW 50 series facades, AWS windows, and even its ProSol TF thin-film solar panels

Photo: Schüco

Schüco's ERC 50 Renovation Façade system can be used to add insulation, high-performance windows, and new cladding to aging, poorly insulated commercial buildings.