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2016 Green Home of the Year Award Winner: Extreme Measures

Posted by **Green Builder Staff**

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Sometimes, the most important accomplishment is simply proving something can be done.

Call it a one-of-a-kind solution for a one-of-a-kind scenario. The Home of Innovation Demonstration House is the first single-family home in the Middle East to earn Platinum certification under the U.S. Green Building Council (USGBC)'s LEED for Homes International Pilot program. It also is designed and built to achieve a net-zero energy balance.

What visitors find truly remarkable is that the house accomplishes those goals even though it was built in Riyadh, Kingdom of Saudi Arabia, one of the world's harshest climates. In that place, high-performance housing is the exception not the rule, according to Rich Binsacca, international communications program manager at IBACOS Inc., the project's innovation consulting firm in Pittsburgh, Pa.

Binsacca says the home demonstrates the commitment that sponsor SABIC—a Riyadh-based chemical technologies corporation—has toward promoting green building. "This is meant to be a business to business program, and SABIC wanted something that building professionals locally and globally could relate to," Binsacca says. "Everyone can relate to a house."

The three-level, 8,600-square-foot home sits within a three-building complex serving the Home of Innovation, a collaborative regional business growth initiative with a focus on better building performance. Two buildings that make up a Collaboration Center the Home of Innovation have earned Gold certification from the USGBC's LEED-NC rating system.

Built as a prototype, the fully furnished house showcases innovative yet commercially available products and systems integrated to achieve high levels of building performance and resource efficiencies. It is intended to steer the region's construction industry toward more sustainable building practices and encourage local industry to manufacture advanced building products, according to Dennis Steigerwalt, managing director of international programs for IBACOS.

"In 2010, [SABIC] had this idea and what it wanted to accomplish," Steigerwalt says. "But what we started with when they came to us turned into something much grander in scale."

Project Stats

Name: Home of Innovation Demonstration House, Riyadh, Saudi Arabia
Innovation Consultant: IBACOS,
Builder: Joannou & Paraskevaides, Ltd.,
Architect/Designer: Zuhair Fayez Partnership,
Interior Designer: theOtherDada,
Photos: SABIC

LEED Needs

To achieve LEED-Platinum and aspire to a net-zero energy balance, the home features a 28-kWh rooftop solar array, a bank of 88 lithium-ion solar batteries that stores surplus electricity for power outages. Saudi Arabia does not yet offer net-metering, but the house is ready when it does, according to Steigerwalt.

The project introduced insulated concrete forms (ICFs) for the home's structural/thermal envelope. Combined with additional air sealing and high-performance fenestration, ICFs reduced the home's overall energy load by at least 30 percent compared to conventional building practices and enabled the optimization—and further energy savings—of heating, ventilating, and air conditioning (HVAC) equipment and appliances.

Although a new and innovative technology for construction in Saudi Arabia, ICFs are a logical evolution from the prevailing use of concrete block, according to Binsacca.

Something—or Nothing—in the Air

Other systems and products featured in the Demonstration House respond to the Kingdom's desire to conserve energy and water resources, and enable healthful indoor air.

Chief among them is a specialized system that senses approaching sandstorms—a common problem in the area—and automatically shuts down all fresh-air ventilation to the home. It then pressurizes the interior of the house to mitigate sand and dust infiltration, according to Binsacca. It's a welcome home improvement tool. "You may not notice it when the storm hits. But the next day, you can see floors inside homes that are covered with thin layers of sand," he says. "It's not a problem we think about, because we don't have that kind of air quality issue here."

The home's central and mini-split HVAC systems, including air filtration and energy recovery ventilation, contribute to a 40 percent overall reduction in energy use compared to conventional homes of the same size.

Energy efficiency abounds in the home's long-lasting lighting fixtures, controls and sensors, low-flow and water-saving plumbing fixtures and appliances, and solar hot water.

Outdoors, there is drought-tolerant landscaping with a high-efficiency irrigation system and no-turf grass areas. These are served by an on-site graywater reclamation system that helps reduce potable water use by 50 percent.

The home features a monitoring system that tracks the home's water use, graywater reclamation, energy use, solar generation and various weather conditions.

Overall, about 92 percent of construction waste is diverted from landfills through recycling and reuse.

Going Public

The Home of Innovation Demonstration House's massive size makes it ideal for large tours and special exhibits designed to educate the masses about green building. In some cases, there's a degree of redundancy to stress the different ways products can work in a given situation or environment.

To help show and tell visitors the story of high-performance housing, two of the home's secondary bedrooms and a shared bath were converted into an interactive exhibit space. This "Performance Zone" features system mock-ups and animated videos, digital and printed content, and key products on display.

"The government and the local construction have always been on board with this project," Binsacca says. "But the real score was the response visitors had to it. In Saudi Arabia, there tends to be a lot of 'show me' by the public when it comes to something like this. A project like this really means a lot to people."

The extremely positive response to the prototype comes in spite of the fact that it functions more as a curiosity than a realistic living place for most of Saudi Arabia's populace, according to Steigerwalt. Some of that is timing: The nation expects to need 3 million more homes by 2025, a 50 percent jump from the 6 million currently present.

Key Components

Alternative Building Systems: Insulation, mini-split HVAC, ERV, fresh-air ventilation for sandstorms)
Appliances: Philips; Samsung; Miele
Building Envelope: ICF (low-E glazing)
Cabinets, Shelves, Millwork: Group Harwal, J&P Ltd.
Central Vac: REHAU
Connections: TE Connectivity (throughout)
Electrical: Badger Meter Europa (electronic water meters); Schneider Electric (electrical and data outlets, electric vehicle charging stations); Legrand (sockets & switches) Vimar Group (electrical controls)
Elevators: Otis
Fire Protection: UTC
Home Controls: Philips-Saudi Lighting Co. (lighting controls); Honeywell (building controls and thermostats); Leviton (security system, lighting controls)
HVAC/Ducts: Carrier (central split heat pump system, central air filter, central air-handling unit, whole-house humidifier); SAFID (air damper, pressurization fan, return air registers, sand filter)
Insulation: FBS Thermomur (insulated concrete forms)
Lighting: Philips-Saudi Lighting Co.
Plumbing/Plumbing Fixtures: Geberit (in-wall toilet tank and actuator); Kohler (fixtures and faucets); Neproplast (distribution and ventilation); REHAU (supply); Watts Water Technologies (back flow prevention); Wavin (low noise flow);Thermaflex (pipe insulation)
Renewable Energy Systems: Saft (solar batteries); Schneider Electric (solar inverter, solar output meter); SunPower (photovoltaic panels); Watts Water Technologies (solar

Construction experts locally and globally have already inquired about buying the floorplans from SABIC. Others are taking notes of elements they can use in their own projects, or methods they can use to train contractors and workers.

“There’s nothing else like this over there that we know of,” Steigerwalt says. “There’s going to be a huge need for middle class housing in coming years. This demo obviously isn’t the type of home that will meet that need. It’s meant to be an idea generator. Hopefully, some of the local builders will come away with ones they can use to address that housing shortage.”

hot water expansion tank)
Ventilation: KDK (local ventilation); Panasonic (energy recovery ventilators); SAFID (ventilation ducts)
Water Filtration: Watts Water Technologies (water filtration system); Pentair (water treatment and chillers)
Water Heating: Grundfos (hot water recirculation pump)
Window Coverings: Somfy (window shading systems); 3M (window tinting film)
Windows, Skylights, Patio Doors: REHAU, Group Harwal

Already open to a lot of natural lighting, the home’s overhead illumination carries further thanks to a 28-kWh rooftop .solar array with 88 lithium ion solar batteries, and skylight windows

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