# CONCRETE HOMES

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## Room With A View

# ICF original soars five stories

By Carole McMichael
Photographs courtesy of Quad-Lock Building Systems Ltd.

If you come across a five-story, 8,000-plus square-foot home with a lap pool on the first floor and a roof garden on the fifth, you might think: here's a candidate for HGTV's "Extreme Homes." Concrete, steel and glass certainly haven't been the common choice of builders in Washington, a state rich in timber. Actually, concrete was not the first choice.

The homeowners wanted to set a Frank Lloyd Wright-style home on a 6-acre site facing a small lake in Auburn, Wash. Herbert Pearson, the architect, and Paul Lockwood, the contractor — project manager for Tohbak Construction Services — explored the choices in the design process, starting with timber. Potential difficulties in putting a five-story house on this unusual site and a desire to build something that would "last forever" soon led to choosing concrete.

"The waterfront section is very tight, with a minimum setback of 65 feet," Lockwood said. "Behind the house, there is a slight slope, then the property opens up into a large space. We looked at tilt-up; but, with this site and as tall as the walls were, we wouldn't have enough of a footprint to prefab the walls and tilt them. We looked at cast-in-place and several ICF options, and decided on Quad-Lock ICF panels because of ease of installation and efficient placement of the rebar. We were able to erect the wall past the next floor structure, put in the floor and work from that level without having to scaffold the walls. Also, it was a lot safer not having to use wood for framing. It is normal on a project with this much concrete work to have at least one worker who will strain his back carrying form wood."

The first-floor level is a daylight basement (holding grade back on one side) that looks out to the lake. There are four main planters that house palm and banana trees. You enter on the second-floor level via a concrete slab suspended over the lap pool on the first floor. The second floor consists of a large living area, storage, a second bathroom, a pantry and the kitchen. The third floor consists of the library, more storage, a book room and a third bathroom. The floor recesses from the corners about six or seven feet at each successive floor until the fourth floor, which consists of one, 1,700-square-foot bedroom. This room was constructed in such a way that if the owners choose to sell the house, it could be divided into four rooms. Extra bathrooms are already roughed in.

On the front and the back of the house, there is a wall of glass and steel that is 45 feet wide and 27 feet tall. The roof garden is covered in black Brazilian slate, as are the floors and walls of the first level.

"We had a standing seam metal roof that has a coppertone finish," Lockwood said. "It sits over rigid insulation that sits over a light-gauge steel stud rafter system. The roof garden does not actually have a roof, but is positioned between two roof structures. There is no wood framing in the house.

"This project required pretty significant engineering. The

*In the center of each stairwell there is a shaft that extends from the lowest floor to the ridge of the highest roof.*

concrete walls do not encompass the entire house. We built two honeycombs on either end of the residence and support the inside with structural steel. The concrete provides the shear and steel frame supplies the lateral."

## Going up

The Quad-Lock foam panel is 4 feet long, 1-foot tall and 2.25 inches thick. The ties holding two panels are made of high density polyethylene. There are galvanized brackets to create corners and angles. Most walls required a 10-inch final thickness, but a few were a foot thick.

According to Todd Ratcliff, technical trainer for Quad-Lock and the tech rep for this project, the biggest challenge was the overall height and the number of angles. The house had only two corners and 19 angles that had to be constructed.

The panel design helped compensate for the extra labor involved in achieving the many angles because they needed bracing on only one side. Both pieces of foam are connected by the ties, so when the bracing is connected to the ties, it controls both sides, keeping the walls plumb.

Before the pour, space for utilities was set into the forms. A foot-wide wooden form like a pocket beam, running the height of the wall, was attached to the inside of the wall, then removed after the pour. Foam was peeled off the inside to access the space. The utilities included water, gas, sewer, power, cable, phone and exhaust vents.

"Each lift ranged from three to six feet," Ratcliff said, "depending on who was on the end of the hose. We would pour a 10-foot wall at a time — do 4 feet, follow with the vibrator and keep going around. We'd stop at each story.

"There are some parameters on the compressive strength of the concrete mix, but the only difference in the mix was in the slump because we like to pour a wetter mix. We get this by adding a superplasticiser. We used the same mix from level one to level five. As we got up in height, the mix flowed forward. When it got up to the sides of windows, it stopped rolling, so we vibrated all our openings to ensure we had good consolidation."

"The site was very space-restrictive with concerns over not disturbing vegetation," Lockwood said, "so pumper trucks were required for all concrete pouring. It would take 28 days for a permanent cure, but we needed to wait only a week before adding weight to the load.

"There were few real problems with scheduling because of the tremendous amount of planning. With the components of this residence, we were able to work on many parts at the same time. Total construction took only 54 weeks (including rain delays upon start of excavation). We had the forming and pouring crew, as well as light gauge framers and structural steel fabricators all working at the same time."

## Solid comfort

"The floors are attached pretty much in the same way throughout the house," Lockwood said. "The roof garden and library do have the strongest floor joists because of the loading. The joists are connected to the ICF with Simpson ICF clips, which are attached to a ledger. The floor attaches to either the ICF, light-gauge steel stud framing or structural steel.

"The house is heated primarily through a hydronic radiant floor system, run by a 98 percent efficient gas boiler. The boiler also heats the pool and provides hot water to a heat exchanger for emergency heat back up. Each floor has a manifold. The small rooms are on their own zone, while the larger, open spaces have multiple zones to adjust for external influences."

Besides air conditioning, there is electronic and UV air filtration and a fresh air ventilator that draws air from the outside. Everything that draws air from the outside cycles through UV light.

## The learning curve

As this was Lockwood's first ICF-built residential home, he had to do a lot of research on how to select a crew. He decided to have a subcontractor who had at least worked with ICFs before, though not with Quad-Lock.

"Using Todd Ratcliff was key," Lockwood said. "He not only helped us through the final design round, but also was instrumental with the application of the product, giving us some pointers so we were comfortable."

"Erecting the first floor was the crew's learning curve and took a little longer than they would have liked, but the next three main floors went up lickity split," Ratcliff said. "They were comfortable with it and picked it up quickly even on such a difficult job.

"Generally, we get a good response to training. We had a green crew put up 2,000 square feet of wall in a day and a half. They loved it — the ease of putting it up. It's new and interesting and absolutely safer. There are no nails used and no noxious fumes from stripping forms."

## Forward-looking features

"One of the interesting design details in this project is the stairwell at either end of the building," Lockwood said. "In the center of each stairwell, there is a shaft that extends from the lowest floor to the ridge of the highest roof. There is a hidden fire door behind a mirror at each level. From the shaft there is a conduit to all phone, data and video junction boxes, including space to accommodate future changes in technology."

The house is set up with a system that allows multiple touch-screen control of a security camera, audio and video.

One of the more challenging design details, according to Lockwood, was a handrail system that was stainless steel and glass. It included irrigated and drained planters.

## The market

Both Lockwood and Ratcliff see concrete housing becoming more popular. Lockwood has already done some more residential concrete projects since the Auburn, Wash. home. He sees the main advantage of building with ICFs in the area of thermal and sound performance.

According to Ratcliff, the main reason people use ICFs is that it is considered a "green" approach to building. "Buyers are more attuned to natural resources — not wanting to cut down trees," Ratcliff said, "and having a house full of materials that can off-gas harmful VOCs. I've done a number of jobs because of air-quality issues. Buyers don't want to damage the environment. They have the 'green' ideal.

"I think there is an excellent future for ICFs everywhere because of the rising cost of conventional building materials, and the cost of utilities in certain parts of the country, such as California. Why not build a highly energy-efficient home? CH

# ICFA elects Quad Lock's Kustermann as chairman

Hubert Max Kustermann of Quad-Lock Building Systems Ltd of Surrey, British Columbia, Canada, has been elected chairman of the Insulating Concrete Form Association (ICFA) Board of Directors, succeeding Ed Storm of Reward Wall Systems. Paul Camozzi of Amvic Inc. was elected vice chaiman.

In addition to Camozzi, the ICFA also elected six other new board members, including: Ron Ardres of Reddi-Form, Steve Paske of Cellox Corp., Bernard Panetta of Perform Wall, Dean Seibert of Windlock Select, Kent Stumpe of Senergy, and Ian Giesler of ICF Builders.

Kustermann said he will focus his efforts this year on four specific areas: promoting integrity and ethics within the industry, highlighting ICFs as a green building material, working with allied associations to advance the use of ICFs, and elevating the recognition of the association and its members.

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**Publications & Communications Inc.**
**11675 Jollyville Rd., Suite 150**
**Austin, TX 78759**
**512-250-9023 • Fax: 512-331-3900**