



CONCRETE HOME IS FORTY YEARS YOUNG

Exposed concrete walls and roof have kept this Southern California home safe and beautiful



Fig. 1 – The house was designed by Whitney R. Smith, FAIA, one of the architects who participated in the famous Case Study House program (1945 to 1966).

Southern California is said to have four distinct seasons: Summer, Wildfire, Landslide and Earthquake. So when Ed Rice built his Bel Air, Calif. home in 1963, he used all-concrete construction to ensure his family would enjoy year-round safety and comfort. After living in the house for more than four decades, Rice says he still enjoys the timeless beauty of the hillside home and its view of the Pacific Ocean. “But what is most beautiful,” he says, “is the peace of mind my wife Linda and I enjoy knowing that the house can withstand the ravages of nature. I can travel on business, for example, and not worry about my family every time I hear a fire siren.”

Safety was very much on Rice’s mind when he built the house. “Our home is in a high fire-hazard location due to the risk of hillside fire storms,” he says. “A major brush fire swept through the area shortly before we started construction, generating a fire front with winds and temperatures that cause wood-framed structures to explode into flames. And living in Los Angeles, the risk of earthquakes is always a consideration. With concrete, I gave my family the best protection available.”

Yet the home he created defies the stereotype of a concrete bunker. Instead, it is full of natural light, warm colors and inviting tactile surfaces. The house was designed by Whitney R. Smith, FAIA, one of the architects who participated in the famous Case Study House program (1945 to 1966) that popularized a casual indoor-outdoor lifestyle. Like the Case Study homes, the Rice Residence uses basic materials and a minimum of decoration, allowing the flow of space and the proportions of structural elements to create visual interest. Every room has floor-to-ceiling sliding glass doors opening to the outside, and clerestory windows and skylights bring light deep into the home’s interior. Artistically placed panels of colored glass send shafts of multi-hued light dancing across floors and walls.

“Whit Smith started by designing the courtyard and built the house around that,” Rice says. Guests enter into a generous foyer with views straight ahead into the courtyard. The foyer flows into a two-story-high living room to the left and a skylighted dining room to the right. The kitchen, family room, swimming pool and other family



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activity areas are located off another side of the courtyard. Bedrooms are on the remaining two sides of the courtyard, and an upstairs guest suite now serves as Rice’s home office.

CONSTRUCTION INNOVATIONS

The creative design is complemented by an equally innovative structural system. Interior and



Fig. 2 – Every room has floor-to-ceiling sliding glass doors opening to the outside, and clerestory windows and skylights bring light deep into the home’s interior.



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exterior walls are integrally colored split-faced concrete masonry units that have the texture and appearance of ashlar limestone. The walls are reinforced and filled with grout to resist seismic forces and provide acoustical privacy. Concerned about hillside stability, Rice used drilled concrete piers, bearing on solid rock, for the foundations. The higher cost of piers was offset, however, by allowing the reinforced masonry walls to span between piers without the use of grade beams or continuous spread footings, a structural economy that also permitted faster construction.

The walls support post-tensioned concrete floor and roof slabs made with Type K shrinkage compensating cement. These two technologies worked together to prevent cracks from forming in the concrete slabs. Rice took advantage of this attribute by deciding to omit any form of roofing membrane and to leave the concrete roof deck exposed.

Incredibly, the roof has never leaked, despite more than 40 years of exposure. This fact is even more amazing when one considers that the roof is completely flat and not pitched to drain. The roof deck does double duty as patio, playground and storage area—usage that could cause leaks if ordinary types of roofing had been used. “The only time we have ever had a leak is when someone left a window open in a rainstorm,” Rice says.

The house is believed to be the first residential building built with post-tensioning and shrinkage compensating concrete. Rice was a pioneer in the use of these technologies and was recently honored by the Post-Tensioning Institute as a “Legend of Post-Tensioning” for his contributions to concrete engineering. In addition, as Chairman of the Board of CTS Cement Manufacturing Corporation, he has been one of the developers and leading proponents of Type K cement.

“Concrete itself is a good barrier to water penetration, but leakage can occur through cracks,” says Rice, sounding very much like the University of California, Los Angeles, professor of engineering and material science that, for many years, he was. “Portland cement cracks because it shrinks as it dries. However, shrinkage compensating cement expands slightly as it cures. The two types of cement can be blended



Fig. 3 – The foyer flows into a two-story-high living room to the left and a skylighted dining room to the right.



Fig. 4 – The house is believed to be the first residential building built with post-tensioning and shrinkage compensating concrete.



Fig. 5 – The kitchen, family room, swimming pool and other family activity areas are located off another side of the courtyard.

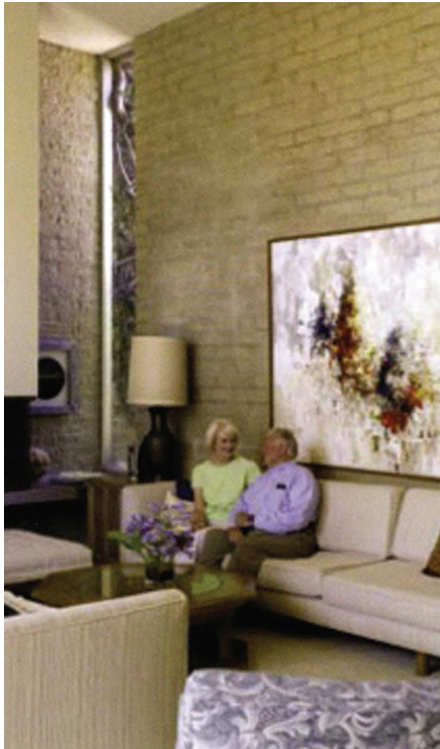


Fig. 6 – The Rice Residence uses basic materials and a minimum of decoration to create a visual interest.



Fig. 7 – Artistically placed panels of colored glass send shafts of multi-hued light dancing across floors and walls.

together to compensate for shrinkage and reduce the potential for what is known as “drying shrinkage cracking.”

Concerning post-tensioning, Rice explains that “concrete is strong in compression but relatively weak in tension. In post-tensioning, we run high-strength steel cables through the concrete slabs. We stretch these cables, sort of like rubber bands, so that they keep the concrete in compression and prevent tension cracks from forming.”

Using post-tensioning and Type K cement in tandem can prevent crack formation and make concrete watertight. “Both techniques are widely used in non-residential construction,” Rice says. “With the resurgence of interest in concrete homes, I expect builders will increasingly find innovative uses for these technologies.” (Additional information is available at CTScement.com and post-tensioning.org.)

Now, after the structure has endured four decades of exposure to brush fires, earthquakes, 100-year rainstorms, and even teenage children without damage, Rice wryly observes, “I think we can comfortably conclude that the experiment was successful.”

AFFORDABILITY AND SUSTAINABILITY

The home’s success can also be measured by the affordability of the all-concrete structure. Despite the widespread assumption that concrete construction is more costly than wood framing, Rice says concrete is surprisingly affordable when overall construction costs are considered. For example, says Rice, “Using exposed concrete walls and roof decks saved the expense of installing additional finishes and roofing.” It also allowed the family to move into their house just six weeks after above-grade construction began. “Our third baby was on the way,” Rice remembers, “and we wanted to be settled in the new house before she was born. By using all-concrete construction, we could move in as soon as the structure was enclosed.”

Construction costs, however, are just part of the total cost of ownership, and the house has proved to be quite economical to operate. “The all-concrete construction means that my

property insurance is underwritten at the lowest rate, despite the high-hazard location. The savings in insurance premiums alone has more than recouped any additional costs incurred for concrete construction,” says Rice.

The mass of the concrete provides “thermal inertia” to keep the interior comfortable regardless of outside temperature swings. Despite California’s hot summer, Rice points out that “the only room requiring air conditioning is the office, and that’s because a sliding glass door, positioned to allow views to the ocean, allows the late afternoon sun to overheat the room.”

Moreover, the concrete finishes and roof deck continue to minimize maintenance costs. “The concrete walls have never had to be painted, and I will never have to pay to re-roof the house,” Rice says.

Many of the factors that make the home affordable—low energy consumption for heating, cooling and lighting—also make it an environmentally friendly building. The light-colored concrete roof reflects solar energy instead of using it to heat the atmosphere around the building. The low-maintenance finishes and roof reduce the ongoing environmental burden of applying and disposing of layer upon layer of finishes and re-roofing.

In a recent move to improve both the affordability and sustainability of the house still further, Rice has installed photovoltaic (PV) solar energy collectors on the roof. He recovered much of the cost of the collectors through utility company rebates and tax credits, and gets to bank his excess power with the electric utility company to withdraw when needed. The solar system generates so much electricity that he has even installed an electric water heater so he can reduce his bill for natural gas. Plus, Rice notes, “The PV installer said this was the easiest installation job he ever had. On other buildings, he has to worry about waterproofing and flashing. But here, he could just anchor equipment right into the concrete deck.”

LIVING WITH CONCRETE

While Ed Rice is always ready to talk about the concrete construction of his residence or to show



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KOMPONENT

visitors his concrete research laboratory in the basement, wife Linda Rice sees it differently. To her, the structure is just “home,” and she would rather show a guest her garden or the most recent creation from her silk-painting studio in one of the bedrooms. Still, she admits to having developed a good-natured fascination with concrete. “I had to, living with Ed,” she says, laughing. “One day, for example, I went to bake cookies and found the oven full of concrete samples Ed had placed there for drying.”

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