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A rapid evolution of concept. That's how innovative architect and home builder Michael Frerking describes his professional process and approach. His design and build company, Living Systems Architecture and Construction continually develops brand new technology and integrates into the overall architecture, creating some of the most efficient structures by any grading scale in the United States or Europe. Whether it be light diffusing reflector decks, alternative-cutting edge materials or even connecting and collaborating with highly intelligent clients, Michael's projects come together with a sense of creative continuity and a personal passion. The culmination of these tenets can be seen in The Tidwell – Teachy Residence, Frerking's most ambitious and innovative project ever.

Materials:
Hydraulic Cement, or Portland cement, is the largest carbon producer of any single building material. Magnesium Oxide is an alternative binding material and the only real product viewed as a contender to replace Portland cement. Magnesium Oxide (MgO) sequesters more energy than is required to make the product which renders it net minus in terms of Carbon production and environmental impact. The benefits of MgO in construction have been known for thousands of years and it can be found in the motar used to bind sections of the Great Wall of China. The material has been slow to be widely utilized in the west but since Frerking works directly with the manufacturer of Magnesium Oxide in the United States he is able to put it on the ground with the Tidwell-Teachy Residence, another instance of Living System's streamlined design-build methodology that leads to sustainable results. Aiding in the production of responsible materials was Premier Chemical who provided custom chemical mixes compatible with the earth and materials in the local site area.

Lighting:
The Tidwell – Teachy project features Michael Frerking's reflector deck technology to light and heat the interior of the house. "For passive solar heating to work effectively it requires a large amount of light which typically means a lot of glass and clerestory windows, which also means a fair amount of glare and bright spots throughout the home," says Frerking. "The

reflector decks take the light and reflect it up onto the ceiling, bringing it deep into the home and diffusing it throughout the space, the resulting affect is pleasant and free of glare." The diffused light also helps store heat in a thermal mass, increasing the efficiency of passive solar. "Lighting a residence in this way really is an art form," says Frerking.

Exterior:
Living Systems always considers the regional climate and how it affects the longevity of materials when choosing materials and designing the exterior of homes and buildings. Any materials exposed to the Arizona sun and heat will determinate rapidly and there is always an effort to create exteriors where only masonry or metal will be exposed to the harsh solar environment and not wood.

Design:
Although the technology that Michael Frerking and Living Systems employs is cutting edge and in many cases years ahead of what other builders are doing, there is a conscious design choice to make the advanced systems work within the boundaries of good aesthetic design. The Tidwell – Teachy Residence is a good example of that, the project will be an attractive home in the regional style while being wholly unique at the same time. "One of the things I do is to integrate the systems visually into the architecture, to create a beautiful and efficient home without it looking weird or different," says Frerking.

Water / Energy:
The residence a true Net positive home, creating more energy and electricity than it consumes and nearly creating more water than it will use as well. The project uses a night sky radiation cooling source which involves water tubes running under the roof. At night this becomes a radiator and circulates chilled water to cool the floor mass and provides cooling for the house during the day. The Tidwell-Teachy Residence also uses a Grid-Tie Photovoltaic system, selling excess power to the gird in the summer time and buying energy back during the winter. In addition, the house also achieves net zero water use via a substantial 15,000 gallon rain water harvesting system.

Client Collaboration:

With increasing consistency Michael Freking finds himself working with clients who not only understand the current green technology but have a scientific background and some have even been a part of developing these technologies or patents themselves. "I find sophisticated client, or in many cases they find me," says Frerking. "It's been getting typical to build for scientists with a background in sustainable research, these are smart people who push the edge, do their part and they want to be participants in the process." This was certainly the case with the Tidwell project. The owner wanted a home and sought out Living Systems to design and build it. This particular owner has a background in laser optics research in the aerospace field and his expertise found its way into the design of his home through a collaboration with Living Systems. "We took his understanding in optics and used it to take what we do further," says Frerking. The owner's input and evaluation of Living System's reflector decks resulted in a minor tweak that increased their efficiency 40%. "This project was exciting, in terms of technology we've leapt forward several years at least," says Frerking. "It's the most innovative thing I've ever done."