

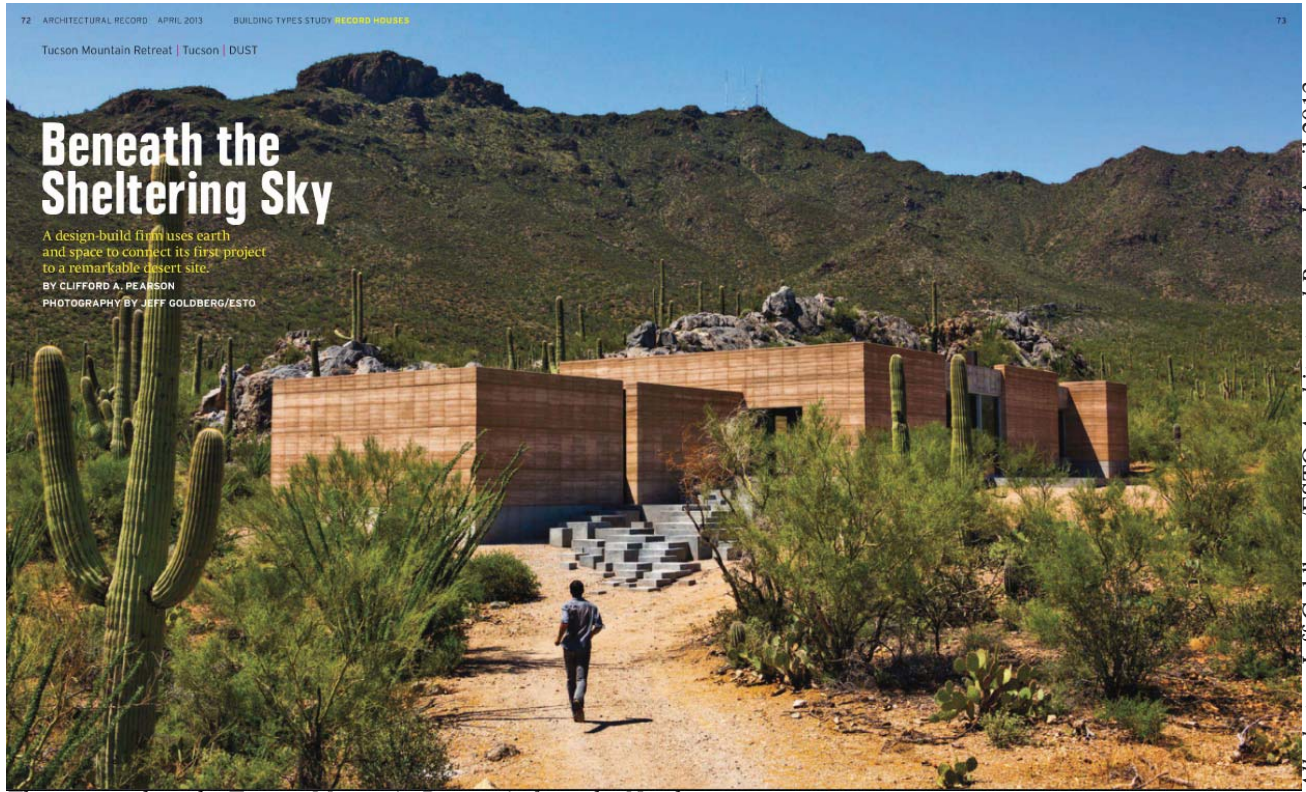
Arch 464
ECS
Spring 2013

Name _____

Quiz #3

"Desert Energy"

Read and look at everything before you write!



The approach to the Tucson Mountain Retreat is from the Northeast.

For this problem you are the sustainability consultant for the homeowners, David and Karen Francis and Dust, a design/build firm. The design team is not satisfied with all the green architecture strategies employed on the site. The completed building features some passive design strategies. Your role is to suggest greener and more poetic alternatives for site energy creation and green architecture features throughout the building and on the site.

Context. The site is in the desert near Tucson, AZ. Tucson has little rainfall and predominately clear skies each year. The building is connected to city utilities, but has the potential for using them only as back-up for this potentially self-sufficient home.

Description. *Architectural Record* described the project in its April 2013 issue. The text of that description is on pages 2–3 of the quiz.

READ THE ENTIRE QUIZ BEFORE YOU BEGIN!

CADE HAYES admits he was nervous when he started work on the Tucson Mountain Retreat, a 3,650-square-foot house on the edge of Saguaro National Park. Having grown up in New Mexico, he had developed a love of the desert. “It was our first project and we didn’t want to scar the land,” says Hayes, who runs DUST, a Tucson-based design-build firm, along with Jesus Robles. Both Hayes and Robles studied architecture at Texas Tech, and Hayes had worked for architect Rick Joy for five years, so they had the skills for the job. But their respect for the area’s rugged yet fragile terrain kept them humble in the face of building on it.

Luckily, their clients—David and Karen Francis, who live in San Diego, and their daughter Nina, who is at college studying music—shared their kinship with the land. David Francis grew up in Tucson and wanted a house there for weekends and vacations, a place where he could reconnect with the desert and indulge his love of music. He had visited a friend who owns a rammed-earth house designed by Joy and told him, “You’ll have to call 911 to get me out of here.” But instead of commandeering his friend’s residence, he bought a 6½-acre site nearby in the Tucson Mountains and built his own house. “I wanted a low-maintenance place, since we would be there only part time,” says Francis, explaining why he picked rammed earth. “And it just seems like the right material for this area.”

The decision to use rammed earth informed the entire design process, starting with the orientation of the house and its placement on the site. To exploit the material’s effectiveness in absorbing heat from the sun during the day and releasing it in the evening when outdoor temperatures drop significantly, Hayes and Robles aligned the rectilinear structure along an east-west axis so the main elevations faced north and south. Only one small window interrupts the thick walls on the west, and none on the east. The architects and clients wanted the house to embrace the desert—not hunker down in it—so they opened all its main rooms to big views and shaded patios on the north and south. Floor-to-ceiling sliding glass panels can turn interior spaces into covered extensions of the outdoors. “The clients wanted each room to be just one step away from the land,” says Hayes.

The earth walls, which range from 18 inches to 3 feet thick, snake through the house, protecting rooms on two or three sides and imprinting both interiors and exteriors with their warm, textured presence. But the architects wanted to be



One of the bedrooms (left) and the music room (right).

efficient with materials. “Wherever we could take away a wall, we did,” says Hayes. Likewise, the clients pushed for efficiency in layout and asked for no hallways. So the architects devised a plan that works as a trio of attached boxes—one for a bedroom wing, one for the living/dining/cooking space, and one for a music room that can double as a guest suite. Each box is entered only from the outside: a narrow slit in a rammed-earth wall for the bedrooms, a deep porch for the living pavilion, and a simple door off a patio for the music room. This means people have to go outside to get to another part of the house, but Francis says, “It hardly ever rains here. And it reminds you that you’re in this wonderful desert.”

Concrete beams that are 3 feet 3 inches deep extend 40 feet in the living pavilion and 46 feet in the bedroom wing to tie the boxes together and support the roof, which has a 450-square-foot deck for stargazing and margarita sipping. A winding steel stair tucked away in a small office leads to the roof, while a dumbwaiter delivers the margaritas. The clients plan to move in this spring, and Francis is looking forward to testing out the music room, which could serve as a professional recording studio.

This being Tucson, water is a critical issue. Small pumice stones on the roof filter rainwater, which goes to a 30,000-gallon cistern buried in the ground. Landscaping, which will begin soon, involves bringing the desert right to the house and will include native plants growing between the concrete steps that cascade down the slope from the front door. Right now those variously sized concrete blocks stick out against the dry terrain, but they will eventually look as if the desert is enveloping them. Connecting to the land is what this house is all about—whether you’re in the living room appreciating the views, on a patio breathing the desert air, or on the roof lost under a starlit sky. ■



Analysis

3 points 1. Given the building siting and orientation describe three successful strategies that the architects used to reduce energy consumption on the site. Fully explain the effects of these three strategies.



1

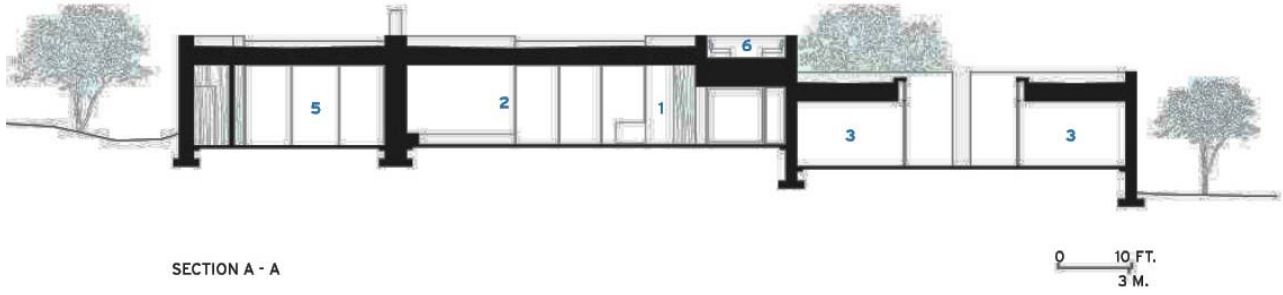
2

3

Site Energy

3 points

2. Discuss the possibility of using three different site energy sources for this building and show how they could be deployed on the building or the site.



1

2

3

Green Components

3. Fully describe two green architecture strategies that the architects used that could achieve LEED points in an area other than energy conservation. And describe two non-green features of the house

4 points



1

1

2

2