BRICK BY BRICK: BUILDING A MODERN ADOBE

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In 2008 my husband and I completed a seven-year project building our adobe home by hand on the north slope of the San Gabriel Mountains at 4500 feet elevation overlooking the Western Mojave Desert. We had attended a four-day workshop with Joe Tibbets at his Southwest Solaradobe school in Bosque, New Mexico, to learn how to make stabilized adobe blocks and how to build walls. Thanks to Joe we learned of Rob Mehl, RPM Architects in Santa Ynez, California, and Fred Webster, seismic engineer, from Menlo Park, California. When we approached Los Angeles County Building and Safety, we were denied a building permit for an adobe house because they said there was no code for adobe, so we flew Fred down for a meeting with their Research Unit in Alhambra, and Fred took *their* code book off *their* bookshelf and pointed to the masonry code that covered adobe. “Well,” they said, “okay we won’t say no yet. Turn in your plans and we’ll take a look.” Without Fred we would never have obtained the permit.

Figure 1. 2.5 Gallons asphalt emulsion.

Figure 2. Brickyard.

Our adobe formula

When we went to Southwest Solaradobe, we brought with us a five-gallon bucket of our soil, and Joe put some in a jar, shook it up with water and observed how it settled out. He proclaimed our soil a perfect combination of clay, silt, and sharp sand. All we needed was asphalt emulsion to create stabilized adobes. We made small test bricks and weighed the dirt and the asphalt emulsion in each one. We set the bricks on sponges in a pan of water and left them overnight, weighing them before and after. To make stabilized adobe the brick could not gain more than 3% in water weight overnight. Our final adobe mix was forty shovels of dirt, 7.5 gallons of water, and 2.5 gallons of asphalt emulsion for each mixer load (Fig. 1).

With local help, we made 14,500 adobe blocks, 16” x 7.5” x 4”, working every weekend for one summer, using the local soil set aside during the grading of the house pad (Fig. 2). At the end of each day, in the hot desert sun, we rolled the blocks up on edge to dry, and then a week later, we could stack them. We built the garage first and lived in the garage for two years while building the 3700-square-foot house where we live today.

Passive solar

An essential element of Rob’s design was situating the house on an east-west axis to take advantage of passive solar concepts based on the seasonal movements of the sun across the sky. The length of the eaves was critical. During summer, when the sun is high in the sky, the eaves block the sun from touching any of the glass windows and doors on the south side of the house. Conversely, in the winter when the sun is low in the sky, the eaves allow the sun to shine into the house, reaching halfway across the house to warm the interior.

Seismic safety

At our first meeting with Rob and Fred, Bruce expressed his desire for the house to mimic the shape of a Yucatecan Maya house, straight parallel sides with round ends, prompting Fred to ask if Bruce was married to this idea. Bruce came back with an “absolutely!” From then on Fred was dealing with the

Figure 3. Galvanized steel rods.

Figure 4. Round end and buttresses.

Figure 5. Eight cross-ties.

Figure 6. Laying block around the steel rods.

additional engineering involved in making this racetrack-shaped house seismically safe. I thought it would be the rounded ends that involved many more pages of the engineering calcs that ended up in a thick binder, but no it was the very long straight sides that would necessitate Fred's creative genius. He came up with the ten buttresses to prevent the walls from falling out and the eight 3x12 cross-ties to keep the walls from falling in.

Following Fred's plans, the house incorporates multiple seismic elements. Vertical galvanized steel rods (Fig. 3) are placed every four feet in the adobe walls, anchored in the concrete footing with a j-hook and threaded at the top to receive a nut. Around the top of the wall is a 16-inch wide by 9-inch deep concrete and rebar bond beam and a wooden top plate. Each vertical rod coming from the footing passes through the adobe wall, through the bond beam and top plate, and receives large washers and nuts screwed down tight. More steel in the wall: on top of every third course lies a horizontal heavy wire truss tied onto the galvanized steel rods.

Ten buttresses (Fig. 4) were essential to Fred's seismic engineering plan. Like the walls, the buttresses are two feet thick. The footing for each buttress is two feet wide by three feet deep and is ten feet long: four feet under the buttress itself, two feet under the wall, and another four feet extending under the floor of the house. It is a huge mass of concrete and steel that will steady the house when the big one comes. If this house moves at all during an earthquake I swear it will move all of one piece! The house is built like a tank!

Figure 7. Using the vertical level.

Figure 8. Bond beam on top of the wall at entry.

Figure 9. Setting the front door header.

Figure 10. Truck crane placing ridge beam.

Another seismic essential is the design of the forty-foot 3x12 cross-ties that span the entire width of the house (Fig. 5). There are eight of them, two at each of the four posts (tree trunks) that support the ridge beam. The cross-ties are anchored with custom steel plates to the tops of the walls and bolted to the posts. The buttresses keep the walls from falling out, while the cross-ties keep them from falling in.

Years later, we were saddened to hear of the passing of Fred Webster, engineer extraordinaire. Speakers at his memorial service recounted his brilliance, his outside-the-box thinking, and his ability to solve complex engineering problems. He was paramount in the specialized world of adobe engineering. We live with his generous presence every day in this house.

Building the house

Bruce marked the perimeter of the house with chalk line and used his Bobcat to dig the footings two feet wide and three feet deep - not an easy task because the house pad was compacted to County standards and was extremely hard and dense. Once the footings were dug we ran two parallel lines of rebar around the bottom of the trench and tied rebar cages every sixteen inches with parallel rebar running around the top. We set this rebar structure on top of and wired to “dobies” - little 4 x 4 x 4-inch concrete blocks that suspend the structure off the ground so that when the concrete is poured

Figure 11. Rafters at west end .

Figure 12. Corten steel roof.

it completely surrounds the rebar creating the steel and concrete footing that supports the two-foot thick adobe walls.

We carefully placed each 28-pound block (Fig. 6) adjusting every block for vertical. Each adobe block has its own unique shape and slightly bulging sides, so to test for vertical we used a long level with a small block of wood attached at each end. We placed the bottom block of wood against the concrete footing and the top block of wood, which could slide up and down, against each recently set adobe to ensure that the wall would remain vertical to the footing, regardless of the protruding curved sides of the adobe blocks in the wall below (Fig. 7).

As the walls got taller, we had to use scaffolding inside and out. One of us would load blocks up onto the scaffolding and the bricklayers would lean down and heft a block up onto a layer of mud, the mortar between the courses. One of the guys would toss shovels of mud up onto the latest course of block, or we'd use hods to bring mud up to the top of the wall. While the mortar was still wet, we would strike the joints with a joint tool and then brush them with a whisk broom to get just the right look.

At the top of the wall we constructed a bond beam (Fig. 8), an essential element of Fred's seismic design. The bond beam is a 16-inch wide by 9-inch deep channel of concrete and steel rebar that runs completely around the house at the top of the wall. We formed that channel by making specially sized veneer blocks,16 inches long by 4 inches wide and 4 inches high, and set them in two courses along the inside and outside of the wall leaving the 16 x 9 void in the center for the concrete and steel.

Over each door and window we placed massive headers (Fig. 9), each one made of three pieces of redwood, bolted together in such a way as to leave a center channel for the concrete-and-steel bond

Figure 13. South side of house, summer.

beam to continue uninterrupted around the top of the wall. After the walls were done, we placed the ridge beam (Fig. 10) across the center posts and set the rafters (Fig 11) and then the roof (Fig. 12).

Conclusion: Experiencing the poetics of adobe

Stepping through the ancient wooden doors from India, past the alcove with saints and angels, over the threshold into the interior is like entering a sanctuary. The adobe walls feel protective, womb-like, cool and quiet with a low vibration. You feel protected, your heart slows, your mind quiets, your breathing slows. Then with two steps down into the living area you feel the space expand as the ceiling soars quietly overhead. This is the wow moment.

Living in this house surrounded by nature, the quiet inevitability of the house and its surroundings is pervasive and now includes the acceptance of the burned landscape. The sculptural blackened forms of the skeletons of the junipers, the piñon pines, and the Joshuas stand as permanent reminders of the September 2020 Bobcat Fire. And yet inside the home you are sheltered. The firemen called our house a “stand alone.”

Made of earth, the house is coupled to the Earth. As you live and work and move through the house, Earth energy flows upward into your feet, your legs, filling your body, and finally quieting the mind. You are surrounded by earth as in a cave: quiet, sacred, ancestral. Whether you are sitting, reading, cooking a meal, or working on the computer, you feel yourself in the body of the house, notched into the side of the mountain, permeated by the slow energy of the adobe, and the ancient energy of the mountain.

Stevie Love *is a working artist using thick juicy acrylic paint to form paint-sculpture hybrids that drape against the wall, inspired by intense energy, joy, and nature. Love’s work has been featured across the U.S., Asia, and Europe, and is in the permanent collections of the Museum of Art and History, Lancaster, California, and the Riverside Art Museum, Riverside, California.*