Backfill

Straw-Bale Vault

by Janet Armstrong Johnston

It's not every day that a world-famous artist asks you to design and build a retreat honoring the work of Egyptian architect Hassan Fathy — in highly seismic Joshua Tree, Calif., to boot. Some years ago, the design/build firm I worked for received just such a request from composer Lou Harrison, who at the time was 80 years old. (He died in 2003, after the building was completed.)

Fathy, a proponent of traditional building forms and sustainable design, frequently used vaulted roofs. We had been working with straw-bale construction for a number of years and knew builders who were experimenting with self-supporting vaults — but no one had ever built one on a permitted job. It took some doing, but after three years and one full-scale structural test, we got a building permit for a straw-bale home with load-bearing walls and a barrel-vault roof.

During a weekend bale-raising, 30 friends stacked straw walls and buttresses over pressure-treated plates on a grade-beam foundation. The bales were covered inside and out with full-wall-height 14-gauge wire mesh, which had been embedded in the grade beam and would later be embedded in bond beams on top of the walls.

To support the construction of the 20-by-40-foot vault, we built a falsework of arched plywood ribs on 2x4 legs. We strung wire mesh over the falsework **(1)** and, using wood wedges as spacers, stacked the vault bales **(2, 3)**. Later, we placed mesh over the top of the bales, tied it through to the interior mesh with wire, and solidified the arch by filling the wedge spaces with a concrete-perlite mix. For six weeks we let the weight of the vault compress and strengthen the walls; periodically we shortened the falsework legs. To our chagrin, we had to rehang the doors — twice.

Finally, when the walls stabilized, we removed the falsework and completed the structure by plastering all surfaces with cement stucco. The top of the vault is waterproofed with a paint-on acrylic/latex product.

Janet Armstrong Johnston, *an architect, owns StrongArm Construction in Joshua Tree, Calif.* *Special thanks to contractor John Swearingen of Skillful Means and project engineer David Mar of Tipping Mar + Associates.*