

Case Study: Hospitality

Rancho Arroyo Grande: A New Standard for California Wineries

By Claire E. Tamburro, ASID

The owners of Rancho Arroyo Grande originally planned to develop their newly acquired 4,000 acres, located on the central California coast near Pismo Beach and San Luis Obispo, into a community of homes.

As Gary and Thereza Verboon spent more time on the property, once the site of a 125-year-old winery that had burned down and lain untouched for a decade, they felt the peace and beauty of the landscape should be preserved and the property restored to its original purpose. The Verboons decided to take their restoration plan a step further and re-create a winery that would attract visitors to the Central Valley area—famous for beaches, cattle ranches, mountains, canyons and abundant wildlife—and to do so by incorporating sustainable design and building practices.

Centuries ago, Franciscan friars introduced the wine-making custom to the California central coast area, which now boasts more than 100 wineries. Rancho Arroyo Grande, scheduled to open sometime in 2005, will stand apart from its regional competition by hosting community events, festivals, wine tastings, trade shows, educational tours, rodeos and, eventually, a bed and breakfast. The owners' ambitions also include producing more than 100,000 cases of wine annually.

The Verboons turned to Integrated Structures, Inc., a Berkeley (Calif.)-based architectural and engineering firm, to help them realize their vision. The firm is renowned for environmentally conscious projects that include schools, churches, wineries and residences throughout the United

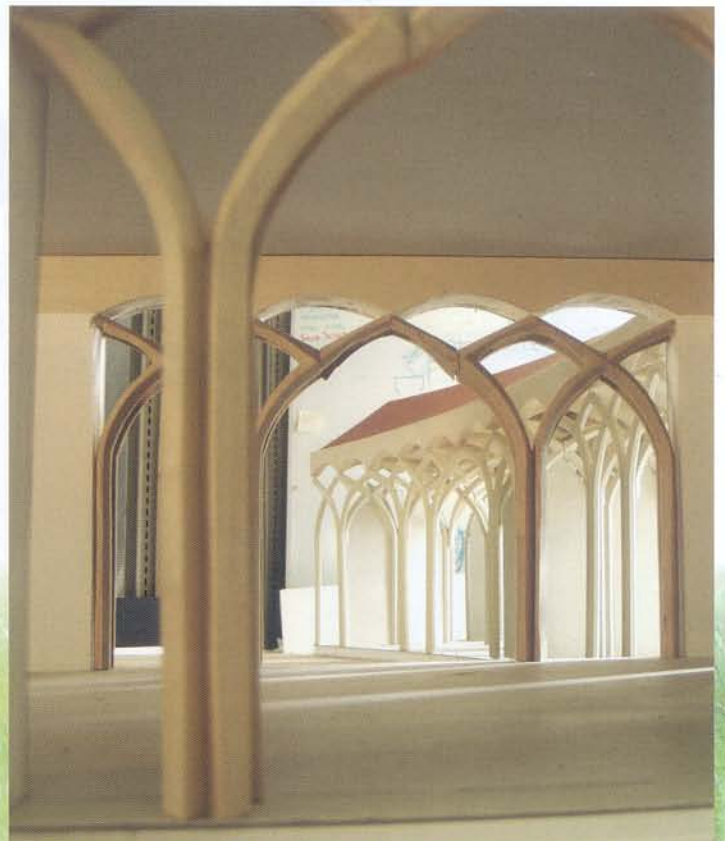


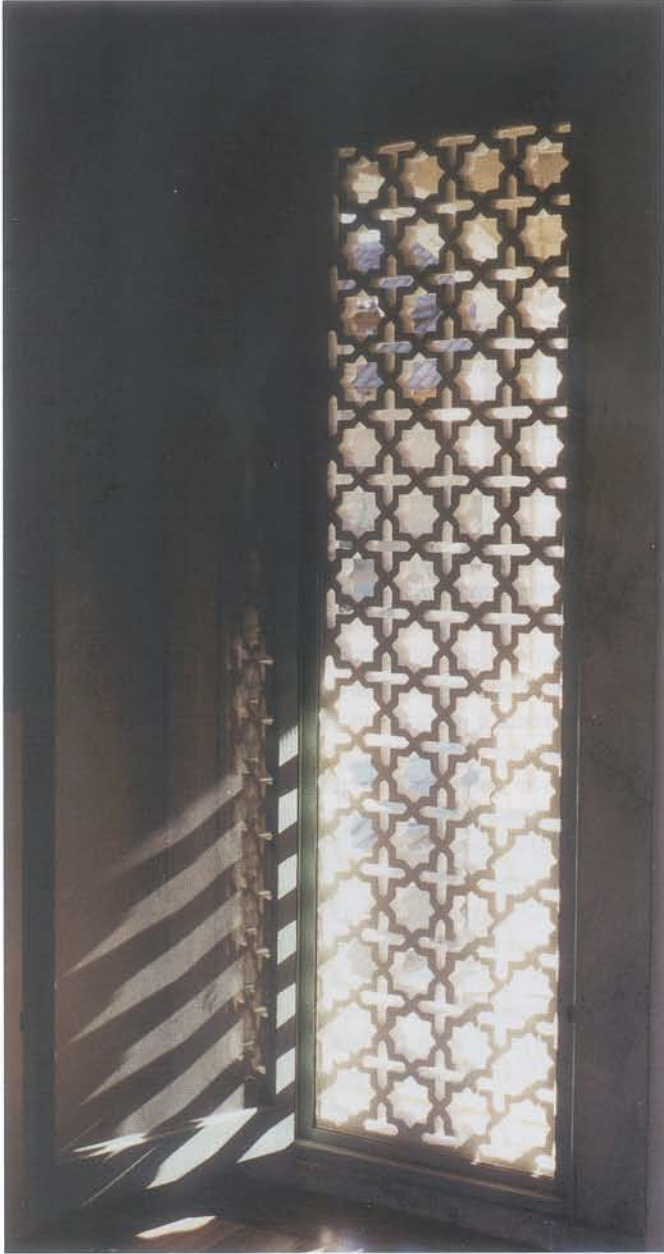
▲ *Watercolor rendering of Rancho Arroyo Grande elevation by Jon Havrilesko of ISI.*

States. The brainchild of R. Gary Black, Allied Member AIA, professor of architecture at the University of California at Berkeley, Integrated Structures combines age-old design and building techniques with environmentally conscious innovations, and employs Black's scholarly research of concrete lattice structures, heavy timber connections and straw-bale construction.

Black and Cullen Burda, vice president of Integrated Structures, plan to incorporate each component of the winery, outbuildings and surrounding landscape into an environmentally sound (their goal for the project is a LEED™ Platinum rating) and aesthetically pleasing compound. The design includes constructed wetlands, micro-turbines to produce electricity, straw-bale construction with a spar membrane system, roofs with hydronically insulated panels for radiant solar collection, photovoltaics (solar cells) and pine

▼ *Computer rendering of Rancho Arroyo Grande by Jon Havrilesko of ISI.*





Typically, terrazzo flooring can run as much as \$95 per square foot. Integrated Structures' method costs about \$20 per square foot. The team's preparation method uses Styrofoam™ forms hot glued to the slab, instead of the brass, zinc or copper forms usually used. Once the first color of terrazzo is cured, the Styrofoam is popped out and the second color is poured. Since it is the metal forms that drive up the cost of this type of flooring (as much as \$5 per piece as opposed to \$0.50 per piece for Styrofoam) this method saves considerable expense.

Through Integrated Structures' cost-effective sustainable design and building practices, the Verboons' ambitious vision for Rancho Arroyo Grande is taking shape. Future guests will visit a tasting room that blends natural materials, such as stone and Venetian plaster, to blur the line between interior and exterior and enhance the stunning outside views that the Verboons strove to preserve and complement. Rancho Arroyo Grande stands to illuminate both the delicacy of red wine and the comfort and aesthetics of a green interior.

For more information about Rancho Arroyo Grande, go to www.ranchoarroyograndewines.com. For more information about Integrated Structures, Inc., visit www.integratedstructures.com.

◀ Part of the "night cooling system," the concrete screen provides security and ventilation when the shutters are open.

All Rancho Arroyo Grande photos courtesy Integrated Structures, Inc. Photos by ISI.





▲ Cast-in-place concrete column and arch with lacquered copper inserts give authenticity and rustic elegance to the interior.

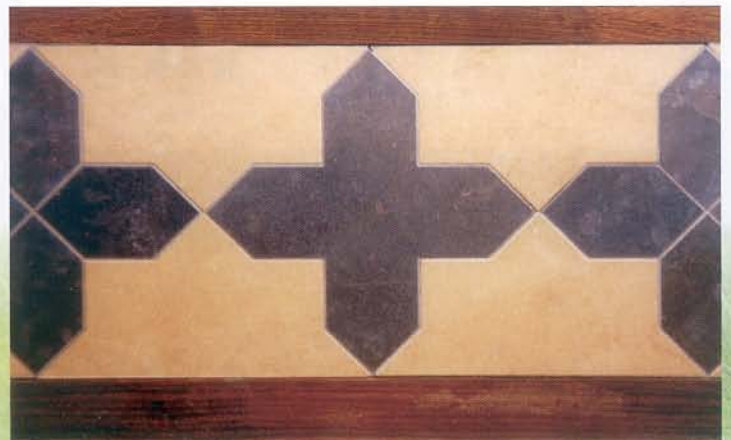
Conventional wineries require electricity for HVAC systems to maintain a desired temperature throughout the day and night. In contrast, the "night cooling" system by the design team allows the cool night temperatures to be trapped inside the building and insulates against the warm temperatures during the day. Black explains that sensors throughout the building detect whenever the outside air is cooler than the inside air. These sensors then automatically open motorized shutters and draw cool night air into the building through a screen. Simultaneously, fans near the ceiling blow warm air that has risen to the outside. The air is cooled throughout the night so that by morning it is approximately 52 degrees. The sensors again tell the automatic shutters to close as the sun comes up. The straw-bale construction then comes into play. The inner and outer concrete slabs are each three inches thick and infused with the cold temperatures from the night. When the sun rises the exterior wall is approximately 50 degrees.

By mid-afternoon the exterior wall has been heated by the sun to approximately 80 degrees. The heat begins to travel into the interior wall but meets the straw-bale insulation. As the day progresses, this insulating layer will also heat up but is so thick that this heat will barely reach the inner slab by the end of the day. In this way the three layers prevent the heat of the sun from penetrating the interior of the building, thus insuring the cool interior temperature achieved the previous night is maintained, and the process starts again.

Integrated Structures also devised a way to integrate solar heat. The roof is a ½-inch to 2-inch concrete slab with an inside layer of ½-inch water pipes used for radiant heat. Below the pipes is a layer of polystyrene insulation and below that another slab of ½-inch to 2-inch concrete on the interior. The sun heats the water in the pipes during the day, which is then sent throughout the winery and can be used as steam to prevent bacteria growth. Gravity also is used to move water throughout the compound, instead of electricity for pumps, so energy costs are low.

Cutting construction and energy costs, the design team is able to create a more luxurious interior than the budget otherwise would have allowed. For Rancho Arroyo Grande, Black plans to institute techniques similar to those Integrated Structures developed for another winery project, which required expensive two-toned terrazzo flooring. Terrazzo is a mixture of cement with marble dust and pieces mixed in for aggregate. Once poured into place and cured, the terrazzo can be polished to bring out the colors of the marble. This type of flooring, which produces a beautiful and durable surface, is considered eco-friendly because it uses discarded material and has a long lifecycle. Some installations have lasted more than 30 years with little or no sign of wear.

▼ Terrazzo flooring is considered eco-friendly because it uses discarded material and has a long lifecycle. It is also exceptionally durable.



resin—a natural byproduct of a nearby paper mill—to pave the roadways.

Although it would seem the price tag of these sustainable practices would generate costs in excess of typical construction methods, the ultimate value of the firm's design stems from its fundamental mission to design buildings made to last a century or more—three times the life span of more traditional buildings. Some Integrated Structure designs, moreover, are more cost efficient than traditional alternatives: the firm seeks to eliminate wasteful construction practices and to use untapped energy sources within the structure itself, reducing the budget and conserving resources. Furthermore, the end result of sustainable designs, such as a natural, energy-saving temperature control system, will save more money over time than any excess cost of construction.

Integrated Structures met the HVAC challenge at Rancho Arroyo Grande by combining a straw-bale construction method and a unique "night cooling" system that draws upon natural daily temperature fluctuations to maintain comfortable temperatures in the building throughout

the day and night. A centuries-old process, straw-bale construction uses as insulation bales of hay encapsulated between cement inner and outer walls. In lieu of wood or metal studs, a spar and membrane system pierces the hay bales and joins the concrete slabs to form 2-foot-thick walls. Integrated Structures originally adopted this very stable construction system to help resist seismic loads, an important consideration in California. Burda says, "This is cost competitive with standard framing even though the foundations are wider and the roof is bigger. The system is great for cold storage because of its construction cost, thermal mass and insulation. The architecture has a wonderful old world feel due to the thick walls and lends itself to residences, spas and hospitality (spaces)." Code requires an insulation R-value of 19. The straw-bale system gives an R-value of 50—far above the minimum requirement.

Because of the exceptional insulation properties of straw-bale construction, the designers were able to implement another unique heating and cooling strategy. Temperatures can exceed 100 degrees during the day in this area of California and at night can fall to the low- to mid-50s.

▼ The patent-pending "Spar-Membrane Wall System" ready for application of shotcrete.

