



PLASTER AND THE CALIFORNIA MISSIONS: TRADITIONAL CONSTRUCTION & RESTORATION

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As the most viewable buildings still standing, the 21 California Missions **are** California history. They serve as the main inspiration for custom home architecture in Southern California, and provide every 4th grader in the State with a unique education. Some would argue that the Missions in California represent a unique architectural style all their own. Plaster products were widely used in the Missions, and provide the stucco industry with its most relevant historical reference point.

When people ask “Why is stucco so common in the Southwest?” my answer is “The Missions.” Their building methods set a precedent that continues to today, rooted in Spanish, Moorish, and Mexican traditions. From the first Mission begun in San Diego in 1769 to the final one begun in 1823 north of San Francisco, the network of Spanish Missions did more to create the stucco industry than any other single factor.



The Church at Mission Santa Ines

The Missions all started very humbly, as these were frontier outposts. They worked with what was available, adobe, ladrillo bricks, and stone. “The first temporary quarters, hastily built, were little better than brush huts with grass-thatched roofs... The second structure at most of the missions was of adobe.... As soon, however, as a mission was strong and prosperous, the pride of the padre usually extended to an ambition to build a church in more lasting material, hence stone or burned brick were employed.”¹



The Church at Mission Santa Barbara, made of stone

As through the course of human history, once the Missions became prosperous, they were plastered. “All mission churches had exterior plaster of lime-and-sand stucco, following the Roman formula of three parts clean washed sand to one part burned lime, slaked with water.”² It seems hard to believe, but the Mission construction projects drew from Roman records of building techniques written 17 centuries earlier, notably Vitruvius’s *De architectura*, as evidenced by the books found in several Mission libraries. So perhaps we have Vitruvius to thank for today’s stucco industry.

Mission Walls & Ceilings

Together with the clay roof tiles, the plaster served a vital function, protecting the underlying adobe blocks, ladrillo bricks, and stone units in the walls from moisture. “When roofed, plastered, and protected from groundwater, adobe walls are enormously durable and provide effective insulation, although their soft surface does not lend itself to decorative relief.”³ A lime-based whitewash served as the final wall surface as additional protection from the weather and also to provide an attractive finish.

Mission compounds were mixes of adobe blocks with limewash, structures of adobe and kiln-fired ladrillo bricks, and stone. The prosperity of the Mission at the time of construction and the function of the building determined the materials. “For important buildings such as the church and the convento, the final plaster would be made of lime, producing a hard and durable finish.”⁴ Ladrillos provided improved weather resistance and sharper lines that were not possible with adobe, and are widely used at Mission San Luis Rey (Oceanside), Mission San Antonio (Monterey County) and Mission San Diego. Prominent stone churches were built at Mission Santa Barbara, San Gabriel, and the now ruined San Juan Capistrano. Nothing made a prouder padre than building a stone church clad in white plaster.



The church at Mission San Luis Rey, built with adobe and kiln-fired clay ladrillo bricks

Interior Wall Decoration

While exterior walls were left simple and bare, interior walls were decorated extensively. Where Mission jobsites couldn't use expensive wood and stone features, they often painted them on the walls. "Dado" wainscots were common, as were painted cornices at the tops of the walls. "True *fresco* painting was rare in Alta California, identified only recently at the Royal Presidio Chapel in Monterey. This technique is executed on wet plaster, allowing the paint to bond with the wall surface and resulting in a more durable finish."⁵



This wall painting came from Mission San Fernando Rey

Visitors to today's Mission museums might be surprised to learn of the colorful decorations used on the Mission interiors, because most have been covered up. "...when the Catholic and Hispanic heritage of the missions was widely unpopular, some mission interiors were redecorated according to British Victorian taste or whitewashed to modernize and dim their Hispanic origins."⁶ Many painted decorations were whitewashed over, covered in wood paneling, or damaged by years of neglect. Many of these decorations only survive today because of a New Deal-era survey of American art called the *Index of American Design*. Now housed at the National Gallery of Art in Washington, D.C., the Index contains the full spectrum of American art up to the 1930s, and included many California Mission wall decorations that would not have survived to this day, if it weren't for the Index. See <http://www.nga.gov/collection/iad/index.shtm> to see some for yourself, listed under Folk Arts of the Spanish Southwest. Mission San Miguel, just off the 101 freeway near Paso Robles, is the only surviving completely original interior.

The Hispanic builders and Native American workers were both experienced with paint materials. "Red was made from hematite (red ochre) and cinnabar, white from diatomaceous earth (chalklike fossil rock), and black from charcoal, burned graphite, and asphaltum. To these sources the Spanish added pigments imported from Mexico... and linseed oil, used as a binder."⁷ One Chumash Indian artist was said to have used "meat of the red tuna, egg whites, and pitch to the pigments. He also used urine, which he collected in clay pots, as a mordant for the paint."⁸ Sometimes the old way is the best, as with lime plasters; other times the old way is best left buried, as with urine paints.

Restoration of California Missions

As the Missions faded from the public interest, they were neglected. The fairly simple maintenance required to preserve adobe and stone buildings was not done, and in extreme cases, walls were dissolved back into the mud from which they were made. Earthquakes accelerated the pace of deterioration of many of the mission buildings.

Concerned citizens groups got organized to save and restore the Missions, and thankfully many are now maintained and well financed. The restoration work done on the missions has shown what works with these walls and what does not.

Portland cement repairs do not work.

Well-intentioned repair efforts used Portland cement in the 1940s, 1950s, and 1960s on walls that had lasted almost 200 years by then. Portland cement was stronger than the original materials, cheap, and readily available. So it was reasonable to believe that cement repair products would only strengthen the structures. But, "when cement was applied to adobe walls, often over chicken wire, its hard, water-repellent surface proved so impermeable that when moisture did occur in the walls it remained trapped behind the cement veneer, slowly eroding the adobe wall from within... In other cases, a cement mortar was added

to ladrillo constructions; over time, the stronger mortar pulled away the surface of the tiles.”⁹ The lime mortars and plasters, on the other hand, that had ably protected the walls for decades, when properly maintained, “are porous and “breathe”, allowing modest dampness to evaporate. Traditional lime- or earth-based renders (exterior plaster) and finishes protected adobe bricks from direct contact with the weather, providing an easily replaceable sacrificial layer.”¹⁰

“Modern conservation practice recommends that cement coverings, including renders, plasters, and “aprons” (surface coverings placed along the lower portions of walls), be replaced with renders and mortars similar to the original material, allowing the walls to breathe... Now mission ladrillo arcades are remortared and restuccoed using soft lime mortars.”¹¹ Lime is the right material for these structures, because of its breathability, durability, and ease of maintenance. Plus, the hard feel of cured limestone hides an inner softness that gently coats and supports masonry units without breaking them (like Portland cement products will).

Restoration at Mission San Juan Capistrano, for example, strives to reproduce as closely as possible the original construction of the walls. “To reinstate the historic character of this area, removal of all inappropriate past repairs, mainly the use of cement, is a key element to the project. Work on the masonry columns includes the removal of hard cement mortar at the joints between the bricks and repointing with a softer, more compatible lime mortar.”¹²



Restoration work at Mission San Juan Capistrano using lime mortars to repoint bricks

Products Available for Mission Restoration Projects

Thanks to their softness, breathability, and protective qualities, lime mortars, lime plasters, and lime washes are ideally suited to restoration of Missions and other buildings of similar construction. There are several products that have established themselves in this niche. Headquartered in Orange, California, Vero imports Italian seasoned-slaked lime mortars, plasters, and lime washes, produced in much the same way as those used by Vitruvius in Ancient Rome. Malta Grezza/Fine are ready-to-use lime mortars, and are made more weather-resistant through the addition of Cocciopesto (brick dust). This technique is consistent with that used for reservoirs and fountains in the California Missions,

which “were often rendered with water-resistant *coccio pesto*, hydraulic lime stucco made pink by the admixture of ground terracotta tiles, another Vitruvian formula. *Coccio pesto* was also used on architectural elements, such as the *ladrillo* colonnade columns at Mission Santa Ines.”¹³



Malta Grezza & Malta Fine produce this characteristic pink tone when *Cocciopesto* is used to provide added water-resistance and faster set.

Lime washes (such as Vero Epoca 800) are an ideal finish coat over a lime mortar, as they beautify, can add color, and cross-link with the lime mortar to provide a water-shedding topcoat. “[Limewash] gives a smooth coating which, after an initial wetting, encourages an easy run-off of rainwater. At the same time the nature of this surface allows good, all-over evaporation which helps the wall to dry out. Limewash is unaffected by the ultra-violet rays in sunlight which destroy synthetic paints.”¹⁴

Vero lime plasters can also be used as topcoats over the lime mortars, when smooth textures and a more substantial color coat is desired. “Lime plaster is extremely strong stuff that has withstood hundreds of years of weather. Moreover, because it is pliant (somewhat flexible), lime plaster is not likely to crack very much as a building shifts or walls expand and contract in response to natural temperature fluctuations or as moisture levels rise and fall... In addition, lime plaster and earthen materials expand and contract similarly. Consequently, when lime plaster is applied on an earthen wall or an earthen plaster, it is less likely to crack or peel off a wall.”¹⁵

Other manufacturers also carry lime mortars, including the bagged Natural Hydraulic Lime products imported from France by Transmineral USA out of Petaluma, California. Their Ecomortar product is preblended with properly graded sand and ready to use. Lime finishes are available from many companies in California and elsewhere in the U.S.

Conclusion

Next time you're near a Mission, pay it a visit. If you're in the plastering business, you'll pay extra attention to how the walls were built, and you should thank the Franciscan Padres for bringing plaster to California and planting the seeds for the architecture, materials, and techniques used today. The same materials used in building the Missions are available today, and should be used exclusively in preserving these and other historic buildings.

¹ E. Engenhoff, *Fabricas* (Sacramento: California Division of Natural Resources, Division of Mines, 1952), 181, as observed by Eugene Duflot de Mofras during his visit in 1840-42.

² E. Kimbro & J. Costello, *The California Missions*, The Getty Conservation Institute, 2009. p. 94

³ *Ibid.*, p. 96

⁴ *Ibid.*, p. 97

⁵ *Ibid.*, p. 135

⁶ *Ibid.*, p. 146

⁷ *Ibid.*, p. 134

⁸ *Ibid.*, p. 147

⁹ *Ibid.*, p. 156

¹⁰ *Ibid.*, p. 156

¹¹ *Ibid.*, p. 156

¹² "South Wing Conservation", <http://www.missionsjc.com/preservation/projects-southwing.php>, July 10, 2012.

¹³ E. Kimbro & J. Costello, *The California Missions*, The Getty Conservation Institute, 2009. Chapter 4 note 7

¹⁴ Holmes & Wingate, *Building with Lime*, ITDG Publishing 2002, p. 49

¹⁵ Guelberth & Chrias, *The Natural Plaster Book*, New Society Publishers, 2003, p.165