Abstract

The Gamble House, built in Pasadena, California in 1908, is amongst the greatest of architectural treasures designed by Charles and Henry Greene. In 2004 the first comprehensive conservation of the exterior elements was implemented. The project plan was designed to document a course towards a holistic preservation outlook with a customized work scope based in science, art conservation and architectural preservation.

While addressing maintenance and disrepair to ensure the ongoing protection of the house, treatments maintained the original design vision of the Greenses and conserved original historic fabric. This paper presents an overview of the conservation project. The development of treatments, their implementation, and efforts toward ongoing maintenance of one of the most iconic of the exterior features – the 36 inch-long hand split old growth redwood shakes, as a case study.

The teamwork attitude was pervasive among contractor, sub-contractors, consultants, and owner representatives as the strong foundation of strict conservation and preservation guidelines clearly defined the intent of the project through all phases.

Keywords

The Gamble House, split wood shakes, historic preservation, redwood, rot, deterioration, consolidation

Architecture as Artifact: Integrated Approach to Conservation of Finishes at the Gamble House

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Introduction

The Gamble House is the only project designed by Charles and Henry Greene to remain substantially in original condition, with all of its architect-designed furnishings in situ. Those of us close to its ongoing conservation feel that the Gamble House is, in fact, a museum where the house is the most precious artifact in its collection. The institutional goal is not only to conserve the house and its furnishings to nationally recognized standards of conservation, but also to provide an exemplary program of public access that interprets the architecture and collections in a relevant, educational, and engaging way (Fig. 1).

In 1907 David and Mary Gamble, of the Procter & Gamble Company in Cincinnati, Ohio, hired Charles and Henry Greene to design the Gamble's retirement residence in Pasadena, California, where other wealthy Midwestern families had become accustomed to spending the winter months. After only ten months of construction, the house was completed and the first pieces of custom furniture were delivered, and by the summer of 1910 all the furniture was in place.
Three generations of the Gamble family realized the artistic importance of the house and maintained ownership until 1966, when it was deeded to the City of Pasadena in a joint agreement with the University of Southern California (USC) School of Architecture. Since 1968 two senior students from the USC School of Architecture have earned the privilege of residing in the Gamble House as part of the Scholar-in-Residence program, which is still active today. While the city holds legal title to the house, all programs and preservation are the responsibility of the USC School of Architecture.

The Gamble House is listed on the National Register of Historic Places and is designated a National Historic Landmark with international significance. It is a historic house museum dedicated to the preservation, presentation, and interpretation of the signature architecture of Charles and Henry Greene in the context of the American Arts and Crafts movement. It serves the public and scholars, welcoming 25,000 visitors annually from around the world.

**Preservation Planning**

By the mid-1980s it was apparent that the exterior of the Gamble House needed assessment. Seven decades of weather had put many of the house’s character-defining features at risk. The original redwood shakes were splintered and cupped, rafters and beams were rotting, and the roof membrane was failing.

On behalf of the USC School of Architecture, Edward R. (Ted) Bosley, the James N. Gamble Director of the Gamble House, enlisted the support of professionals to help set a course for the preservation project. Peyton Hall, FAIA, John Griswold, and Kelly Sutherlin McLeod, FAIA, joined together under Ted’s leadership to develop a customized work scope based in science, art conservation, and architectural preservation.
Development of the 600 page Historic Structure Report (HSR), completed in 2000, was the first step in the campaign. The HSR established standards and criteria, and prioritized findings and recommendations in an interactive database, a tool that lies at the heart of the conservation effort and continues to inform maintenance, operations, and future work at the Gamble House. The scope of work for immediate and short-term needs was couched in language that was meaningful to grantors.

Director Ted Bosley raised the funds for planning and implementation. Significant commitments for project funding were secured from private and public funding including generous pledges from the Gamble family and grants from the Getty Foundation. During the course of five years, four million dollars was raised to cover project management and exterior conservation treatments in addition to consultant fees, other planning and campaign costs, and a modest sum to help endow future maintenance cycles after conservation treatments.

The Gamble House and its detached garage were found to retain a very high level of integrity. Research showed that most of the original surfaces of these buildings were largely unmolested, retaining much technical evidence of the architects’ manipulation of materials and finishes to achieve a subtle, sophisticated aesthetic harmony. The project objective was to address maintenance and disrepair to ensure the protection of the buildings, and to interpret the exterior so that they once again resonate with the original vision of Charles and Henry Greene. Above all, the intent was to conserve as much as possible of the building’s historic fabric, which meant nearly everything, in the least invasive way.

**Project Overview**

First, the house’s resistance to earthquakes was increased by bolting the frame to the foundation, and adding steel frame stiffeners in the attic. Severe deterioration of timber beam ends and rafter tails was treated with borates and permeable epoxies to stabilize remaining wood and compensate for losses. The roof membrane was replaced to protect the building’s structure, interiors, and priceless contents; exterior original split redwood shakes were conserved; 135 window screens were restored; and paint, varnish, dirt, and decay were carefully removed from unpainted wood surfaces such as teak window frames and doors, posts, and railings.

At the conclusion of the project, the goals of the first comprehensive conservation effort undertaken on this historic treasure were met, mitigating the effects of ninety-five years of exposure to sun and weather and preserving the historic fabric for the future. The dynamic scope of work was completed within budget and ahead of schedule.

The extensive project work scope also included subterranean waterproofing and drainage, improvements to roof drainage, and upgrades to building systems. This brief paper will address only a part of the project — the roof, rafter tails, and beam ends. The exterior wood wall shakes, constituting most of the building’s exterior surface, and one of the most iconic of the exterior features at the Gamble House, deserve attention as a case study emblematic of the broader assessment, development of conservation treatments and their implementation, and approach to cyclical maintenance.

**Roof**

The role of the project architect included balancing the conservation team’s objective to honor the Greenes’ original design, and retain remaining historic materials, with the concerns of tradespeople and manufacturers of contemporary materials, who wanted to use tested standard construction methodologies to ensure functionality.
Four generations of roofing preceded this project; the most recent failed shortly after it was installed during the 1980s. Archival documents report that the original 1908 roof material, ‘Malthoid’, was a rolled asphaltic composition membrane and adhered slate granules [1]. It failed within the first ten years after installation. Malthoid is no longer produced in this country; current products for sale using this name are not of the same composition. Built-up modified bituminous rolled roofing with a mineral-surfaced cap sheet was selected as a durable contemporary product honoring Charles and Henry’s design, taking into account finish texture and color based on the value relationships in archival black-and-white photographs. The soft roll of the roofing around the raised edge of the roof eave is an essential feature of the Gamble House, and is not easily achievable with stiff asphalt roofing.

New roof flashings were fabricated and installed under roofing and at locations not visible to visitors. Existing lead flashing at the two chimneys remained intact; lead flashing was replaced at the exterior wall of the third floor. The original design was followed in all detail, down to the nailing pattern, avoiding additional nail penetrations into the exposed historic wood trim. On the north side of the house the original lead flashing was still serviceable and was therefore maintained as an accessible archive. Repairs were made to decorative copper leader boxes and downspouts, reversing poorly executed patches and returning historic components back to their original locations.

**Rafter Tails and Beam Ends**

After decades of outdoor exposure, the exposed ends of many rafter tails and beam ends were infected with a common fungus that consumes wood. Previous repairs filled wood losses, and impermeable epoxy exacerbated continuing damage by not allowing water to evaporate. The environment was ideal for fungal growth. Flowering bodies emerged from the surface of some rafter tails (Fig. 2).

Rotted wood was removed from 262 rafter tails and beam ends, leaving all sound wood intact. The principal conservator, John Griswold, revised the earlier treatment by using materials that perform better under these circumstances. The wood and new patch repair materials are more compatible to changes in temperature and...
to the fluctuating presence of moisture, providing a stable contact between old and new elements. Lightweight permeable epoxy filler was used to replace lost wood. A commercial low-viscosity consolidant and filler epoxy product was deliberately specified for consistent and reliable mixing, application, and performance characteristics.

Using handheld instruments such as dental tools, artisan subcontractors sculpted the tinted epoxy to provide a portrait of the weathered surface of adjacent original wood, extending grain patterns while creating channels for water to escape. Longitudinal cracks in the timbers (or checking of end grain) were left exposed, allowing the wood to continue to age naturally in equilibrium with its environment. The epoxy at the surface of the fill was tinted using color-stable mineral pigments, and then stained on the surface to blend visually with adjacent wood when viewed from the ground. The finished work conveys the appearance of a century-old structure that has weathered in its natural environment. However, there is a clear distinction between historic and new materials under closer view (Fig. 3).

**Exterior Redwood Shakes**

The hand-split exterior redwood wall shakes have been the subject of much concern since the house came under the stewardship of the city and the university. Comparison with early photos shows how they had shifted dramatically from a uniform dark value to a much lighter, uneven finish. Many have speculated about their original finish, still visible on the reverse side of well-protected shakes. [Figure 4] The translucent brownish-green tint optically complements the warm, dark tones of the redwood. It was reasonable to speculate that the green hue was a copper salt-based preservative.
Around 1930, the only remaining family member living in the house—the sister of Mary Gamble known fondly as Aunt Julia—had the house painted with a sturdy coat of opaque green lead-based oil paint, save for the doors and windows, board and batten ceiling paneling of the verandas, and porch posts and railings.

At the time of the HSR investigation in the late 1990s, there was a great deal of variation in the condition of the painted shakes. Some exposed faces were warped and splitting, finely cracked with delaminating paint...
over heat- and light-damaged wood surfaces. [Figure 5] The paint in these areas was a network of tiny floating islands undercut by dark soiling and fine debris. In contrast, well-protected areas tucked under overhanging sleeping porches or with north-facing exposure retained a dark green-gray paint in relatively good condition. Here, a silvery white efflorescence had developed on the surface, the beginnings of the oxidation and hydrolytic process of paint decay.

![Warped shakes before restoration. Courtesy Historic Resources Group](image)

Other types of conditions were found on the shakes between these extremes, including repeated abrasion from visitors, mineral deposition, and tide lines from rainwater flowing around downspouts. Adding to the complexity of the deteriorating surfaces, local tests with different undocumented methods had been conducted over the years preceding this project in an effort to determine the best way to return the shakes to their intended appearance. On all of the areas, some ill effects were seen. Grain detail was obliterated, wood fibers were raised, or residual efflorescence had formed from products used for stripping.

During the initial investigative phase of the project, it seemed most appropriate to continue the quest for the best methods to remove the non-original paint with the least risk of damage to the shakes themselves. As part of the project implementation plan, it was recommended that a conservator perform paint removal tests, test wood materials, and identify the composition of the original stain for the purpose of replicating the original finishes.
Peer review by the Getty Foundation suggested a focused symposium of advisors who were convened to ask new questions and seek more answers before undertaking an aggressive exterior treatment. Was Aunt Julia’s paint a part of the ongoing history of the house? Why remove the sound areas of paint if only to subject the shakes to possible damage? Why not treat the shakes as one might approach the surface of a Renaissance polychromed wood sculpture? This would establish an aesthetic target appropriate to the state of preservation of the original materials and help develop a method to ensure their stabilization where needed locally. It would also visually reintegrate distracting or disfiguring areas to allow the overall surface to read in an authentic but aesthetically pleasing manner. It was agreed that Southern California has the advantage of a particularly benign climate and that a less potentially damaging approach could be investigated.

The results of the symposium supported a specialized approach to fusing esoteric museum conservation and practical construction methods. The team set out to better characterize the original finish, the later paint, and the conditions of the wood substrate. Fourteen different conditions were identified and graphically mapped as color-coded zones for each of the house’s exterior elevations. Sample shakes were carefully removed from representative zones, documented, and analyzed by the material analysis scientists at Orion Analytical Laboratory [2]. Besides identifying the original finish, the modes of deterioration were characterized to help develop a treatment strategy that would accommodate subtle variation of technique depending on each zone encountered.

The results showed the original stain dip was wood-based creosote with Prussian blue and chrome yellow pigments composing the transparent green color.

It was observed that Aunt Julia’s paint had essentially “fossilized” the wood surface in the most severely degraded areas, forming a delicate “pseudomorph” of the original split grain texture of each shake. Although highly friable in areas exposed to intense sunlight and heat, the cracked and oxidized paint remnants were holding the decayed wood fibers and accumulated soiling in place. After being criticized over the years for painting the house, the late Aunt Julia was exonerated for actually doing the house a favor. The paint bore the brunt of weathering processes, sparing the natural split grain appearance of the shakes so valued by the Greenes.

This information turned the team’s attention away from trying to remove the paint to preserving it in situ. Testing began to find an appropriate consolidant or penetrating sealer that would simultaneously protect the substrate wood and strengthen the delicate surface. Initial testing of possible solvent carriers revealed that, when saturated, the light yellow-green oxidized paint hue reverted to the original darker green paint color that remained on more protected surfaces. Aunt Julia was further vindicated as it became clear that her choice of paint color closely resembled the Greenes’ original pigmented stain.

After testing various surface treatments, including pine tar [3], a commercial penetrating sealant with UV stabilizers was specified as an overall base treatment to protect the failing wood material by consolidating and shielding both the wood and the deteriorating paint [4]. Various mixtures with stable mineral pigments were mixed with the sealant to better visually reintegrate surfaces that were most yellowed due to sunlight and heat exposure. This tinting was visually measured by the conservator to factor in the age of the house, its original color, and its natural weathering patterns. The aesthetic target, broadly speaking, was a gracefully aging ninety-six-year-old house. The treatment allowed the “natural features” of the house’s “patina” to remain. The biggest aesthetic challenge was reintegrating the variously stripped test areas.

The treatment approach for the exterior wall shakes illustrates the difference between restoration and conservation. The exterior wood surfaces were not “restored” to the finishes or appearance of the house in 1908. Restoration would have presented a bare wood surface, which would have then required refinishing.
with new materials intended to emulate the original materials. For the exterior wall shakes, a restoration methodology (removal of non-original seventy-year-old lead-based paint as originally planned) would have destroyed the “history” of finishes, with unavoidable impacts on the surface profile of the wood. Resetting the clock to an almost-new appearance would have resulted in a new, destructive cycle of aging and refinishing. The original wood-based creosote dip, specified by the Greenes, would have been lost.

The objectives identified, after thorough consideration, were to conserve the wood, retain the history of existing finishes, avoid treatments that would damage the wood, retain the variations in finish appearance that reflect the natural conditions of the building and site, use materials and methods that are optimally reversible and/or re-treatable, and achieve an aesthetic result that conveys the Greenes’ design intent and results.

The preservative treatment brought back to the shakes a dark color value relationship with the windows and porch posts and railings. A negligible number of damaged wood shakes needed to be replaced; the replacements are vintage shakes of matching species and grain.

The appearance of the house and garage will slowly turn toward the pre-treatment appearance, but those treatments were extremely gentle, and re-treatment is feasible and gentle. In keeping with current conservation methods, as few interventions as possible were made, and an area of shakes in a protected location was left untreated as a document in the field. One cycle of re-treatment has already been completed, using the endowment for funding periodic inspection and treatment. Preventive, attentive, highly skilled care preserves historic fabric, and supports a gentle, cautious approach to treatment.

Conservation

The conservation project philosophy used at the Gamble House is based in long-term protection and preservation by applying architectural conservation standards of assessment, documentation, and treatment. The project sought to maintain the highest conservation values and standards of science and artisanship. A fusion of federal guidelines, the Secretary of the Interior’s Standards for Preservation, with the Code of Ethics and Guidelines for Practice of the American Institute for Conservation of Historic and Artistic Works (AIC) determined the project treatment criteria. One of the foremost tenets is the concept of ‘reversibility/retreatability’, or being able to isolate and undo, to the greatest practical extent, whatever interventive treatment is performed on an artwork or artifact. Minimal intervention is another fundamental mandate of accepted conservation practice. Some historic structures, such as the Gamble House, possess such a high degree of significance that they are works of art in the fullest sense, and therefore benefit from the enrichment of the federal guidelines with those of the AIC.

Charles and Henry Greene were involved deeply in every aspect of the design and handcrafted construction while closely directing highly skilled craft workers. For example, the surfaces of natural materials such as split redwood shakes were chosen individually for their interesting grain patterns and other unique qualities, and placed to enhance the visitor’s overall aesthetic experience. Archival documentation of the Greenes’ subtleties of intent, in letters, written specifications and drawings, and early photographs further confirm that the architects were, in effect, the true artists of the house.

After six years of preparation, the project team had developed a customized work scope based in science, art conservation, and architectural preservation. This fusion depended largely on collaboration among members of the multi-disciplined project team—collaboration unrestricted by egos and boundaries set by areas of expertise. The challenge of bridging between assessment and implementation phases was successfully managed by a teamwork attitude, which was pervasive among the contractor, subcontractors, consultants, and
owner representatives. The strong foundation of strict conservation and preservation guidelines clearly defined the intent of the project through all phases.

John Griswold served a key role in the assessment team: surveying existing conditions, procuring and interpreting scientific analysis and developing conservation techniques. The conservator’s contribution was critical to this project in bridging the gap between assessment and implementation phases of the Gamble House project, transitioning into varying roles as conservation strategies developed into a construction context and eventually into the ongoing maintenance program. Because of the team approach, the conservator was allowed to transition between these phases in a ‘confluence of interest’ going from the architect and owner’s side of the project to become a specialist consultant and subcontractor to the general contractor.

The foresight and diligence of the director, Ted Bosley, in securing an endowment for maintenance established the prospect of constant curatorial care, allowing conservation treatments to be minimally interventional. In order for preservation projects to be successful, treatment options must be considered with the ongoing maintenance needs associated with them, such as funding and the availability of treatment materials and skilled tradespeople. At the Gamble House, periodic inspections by the project conservator are conducted as part of the maintenance plan and building elements are re-treated if required. Now, at the ten year anniversary of project completion, John Griswold reports that the exterior treatments and repairs to the Gamble House are holding up well. There is some local fading of color (actually, desaturation, as color was only applied in limited areas) on the more severely exposed areas of the wall shakes and some deterioration at the third-floor rafter tails. This is all to be expected.

**Conclusion**

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*Fig. 6. Gamble House exterior. © 2014 Alexander Vertikoff | Vertikoff Archive*
Projects such as the Gamble House conservation do not happen without vision and leadership. The Gamble House director, Ted Bosley, had the wisdom to recognize this concerted effort had to be taken if the Gamble House was to survive for future generations. Ted’s leadership and steadfast integrity kept all members of the project team, during all phases, focused on the established objectives, schedule, and end goal set for this conservation project: to protect a fragile national treasure while maintaining its authenticity and honoring the original design vision of Charles and Henry Greene (Fig.6).

Resources

Amteco TWP 500 Series wood protectant: Amteco, Inc. 1100 Jefferson Dr., Pacific, MO 63069
Abatron WoodEpox wood replacement compound: Abatron, Inc. 5501 95th Ave., Kenosha, WI 53144
Abatron LiquidWood wood restorer: Abatron, Inc. 5501 95th Ave., Kenosha, WI 53144

Endnotes

[2] James Martin, PhD performed the investigation and produced an unpublished report. Visible light microscopy, polarized light microscopy and ultraviolet fluorescence microscopy were combined with FTIR analysis.
[3] Martin Weaver suggested this be included in tests, given the remarkable history of its use as a preservative for the stave churches in Scandinavia.
[4] Mark Knaebe, chemist for the U.S. Department of Agriculture Forest Products Laboratory, suggested trying a modified long oil alkyd with UV stabilizers produced by Amteco, Inc. and sold under the trade name TWP. This product had been tested and put in service by the National Park Service with very good results on redwood structures. Of particular interest was the fact that the product was found to oxidize and gradually break down within the wood substrate, increasing porosity and wettability as it degrades. This fact allows for future re-treatment without having to remove a cross-linked build-up of degraded coating.

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