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Historic Fabric vs. Design Intent

Authenticity and Preservation of Modern
Architecture at Frank Lloyd Wright's Guggenheim
Museum

Angel Ayón

Abstract

This paper attempts to address the dichotomy between preservation of historic fabric and the original design intent, which may arise during interventions on buildings from the Modern period. It presents intervention principles developed for recent preservation work at Frank Lloyd Wright's Solomon R. Guggenheim Museum in New York, and outlines how these principles were used to address four specific design challenges posed by Wright's masterpiece. By addressing structural repairs, rain protection, fenestration upgrade and exterior colour issues, the paper shows how, during the Guggenheim project, priority was assigned to the design intent in some cases, to the historic building fabric in others, or indeed to neither factor. It explores the concept of authenticity and expands its application in the context of the preservation of Modern architecture by considering issues of craftsmanship and mass production, integrity and durability, systems performance and conservation state, original expression and contributing changes.

Introduction

Built heritage conservation, as known until the 1990s, focused primarily on the preservation of the surviving historic fabric and the identification and enhancement of its intrinsic values, as a way to preserve such building fabric for future generations. Conservation of Modern architecture, however, has brought a new paradigm, since the historic fabric is often perceived according to Louis Sullivan's aphorism 'form ever follows function'¹ and its conservation is frequently regarded as secondary to that of the aesthetic, functional or programmatic requirements that comprised the architect's original design intent.

Extensive documentation regarding the theoretical fundamentals underpinning the work of a given Modern architect is often available to scholars, preservation practitioners and the public at large. This combined with the relative proximity of a recent past in which the architect's design intent is as well-documented as the built embodiment of such concepts, reinforces the notion that, in Modern buildings, preserving the original design intent is equally or more important than preserving the historic fabric.

A building's original design intent is, however, often an evolving body of ideas, as evidenced by much of Frank Lloyd Wright's work and that of many other Modern architects. In the case of the Guggenheim, the core concept – Wright's superb inverted ziggurat – remained solid during seventeen years of design and construction (Figure 1). But some details evolved over time to accommodate several changes such as site enlargement (from the 1945 set of drawings to the 1951 set, the Rotunda was relocated from the north to the south corner of the lot), project scope and extent (a tower



Figure 1 Frank Lloyd Wright, Solomon R. Guggenheim Museum, New York City, built 1956–59 (© William Short, the Solomon R. Guggenheim Foundation).

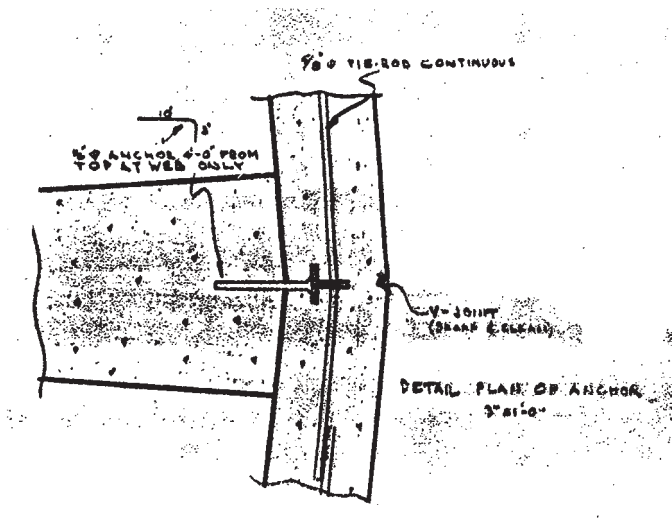
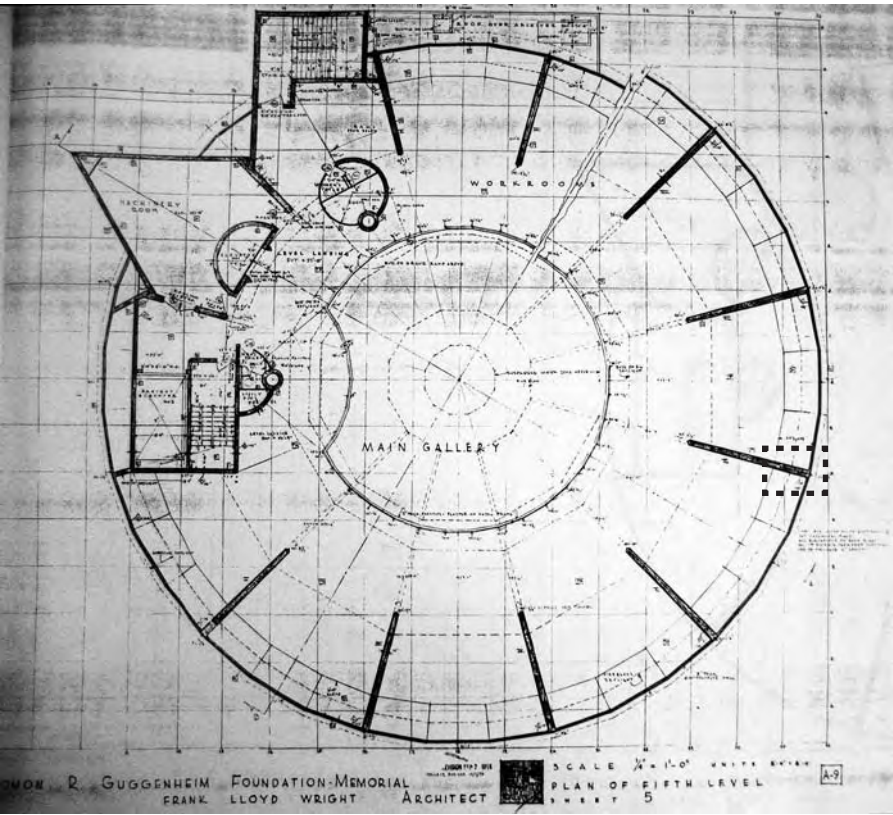


Figure 2 Frank Lloyd Wright, Solomon R. Guggenheim Museum. Typical exterior wall detail at load-bearing wall (© The Frank Lloyd Wright Foundation).

included in the 1953 set was subsequently discarded), and exterior finishes (the original 1945 design included painted shotcrete – then known as gunite – but subsequent design updates considered exposed white marble aggregate and orange, white and red marble claddings).^{2,3}

A closer look at the working drawings issued in 1956 (the final set used for bidding and construction) reveals a sunken expansion joint detail⁴ (Figure 2) and a note on the ground floor plan indicating that ‘walls shown faceted on 10° segments may be [a] continuous curve’⁵ (Figure 3). The building elevations included in the same set show the Rotunda walls as faceted surfaces, not

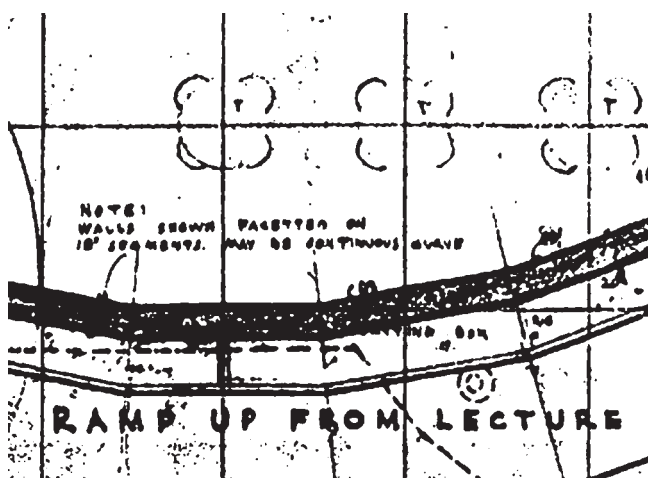
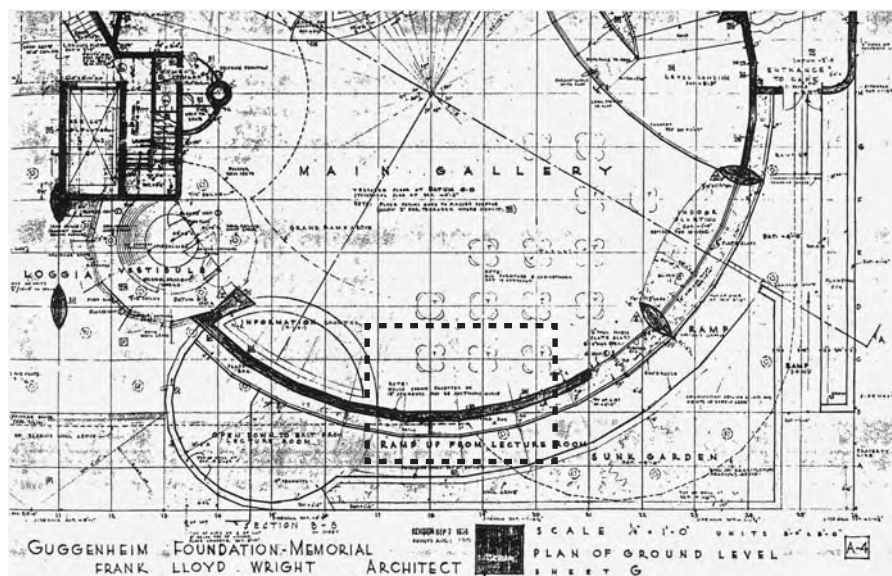


Figure 3 Frank Lloyd Wright, Solomon R. Guggenheim Museum partial ground floor plan and detail (© The Frank Lloyd Wright Foundation).

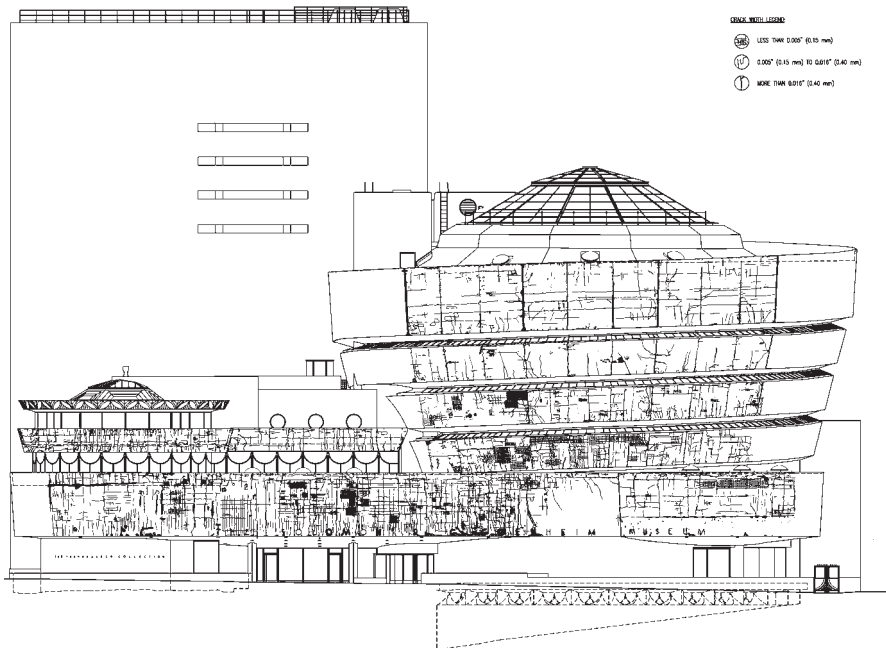


Figure 4 Surface texture and coating failures at Solomon R. Guggenheim Museum façade, New York City, 2004 (© A. Ayón and L. Boynton WASA/Studio A).

curved. In a letter to the builder George Cohen a few months later in early 1957, Wright argued in favour of ‘the simple curved surfaces of the pantheon instead of the complex paneled planes intersecting’.⁶ He went on to state in the same letter that ‘the curved continuous surfaces with the sunk-joint at every web-center presents [sic] no difficulties’, and threatened to reject a subcontractor ‘who cannot see the advantage to him of the plane surface’. As a result, the Rotunda’s cast-in-place shotcrete walls were built with a curved, unfaceted geometry, and with no expansion joints. This condition led to visible surface cracking once the formwork was removed, which became more noticeable after 50 years of expansion and contraction of the walls (Figure 4).

Despite the contradictory notes and details included in the contract documents and found in the project record and subsequent publications, the Guggenheim’s continuous curved surfaces are undoubtedly the result of Wright’s original design intent – a resolution he reached during construction. The aforementioned archival findings provide an insight into Wright’s design process and expand our understanding of his design philosophy beyond his own account⁷ and further assessment by historians and architectural critics. They illustrate the complexity of building a Modern structure such as the Guggenheim, so experimental in concept, form and materials. And more importantly, they indicate that a building’s original design intent was an evolving concept and that its final incarnation, which we designate as historic fabric, is as relevant and worthy of preserving as the intent.

Four interventions at the Guggenheim

Recent conservation work at the Guggenheim Museum brought to light a range of structural, architectural, environmental and materials conservation conditions, as well as potential repair solutions that tested the appropriateness of established preservation philosophy when applied to a Modern building. Exterior cracking and coating failures, combined with aging building systems and low-performing glazed enclosures, windows and skylights, required extensive research by a multidisciplinary team into suitable repair solutions. The final scope of work included the upgrade of building systems and exterior wall assemblies, removal of exterior coatings, concrete repair and recoating, skylight and window replacement.⁸

The preservation approach to intervention on the Guggenheim was conceived by the project architect WASA/Studio A following the stipulations set forth in the United States Secretary of the Interior's Standards for the Treatment of Historic Properties, as well as in international documents such as the 1964 Venice Charter for the Conservation and Restoration of Monuments (The Venice Charter), the 1979 Australia ICOMOS Burra Charter (as revised in 1999), the 1994 Nara Document in Authenticity and other relevant documents underpinning the theory and praxis of historic preservation to date.

The principles for intervention included:

- retaining original materials;
- retaining changes that occurred over time;
- preserving distinctive features;
- repairing rather than replacing, and replacing in kind if necessary;
- avoiding radical changes in work designed to meet current code and energy requirements;
- ensuring that treatments are not injurious;
- ensuring that new work is reversible and differentiated from historic building fabric.

This preservation philosophy guided the project team's responses to the complex challenges posed by Wright's building. The project components outlined below provide four relevant case studies that illustrate how the historic fabric vs. design intent paradigm was addressed.

Structural repair

When it was uncovered and confirmed that the horizontal reinforcement of the uppermost Rotunda wall was discontinuous, several structural repair solutions to re-establish the continuity of the reinforcement were considered. One of them involved wrapping the exterior surface with a surface-mounted carbon fibre reinforced polymer (CFRP). This innovative exterior repair



Figure 5 Detail of Rotunda wall showing original formwork marks after exterior conservation work (© A. Ayón, WASA/Studio A, 2009).

solution, in addition to remedying the most prominent structural deficiency uncovered during the project, would have also allowed both a comprehensive treatment of the multiple cracks on the deteriorated exterior concrete and attainment of the smooth surfaces that Wright originally envisioned, and the contractor failed to accomplish during the original construction.⁹

The surface preparation required for installation of the CFRP, however, would have obliterated the original formwork marks. This subtle surface pattern was deemed culturally significant, not only as evidence of authenticity of craftsmanship, but also as an indication that Wright's vision for the Guggenheim was ahead of the construction means and methods available at the time (Figure 5).

In this case, retaining the authenticity of the walls as built outweighed the temptation to implement the architect's well-documented, yet unrealized, design intent for the quality and appearance of the exterior concrete surfaces. To address the discontinuity of the horizontal reinforcement, Robert Silman Associates, PC, the project's structural engineers, conceived a CFRP reinforcement installed on the interior face of the wall, which was exposed for this particular purpose (Figure 6).

Rainwater protection

A second case study for the same project relates to the need to address rainwater run-off from the top of the roughly 270-ft (82.3 m) long uppermost Rotunda wall. Evidence collected during the building's documentation



Figure 6 Carbon fibre reinforcement at the interior face of the Guggenheim Rotunda's uppermost wall (© A. Ayón, WASA/Studio A, 2007).

indicated that the tilted geometry of the uppermost wall allowed rainwater to spill over roughly a third of the height of the wall. This run-off exposed the concrete surfaces to moisture and to soiling from bird droppings deposited on the outward-pitched top of the wall.

Building envelope studies carried out as part of the project determined that minimizing wall exposure to moisture was essential to ensure long-term durability of both the repairs and the original cementitious fabric. A proposal to provide a metal drip edge along the top of the wall, which would have effectively directed run-off away from the wall, was discarded. This attachment, which would have been noticeable from the street, was deemed incompatible with the unadorned simplicity that characterizes the Guggenheim.

Instead, a custom-made cementitious topping designed by WASA/Studio A and William B. Rose & Associates, the project's building envelope consultant, was provided along the top of the wall to modify its pitch inwards (Figure 7). This solution, which unlike the drip edge does not fully eradicate surface exposure to rainwater run-off, is a compromise that substantially reduces soiling and exposure to moisture, while retaining the integrity of the building's Modern architectural expression. In this case, preserving the integrity of the original design intent prevailed over protecting the historic fabric.

Window upgrade

At the Guggenheim's northernmost end (originally known as the Monitor building) there were original polygonal-shaped, floor-to-ceiling, steel-

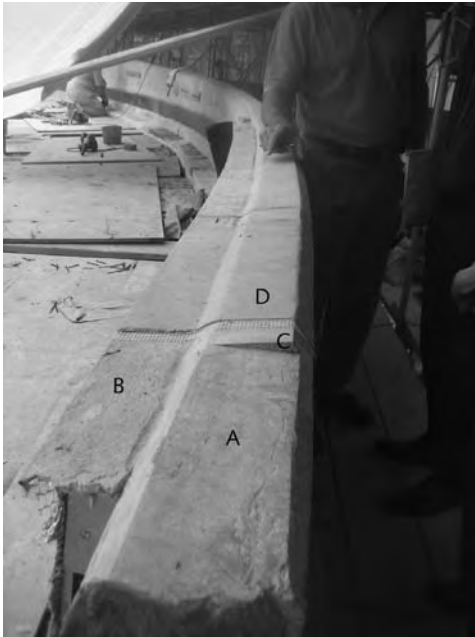


Figure 7 Onsite mock-up of new cementitious topping along the full-length of Rotunda parapet (© A. Ayón, WASA/Studio A, 2007). (Observers in the foreground are standing on the scaffold, facing the exterior of the Rotunda roof parapet. The worker in the foreground is facing the interior (roof side) of the parapet.

- A: Top of existing outward-pitched Rotunda roof parapet.
- B: Top of new inward-pitched stucco-covered surface-applied structural reinforcement.
- C: New inward-pitched resin-based mortar over top of existing parapet.
- D: New reinforced fluid-applied waterproofing membrane over new top of parapet.



Figure 8 Frank Lloyd Wright, Solomon R. Guggenheim Museum, original steel-frame glass walls during construction (© William Short, the Solomon R. Guggenheim Foundation).

frame glass walls leading to perimeter balconies. These glass walls were comprised of a single-glazed, non-thermally broken, galvanized steel-frame system. Unlike the Rotunda, they conveyed a sense of transparency and extroversion suitable for the non-exhibition spaces they were originally designed to be. They also helped to fulfil Wright's vision of organic architecture, where a building embraces, rather than separates, the indoor and outdoor environments that it is meant to demarcate (Figure 8).

At the project outset, the original galvanized steel-frame glass walls were found to be in good condition, showing no significant sign of deterioration

and, by traditional preservation standards, would have been deemed as sound, original historic fabric to be retained. During the winter, however, water vapour from warm, humid indoor air condensed on the colder surfaces of the uninsulated glass panes, steel frames and mullions. Such seasonal condensation compromised the stability of the indoor museum environment, leading to energy loss and increased demand for air conditioning. It required mechanical equipment of larger size and capacity, impaired indoor–outdoor visibility, and rendered the gallery unfit for exhibition display during cold seasons.

WASA/Studio A and William B. Rose & Associates considered several options for refurbishing the Guggenheim's original steel-frame glazed enclosures, including upcoming nanotechnologies such as thermal-protection coatings, insulating blankets and heated glass. The results derived from the refurbishment approach would, however, have significantly modified the appearance of the historic metalwork and, to some extent, would have been injurious to original historic fabric in sound conservation state. In addition, these refurbishment options to retain the well-preserved metalwork were not fully functional or warrantable, and their performance had limited predictability.

Despite the good physical condition of the steel-frame glass walls, their poor performance made replacement the more appropriate upgrade option. As a result, an unprecedented thermally broken steel-frame system, matching the appearance and sightlines of the original glass wall, was fabricated and installed, according to a unique design by WASA/Studio A and William B. Rose & Associates (Figure 9).¹⁰ Representative samples of the original steel-frame enclosure were retained as part of the museum collection to ensure archival preservation of such a distinctive original historic feature.

In the case of the Guggenheim glass walls, enabling the year-long visibility implicit in Wright's original design intent, plus upgrading the environmental performance of this glazed enclosure to contemporary standards, took precedence over the retention of original historic fabric in good physical condition.

Exterior colour

Frank Lloyd Wright's intention to apply the same colour on the interior and exterior of the Guggenheim Museum is well documented.¹¹ Yet to his disdain, the interiors were finished in white, a colour that has been retained to date. A historic paint analysis by Integrated Conservation Resources, the architectural conservators for the recent conservation work at the Guggenheim, determined that the exterior finish (then commercially known as 'Cocoon') was an early version of an elastomeric coating exhibiting a yellowish 'buff' colour. Although the original exterior colour has been questioned as Wright's choice,¹² a photograph of the architect on one of the Monitor balconies while the exterior of the Rotunda was being painted in the background, indicates that he approved of, and certainly lived to see applied, the original buff Cocoon.



Figure 9 Replacement thermally broken steel-frame glass walls, 3rd Floor Thannhauser Gallery (© The Solomon R. Guggenheim Foundation, 2008).

Shortly after the original construction, and as early as 1964, the repainting of the exterior of the museum was considered. What followed was a series of interventions where the original buff colour was over-painted several times. By 1968, a concrete-frame set-back addition designed by William Wesley Peters from Taliesin Associates (the firm that succeeded Wright's architectural practice) was erected on the north-east corner of the museum site. It can be assumed that the exterior finish was overpainted at that time, as well as in 1975, after completion of a ground-floor glazed enclosure designed by Donald Freed Architects that bisected the original driveway between Fifth Avenue and East 89th Street.

Other alterations and exterior painting campaigns followed during the ensuing years, including a 1978 renovation by Richard Meier that transformed the original Architectural Archives into the current Aye Simon Reading Room. After completion of miscellaneous interior renovations undertaken during the 1980s, a 1992 alteration by Gwathmey Siegel & Associates Architects renovated the museum's interiors and added a steel-frame tower atop the reinforced concrete frame of the 1968 addition.

The 1992 alteration, which in addition to renovating and expanding the museum, enhanced the original building enclosure, was the first intervention on the Guggenheim that was not limited to a particular area, but to the

building as a whole. In an attempt to differentiate the original building from the new limestone-clad tower addition, Gwathmey Siegel & Associates Architects chose to refinish the exterior of Wright's building with an off-white, light grey colour similar to the then more recent coating, which was mistakenly believed to be close to the original colour. The colour choice implemented during the 1992 work was emulated during subsequent painting campaigns.

During the recent conservation work, the final decision on the colour of the new exterior finish proved to be controversial. As the original Cocoon and subsequent paint layers had to be removed to allow documentation, assessment and repair of the exposed concrete surface, options for the new finish colour were discussed. Given that the original design intent for the exterior finish had long been lost with overpainting of the Cocoon, and that the historic coating fabric embedded in more than ten layers of paint had been removed as part of the work, special consideration was given to using the original colour for the new exterior finish.

Given that it was only on the exterior where Wright's colour selection was implemented during the original construction, reinstating the original colour, although conceivable, would have been equivalent to overlooking the many changes the building underwent subsequently. More importantly, it would have resulted in a 'period restoration' which would have attempted to de-emphasize the presence – and relevance to the Guggenheim as an institution – of the 1992 addition and renovation, which to date is the most noticeable exponent of the building's evolution after the original construction.

The Venice Charter, one of the key documents providing the conceptual framework underlying the project's preservation philosophy, clarifies that, 'A monument is inseparable from the history to which it bears witness,' and that 'The valid contributions of all periods to the building of a monument must be respected.'¹³ In the light of 'progressive authenticity'¹⁴ where a historic structure's values are not limited to its origins, but also extend to its entire lifespan, the colour from the 1992 addition and alteration was reinstated in the new coatings, thereby recognizing the building as an evolving entity (Figure 10). In this case, the loss of original historic fabric (the failing buff-coloured Cocoon) did not force mandatory reinstatement of the original design intent.

Authenticity and Modern architecture

The work performed at the Guggenheim evidences that preserving either the original historic fabric or the architect's design intent cannot be the sole guiding principle while intervening on works from the Modern Movement. A more holistic approach is required to avoid formulaic considerations; this approach, as exemplified at the Guggenheim, should be based on authenticity, that is to say, it should ensure protection of the value-carrying features defining a building's cultural significance.



Figure 10 Frank Lloyd Wright, Solomon R. Guggenheim Museum, New York City, built 1956–59. Gwathmey Siegel & Associates Architects, Addition and Expansion, built 1989–92 (© D. Heald, the Solomon R. Guggenheim Foundation, 2009).

Authenticity, as defined in the 1994 Nara Document, is ‘the essential qualifying factor concerning values’.¹⁵ This seminal ICOMOS document further clarifies that certain aspects of historic resources determining authenticity ‘may include form and design, materials and substance, use and function, traditions and techniques, location and setting, and spirit and feeling, and other internal and external factors’.¹⁶ As evidenced by recent work at the Guggenheim, in the case of works from the Modern Movement, those internal and external factors may include: craftsmanship and mass production, integrity and durability, systems performance and conservation state, and original expression and contributing changes.

Craftsmanship and mass production

In the Guggenheim, Wright’s unique design solution for the museum’s architectural programme, combined with his use of materials in unprecedented ways – shotcrete installed inside-out against a removable

formwork – produced a building where the experimental nature of the architectural fabric competed, and in some cases prevented, the full realization of the architect's design intent. For instance, when Wright asked George Cohen, the general contractor, to scribe the formwork marks off the concrete surfaces,¹⁷ Cohen argued that 'formwork marks are characteristic of concrete'.¹⁸ He went on to explain that other construction methods, such as prefabrication and traditional out-in shotcrete installation, had been considered and discarded, as their 'cost would have been prohibitive and would have resulted in a machined job which we did not want to begin with'.

The exterior formwork marks on the Guggenheim walls, and the aforementioned correspondence exchange between its architect and the contractor, illustrates that in spite of the machine-like, repetitive, industrial nature of the materials used in Modern buildings, workmanship was not excluded from construction processes. Thus, the idea that craftsmanship was not as relevant during the Modern era and that 'the original design concept and idea are paramount'¹⁹ should be considered with care. Similarly, the notion that in Modern architecture, craftsmanship is not as significant as in older heritage, and therefore, 'the desire to preserve original material, is not dispensed with, but it is de-emphasized',²⁰ should also be weighed up carefully.

Considerations of authenticity of workmanship in buildings from the Modern Movement should be evaluated on a case-by-case basis. Just as in the Guggenheim, the appearance and performance of Modern buildings is often far from what was initially presented by the architect, or from what has been perpetuated by architectural history as the original design intent. Therefore, buildings from the Modern Movement ought to be preserved not for what they were supposed to be, or look like, but for what they actually are and have looked like from the original construction to date.

Integrity and durability

Along with new programmatic solutions and commitment to social causes, a renewed architectural expression was crucial to the Modern Movement. Hence, preservation of the Modern aesthetic should be pursued. However, enhancing the durability of experimental Modern materials is of the utmost importance in order to prevent historic fabric decay. For the Guggenheim, one of its most relevant values, besides Wright's unique programmatic solution, relies on the aesthetics of the building's distinctive, unadorned spiral geometry. Adding new, noticeable, remedial appurtenances to enhance durability could compromise the integrity of the building and should be avoided.

Ideally, preservation of Modern architecture should strike a balance between design integrity and material durability. They should not exist at the expense of each other, but as a balancing act where both are considered.

System performance and conservation state

Preservation of cultural properties, while such properties are in use, should evaluate the environmental performance of selected building-envelope systems and materials to ensure that energy conservation is warranted. Special consideration should be assigned to glazing systems, as glazed enclosures play a significant role in the architectural expression of Modern buildings.

The environmental performance of critical building systems and materials should be assessed along with their state of conservation. There are cases where both deterioration and poor environmental performance justify replacement. In other cases, as with the glazed enclosures at the Guggenheim, the need to upgrade selected building envelope components despite their sound conservation state is mandated by poor environmental performance.

In these cases, taking into account the future impact of emerging nanotechnologies on the building industry, refurbishment should be considered as the preferred option, as long as the integrity of the historic fabric is not compromised. If no attainable repair solution is available, the need to upgrade glazed building-envelope systems to meet the performance requirements of certain architectural uses might outweigh, on a case-by-case basis, preservation mandates for retaining original, yet low-performing, glazed systems in fair conservation state. When the upgrade of historic glazed building-envelope systems is required, preservation mandates for in-kind material replacement must be pursued, along with the enhancement of systems performance and retention of the architectural expression implicit in the original construction and design intent.

Original expression and contributing changes

Historic buildings are not always the sole product of their original construction. Subsequent changes – rehabilitations, additions or adaptive reuse – often become part of a building's evolving history and architectural expression. Built heritage's historic character is embodied in the full range of building fabric, which includes contributing changes. Conservation of Modern heritage, therefore, should not be narrowly focused on the original design intent. Contributing changes that positively enrich a Modern landmark's cultural significance, thereby extending its usefulness and service life, ought to be embraced.

Authenticity cannot be limited to the original fabric and design intent; it must welcome positive changes representing the building's evolution as a living organism. At the Guggenheim Museum, implementing this concept implied forgoing the opportunity to re-establish the original colour (which was only in place for about five years) and embracing subsequent additions and alterations that expanded and complemented both Wright's iconic building and the Guggenheim as a cultural institution.

Conclusion

One of the greatest risks inherent in the conservation of works from the Modern Movement relates to intervention criteria that primarily rely on aesthetics, thereby conserving a Modern building as an object, without taking into account the rationale that led to its conception, or how the building has performed and evolved over time. Similarly, valorizing a Modern building based on its architect's ideas about what the building was supposed to be like, instead of what it actually is to date, is equivalent to monumentalizing the Modern Movement in spite of its limitations and failures.

The preservation philosophy for intervening on buildings from the Modern Movement should not be any different from that established for cultural heritage dating from earlier periods. However, it does require the acknowledgement of the historic fabric vs. design intent dichotomy in order to fully analyse and understand the available documentation on the building's original concept, to assess the as-built historic building fabric and to evaluate subsequent contributing changes as evidence of the building's evolution and development.

Preservation standards, particularly in Modern buildings, should go along with – and not necessarily outweigh – efficient environmental performance. A sustainable preservation approach requires that, when intervening on critical components of Modern building envelopes, upgrades be aimed at preserving the integrity of the historic building character, instead of limiting the interventions to saving historic fabric alone. As acknowledged in the National Historic Preservation Act, 'energy benefits'²¹ are included within the cluster of vital legacies to be maintained and enriched for future generations. Those benefits include both embodied energy (the energy used for the building construction and maintenance to date) and prospective energy, which relates to the environmental appropriateness of a building's foreseeable energy consumption. Consequently, energy values promulgated by, and embedded within, the building fabric, should be included within the full range of cultural resources to be protected and enhanced. A sustainable preservation approach should consider replacing (with in-kind materials where possible) original yet poor-performing historic building fabric with improved systems that meet sustainable performance standards and retain the building's historic character.

Authenticity is an instrument for balancing conflicting interests between conservation of the fabric and the original design intent. Issues of craftsmanship and mass production, cultural integrity and physical durability, systems performance and conservation state, plus the original architectural expression and contributing changes, are relevant qualifiers that attribute new meanings to the concept of authenticity when assessing and intervening on buildings from the Modern Movement.

Biography

Angel Ayón

Angel Ayón, LEED AP, specializes in documentation, conditions assessment, repair and adaptive reuse of historic buildings and sites. He was the Project Architect for the Exterior Restoration and Building Enhancement of the Guggenheim Museum.* Mr Ayón holds a professional degree in Architecture and an MSc in Conservation and Rehabilitation of the Built Heritage from the Polytechnic Institute in Havana, Cuba, and a Post-Graduate Certificate in Conservation of Historic Buildings and Archaeological Sites from Columbia University in New York.

*The Exterior Restoration and Building Enhancement of the Solomon R. Guggenheim Museum was designed by preservation architects WASA/Studio A; structural engineers Robert Silman Associates PC; architectural conservators Integrated Conservation Resources Inc.; exterior envelope consultant William B. Rose & Associates; and M/E/P engineers Atkinson Koven Feinberg Engineers, LLP among other consultants and owner's representatives. The opinions included in this article are the author's and do not necessarily represent those of other members of the design team.

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- 21 National Park Service, 'National Historic Preservation Act of 1966, as amended through 2006', Section 1 (b) (4) (NHPA; Public Law 89–665; 16 U.S.C. 470 et seq.), <http://www.achp.gov/docs/nhpa%202008-final.pdf> (accessed 8 August 2008).