Conserving Frank Lloyd Wright’s Solomon R. Guggenheim Museum

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Abstract

After almost fifty years of service, the first comprehensive exterior restoration was completed on New York’s Solomon R. Guggenheim Museum in 2008. The work included exterior concrete repairs and recoating; concealed structural reinforcement; skylight and window replacement; and mechanical upgrades. This paper examines the issues involved in determining the best courses of action in conserving the building and discusses the results of that conservation work.

The building

The Solomon R. Guggenheim Museum in New York City, dating from 1959, is considered a masterpiece of the American architect Frank Lloyd Wright (Figure 1). However, when it was first completed, it was not the recognised icon of Modernism that it is today. Instead, because of its prominent location across from Central Park on Fifth Avenue between East 88th and 89th Streets, it was considered an aberration by the Upper East Side’s wealthy class. It did not fit in with their taste for classicism, or into Manhattan’s relentless street grid (Calnek 2005: 9).¹ However, over the years, the building was accepted not only as an attraction to the neighbourhood, but also as the largest artefact in the museum’s collection. It has become the second most visited site in New York City after the Statue of Liberty. It is now celebrated as a National Historic Landmark, and in 1979, it became the youngest building to be designated as an individual landmark by the New York City Landmarks Preservation Commission.

Solomon R. Guggenheim, who began collecting Modern art in 1929, formed the Solomon R. Guggenheim Foundation in 1937. At first, his collection was displayed in rented space, but by 1943, he had hired Frank Lloyd Wright to design the building that would eventually house his collection. The site, composed of several lots, was bought piecemeal over a four-year period (Storrer 2009: 36-43). After numerous redesigns, including early concepts where the building was to be clad with orange, red or white marble (Matero & Fitzgerald 2007: 6), the unorthodox design finally received approval from the New York City Department of Buildings and construction began in 1957. At this point, Frank Lloyd Wright was 89 years old.

Figure 1: The Solomon R. Guggenheim Museum after restoration. (All photos by WASA/Studio A, courtesy of the Solomon R. Guggenheim Foundation)
The original building was comprised of a large Rotunda and a smaller appendage known as the Monitor (now referred to as the Thannhauser Gallery). The Rotunda is supported on twelve concrete web walls perpendicular to its circumference spaced every 30 degrees (Figure 2). These support the partially cantilevered spiralling ramp that leads to the top of the Rotunda. The web walls connect at the roof level forming hairpin beams that support the massive central skylight. Along the perimeter, continuous skylights concealed by lay-lights permit diffuse natural light to illuminate the artwork. The curved walls are constructed of shotcrete (gunite), which was sprayed from the interior onto plywood forms secured every 10 degrees to vertical steel Tees embedded in the walls. The reinforcing of the shotcrete consists of vertical and horizontal steel bars sandwiched between two layers of welded-wire mesh.

From his sketches, it appears that Frank Lloyd Wright always envisioned a rectangular addition behind the building along East 89th Street (Storrer 2009: 6). By 1968, the first addition was erected. Designed by Wesley Peters, an engineer and architectural apprentice who was also Frank Lloyd Wright’s son-in-law, the addition was relatively short and squat and not as tall as Wright’s sketch version. In 1975, Donald Freed designed the glazed enclosure that became the ground-floor museum shop, eliminating the driveway that once connected East 89th Street to Fifth Avenue. Richard Meier converted the original Architectural Archives into the Aye Simon Reading Room in 1978. Finally, in 1992, the current Gwathmey Siegel and Associates-designed limestone-clad addition was completed on the foundations of the former Peters’ structure, with proportions more closely resembling Wright’s vision. Arguably, the most significant of the alterations to the building in terms of visual impact, it was described by noted architectural critic Paul Goldberger (1987) as “a calm background, a kind of curtain, before which Wright’s dynamic forms can hold forth.” When completed, Goldberger summed up the addition as follows:

This, then, is the great achievement: the building is now a better museum and a better work of architecture. If the Guggenheim’s roles as a museum and as a piece of architecture have always been somewhat at odds, this renovation at least partly resolves them. In the end, Mr. Gwathmey and Mr. Siegel have come to praise Wright, not to bury him, and the honor they bring to this building ennobles us all (Goldberger 1992).
Archival and physical investigations

From December 2004 to September 2008, the Solomon R. Guggenheim Museum underwent its first major exterior restoration. Up until that time, only minor repairs had been made to the exterior and the building had been repainted several times, as evidenced by up to eleven layers of paint. A comprehensive documentation and monitoring program consumed the first year and a half of the restoration. Extensive archival research, of both the museum’s archives as well as copies of the Frank Lloyd Wright Foundation’s documents available at the Getty Research Institute in Los Angeles, revealed historic construction photographs and volumes of correspondence, original construction drawings, specifications and shop drawings. The documentation program comprised painstaking mapping of cracks of the exterior surfaces, both before and after paint removal (Figure 3) (Park 2007).2

Over 100 paint samples were removed and analysed. Simultaneously, samples of shotcrete were analysed and replicas were used in the laboratory as mock-ups for various manufacturers’ systems of flexible patches and coatings that underwent rigorous accelerated weathering in order to assess characteristics and service life of proposed repair materials.3 Structural monitoring of cracks and environmental monitoring of temperature and relative humidity, both within the shotcrete walls and at the interior of the museum, permitted a better understanding of the building’s behaviour.4 Laser scanning of interior and exterior surfaces produced a 3-D model that enabled structural engineers to comprehend the effects of thermal loading on the 5” (125mm) thick shotcrete walls.5 Non-destructive evaluation located embedded steel. Exploratory probes at select locations revealed the existing condition of concealed steel. Exhaustive documentation was concluded prior to finalising bid documents.

The comprehensive building enhancement program that followed involved not only the restoration of the exterior, but also mechanical infrastructure upgrades.6 In addition, the sixth-floor ramp walls were structurally reinforced with a basket-weave pattern of carbon-fibre-reinforced polymer (CFRP) applied to the interior surface. The performance of the building envelope was enhanced through the installation of an air barrier at the sixth-floor ramp walls, insulation at gaps around the perimeter, and the replacement of the single-glazed windows and skylights with thermally-broken replicas.

Figure 3: Crack map of the west elevation.
A question of colour

The original colour of the Guggenheim was identified as matching Benjamin Moore HC-35, a buff light yellow or light brown (Integrated Conservation Resources 2007: 4). It was accomplished with an early version of an elastomeric paint known as the “Cocoon”. Frank Lloyd Wright was notorious for not inserting expansion joints in his monolithic concrete structures, and the Guggenheim was no exception. By selecting the Cocoon, a high-build coating originally designed for use in mothballing World War 2 naval vessels recommended by the painting subcontractor, Wright hoped to bridge cracks that had formed during construction as a result of his decision.

Charles Gwathmey believed the whitish colour he chose to repaint the exterior of the Guggenheim in 1992 was close to the original, and perhaps his selection of a limestone finish for his addition was based on this mistaken concept (Jerome 2008: 6). Recognising that this would be an area of controversy, the New York City Landmarks Preservation Commission (LPC) separated the paint from the general application for repairs that was submitted by the museum. Indeed, the final choice of paint divided the preservation community. On the one side, the purists viewed the museum’s restoration as the ideal opportunity to reapply Frank Lloyd Wright’s original colour. On the other hand, the museum, supported by the preservation architects, saw the building as a living institution that had evolved over time, taking on the characteristic whitish hue that the building has become known for. Both of these approaches to authenticity could be considered valid. This sparked a major debate that was widely publicised in the local press (Schuster 2007a, 2007b: 3; New York Sun 2007: 3; Chan 2007: E3; Kittens 2007: 3). Should the building be painted the original colour, or should the alterations and additions be acknowledged as having fundamentally changed the object that was being preserved? Both sides advanced convincing arguments. It took two LPC hearings to resolve this issue.

Establishing the conservation approach

The conservation approach preferred by both the museum and WASA/Studio A was based on the Venice Charter (1964) and the Nara Document on Authenticity (1994). Since we were not removing the alterations or additions, the best we could accomplish was a 1992-period restoration. We favoured a progressive authenticity approach, retaining changes that have occurred over time so that a building reads as a timeline of its history (von Droste & Bertilsson 1994: 4).

In the very first sentence of the Venice Charter, it states, “Imbued with a message from the past, the historic monuments of generations of people remain to the present day as living witnesses of their age-old tradition… It is our duty to hand them on in the full richness of their authenticity.” Further on, under Article 3, the charter notes, “The intention in conserving and restoring monuments is to safeguard them no less as works of art than as historical evidence.” In Article 7, it reads, “A monument is inseparable from the history to which it bears witness and from the setting in which it occurs…” Finally in Article 11, the charter states, “The valid contributions of all periods to the building of a monument must be respected, since unity of style is not the aim of a restoration. When a building includes the superimposed work of different periods, the revealing of the underlying state can only be justified in exceptional circumstances and when what is removed is of little interest and the material which is brought to light is of great historical, archaeological and aesthetic value, and its state of preservation good enough to justify the action…” (Venice Charter 1964).

Purists viewed our acknowledgement of the significant role of the additions and alterations, particularly the Gwathmey Siegel addition, as allowing “the tail to wag the dog”. For us, however, the alternative was equivalent to an approach favoured by the mid-nineteenth century preservation theorist, Eugene Emmanuel Viollet-le-Duc, who stated, “to restore a building is not to conserve it, to repair or reconstruct it – but to re-establish it to a complete state such as may have never even existed at any given moment” (Molina-Montes 1982: 22). Instead, we were inclined to agree with Paul Philippot (1976: 372, 374), who wrote,
“It is an illusion to believe that an object can be brought back to its original state by stripping it of all later additions… The original state is an abstract idea and not a historical reality.” Further, the great Italian theoretician of modern conservation, Cesare Brandi, stated in 1951, “It is manifest that a work of art has a life in time. For this reason, which is the same one that forbids falsification, the work of art cannot be taken back to its starting point as if time were reversible” (Molina-Montes 1982: 128).

In the end, the LPC voted for a colour that was not Wright’s original.

**Condition of the exterior surface**

A recent publication by Matero and Fitzgerald (2007: 3-4) has raised doubts as to whether the exterior finish of the building was consistent with Wright’s intent. While it is true he died before the building was opened to the public, there is an archival photograph of Wright on the balcony of the Monitor with workers painting the Rotunda in the background (the building was actually painted in 1958, six months before Frank Lloyd Wright passed away) (Storrer 2009: 39). This photographic evidence indicates that the exterior finish was at least as Wright instructed during the construction phase. The museum, once stripped of its multiple layers of paint, was revealed as remarkably hand-crafted. Formwork marks are visible in raking light even through the paint (Figure 4), but the uncoated shotcrete surfaces exhibited great detail including the imprints of the wood graining from the plywood forms. From archival correspondence, it appears that Wright was expecting a smoother finish. However, the photograph referenced above is evidence that he accepted the final product, however imperfect. Therefore, were the surface marks to be considered defects or evidence of authenticity of craftsmanship (Jerome 2008: 3)? We opted for the latter approach.

As conservators, we are responsible for the choices made about the object in our care. In conservation theory, one of the recognised tenets is to perform the minimal intervention necessary to safeguard the object. Additionally, our profession accepts that our interventions should be as reversible as possible, and that we should save original fabric to the greatest extent practical. The Venice Charter states under Article 9, “The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp…” At the Guggenheim, this latter concept was accomplished through the selection of repair materials, which although compatible, is recognisably different under microscopic examination. The Venice Charter continues under Article 15 to say, “…The material used for integration should always be recognizable and should be the least that will ensure the conservation of a monument and the reinstatement of its form” (Venice Charter 1964).

![Figure 4: Formwork marks were deliberately retained on the restored façade and were treated as evidence of authenticity of craftsmanship.](image4.png)

![Figure 5: Patches carefully recreated the texture and formwork marks. This patch is at the sixth-floor ramp wall, where vertical control joints remedially installed in 1998 were retained.](image5.png)
We perceived the Guggenheim in its present condition as the vessel to be conserved. We did not take the position that we could presume to know Wright’s intent. For this reason, when the question came up as to how to accomplish the post-reinforcement of the sixth-floor ramp wall, the solution to wrap its exterior surface with CFRP, thus permanently altering the texture of those surfaces by grinding them smooth, was rejected in favour of a less invasive, although structurally adequate, approach: the installation of the carbon-fibre reinforcement on the interior surface of the wall. In addition, the contractor, who applied the patches and crack fillers using the specified compatible compound, carefully recreated the texture of the surface as well as the formwork marks (Figure 5). Yet our choice to leave the evidence of the original workmanship may continue to be perceived by critics as marring the surface.

Conserving the steel frame windows – the problem of excessive condensation

As stated earlier, as preservationists we strive to maintain original building fabric. However, there comes a point where a building’s use may take precedence. That point arrived when it came to the Guggenheim’s original single-glazed steel window walls and aluminium skylights. Although the fabric of both types of units was in remarkably good condition, fluctuations in New York City’s temperatures permitted condensation to form on the interior of the glazed surfaces during the coldest days of winter months (Figure 6).

At Frank Lloyd Wright’s Fallingwater, a former private weekend residence that now functions as a house museum, as preservation architects we elected to save similar single-glazed steel casement windows, although in some cases, elements of the sash were severely corroded (Jerome, Weiss & Ephron 2006: 8). In good weather, the windows are often left open, and the house is displayed to visitors as it was lived in. In the case of the Guggenheim, however, we needed to acknowledge the building’s continued use as a functioning world-class art museum, and the integrity of the priceless artwork displayed inside took priority (Jerome, Ayón & Shwartzbaum 2008: 4-5). The performance of the shotcrete walls and apron slabs had been upgraded at the time of the 1992 addition, and was further improved during the 2004-08 building enhancement, but the single-glazed thermally-unbroken window walls and skylights were clearly still an issue.

Numerous design attempts were made to retrofit the existing sash of both windows and skylights, thereby saving the original fabric. In the case of the windows, we found that we could not accomplish this without seriously compromising the interior aesthetics. (Some of the museum’s interior spaces are also a New York City-designated landmark.) In addition, for both glass walls and skylights, the retrofit designs would not provide a true thermal break. After much deliberation, a decision was made to recreate the windows and skylights.

For the windows, this resulted in the unprecedented step of fabricating thermally-broken steel replicas with double-glazing (Figure 7). With the skylights, it was much
easier to find a manufacturer to recreate the aluminium profiles with thermally-broken double-glazed units. Discrete improvements were made to the original design of the skylights, which are not actually visible at the interior because of the lay-lights, and are recessed in shadow on the exterior, as the upward advance of the building’s spiral shape overhangs each floor below.

Conclusion

When dealing with the restoration of Modernist icons, there are many approaches to conservation that could be considered valid. Because of the relatively young age of these buildings, there are far fewer case studies and there have not been as many opportunities in our profession to validate our actions. In the case of the Solomon R. Guggenheim Museum, the design team went through two-day peer reviews twice by an invited panel of distinguished colleagues. Still, some of our decisions provoked major public debate. Fortunately, with the exception of the windows and skylights, our interventions are reversible, leaving options open for future restorers who may make other legitimate choices.

References


Goldberger, P. 1987, ‘In adding to the Guggenheim, a little less goes a long way’, *New York Times*, February 15


‘Guggenheim exterior to go gray’ 2007, *New York Sun*, November 21, p. 3


Schuster, K. 2007, ‘So what’s the “Wright” colour? Friction over Guggenheim paint job’, 
AM New York, October 15, p. 3

Solomon R. Guggenheim Foundation 2007, Historic paint analysis for exterior colors. The 
Solomon R. Guggenheim Museum exterior restoration and building enhancement, report 
prepared by Integrated Conservation Resources, New York, June 11, p. 4

Storrer, W.A. 2009, ‘The wonder of it all. The Guggenheim at 50’, Modernism, Spring, 
pp. 36-43

Centre, Paris; Agency for Cultural Affairs, Tokyo; ICCROM, Rome; ICOMOS, Paris, p. 4

Endnotes

1. A cartoon from the New Yorker during that period depicts a couple driving by the 
Guggenheim with one asking the other, “Are they allowed to do that on Fifth Avenue?”

2. WASA/Studio A (Wank Adams Slavin Associates LLP) was the preservation architect for the 
restoration.

3. The materials conservation work was carried out by Integrated Conservation Resources 
(ICR).

4. William B. Rose Associates was the moisture consultant.

5. Robert Silman Associates, PC was the structural engineer for the project.

6. Atkinson Koven Feinberg Engineers, LLP (AKF) was the mechanical engineer for the 
project.

7. “Due recognition should be given to “progressive authenticity”, that is to say, to buildings 
and constructions, in which, although having been modified throughout time, some of 
the original intention was retained.”

8. The World Heritage Convention Operational Guidelines have always included 
workmanship as one of the tests of authenticity that properties must meet in order to be 
designated on the World Heritage List.

9. The concrete repair contractor was Nicholson and Galloway, Inc. of Glenhead, NY.

10. The manufacturer of these units was Torrance Steel Windows of Torrance, CA.