9º seminário docomomo brasil
interdisciplinaridade e experiências em documentação e preservação do patrimônio recente
brasília . junho de 2011 . www.docomomobsb.org

Documenting the modern movement

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Abstract

This paper discusses the documentation efforts undertaken during the exterior restoration and building enhancement works at the Solomon R. Guggenheim Museum (SRGM), in New York City and the documentation work performed for the refurbishment of the Grade II* listed High and Over, a house in Amersham, England.

In spite of the common ground shared by both buildings as outstanding exemplars of Modern Movement heritage, fewer similarities were found between the respective documentation approaches. The differences in building ownership, use and in the client's brief and budgets were determining factors on the documentation processes undertaken.

In light of the numerous constraints to which conservation projects are subjected to, the exchange of information on documentation strategies, particularly of those which prove to be economical, inventive and effective alternatives to more elaborate or costly scientific tools is of paramount importance.

Keywords: Documentation, Guggenheim Museum, High and Over.

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1. Introduction

This paper explores the different approaches to documentation undertaken during the restoration and enhancement works to two prominent buildings of the Modern Movement: the Guggenheim Museum in New York City and High and Over in Amersham, England. In spite of architectural similarities, less common conservation ground was found between the two projects than expected, and the documentation approach reiterates these differences.

The case studies illustrate technologies and strategies employed during the documentation process, focusing on the simpler and affordable methods that proved effective for each projects' pathologies, budgets, scales, typologies and legislative contexts, underscoring the wide ranging benefits accrued from the documentation exercise whilst highlighting similarities and differences between the two projects.

2. Background

2.1 Guggenheim Museum

The Guggenheim Museum, designed by Frank Lloyd Wright (FLW) between 1943 and 1956, opened in 1959. A series of renovations, additions and alterations took place from 1963 to 1998. By 2005, when the building's physical deterioration and services obsolescence were evident, the architectural practice Wank Adams Slavin Associates LLP (WASA/Studio A) along with the structural engineering firm Robert Silman Associates (RSA) and the materials conservation practice Integrated Conservation Resources (ICR) were commissioned to design the exterior restoration and building enhancement works (Fig.1).

The documentation scope pertained to a combined architectural, structural and materials analysis to assess the causes of the pathologies evident in the building which broadly consisted of concrete cracks, spalls, oxidized steel reinforcement, failure of previous repairs and damage to single glazed steel windows and doors due condensation, along with deterioration of sidewalks.

Based on interdisciplinary analyses, proposals for remediation were devised and their potential impact on the appearance, authenticity and integrity of the built fabric were assessed. The project was concluded in 2008[1].

Fig. 1. Guggenheim Museum, December 2007.
(Photo: Debora Barros)

2.1 High and Over

High and Over, a 1929 Grade II* listed[2] house designed by the New Zealand born architect Amyas D. Connell, is considered to be the first bold expression of the International Style in England (Fig.2). Built between 1929 and 1931, the house is a remarkable testimony to one of the rare and fortunate encounters between visionary client (the renowned archaeologist Dr. Bernard Ashmole, 1894-1988) and daring

[1] For further information on the conservation of the SRGM, refer to: Jerome, Pamela. "*Restoring Frank Lloyd Wright's Solomon R. Guggenheim Museum"* July 2009. Published in the proceedings of the '(Un)Loved Modern: Conservation of Twentieth Century Heritage Conference in Sydney, Australia. http://www.aicomos.com/wp-content/uploads/2009_UnlovedModern_Jerome_Pamela_Frank-Lloyd_Paper.pdf, accessed on 21/02/2011.

[2] Properties of architectural, historic and cultural value in the UK are listed Grade I, Grade II* or Grade II, which respectively encompass 2.5%, 5.5%, and 92% of listed buildings. There are approximately 374,081 listed building entries in England, High and Over was listed Grade II in 1971 and upgraded to Grade II* in 1991.

architect (the young New-Zealander architect Amyas C. Connell, 1901-1980), yielding a unique cultural artifact capable of impacting generations to come. [3]

The 'Y' shaped house with three wings gravitating around a central hexagonal hall embodied a unique balance between an International Style shell and Art Deco inspired interiors. The apt design celebrated the client's interests, synthesizing spatial attributes of Baroque architecture expressed in the Modern Movement vocabulary.

The combination of glistening finishes in social rooms with modern appliances and finishes favoring functionality in the services and private areas demonstrated that a house could be a machine where to live… comfortably.

The most relevant additions and alterations took place in the early 1950's, in 1963 and in 2008.

The current owners commissioned Stephen Levrant Heritage Architecture Ltd in 2010 to provide heritage services for the refurbishment and conservation of the house and upgrade of outdated services.

Fig. 2. High and Over, eastern view, 2011 (Photo: Debora Barros for SLHA)

[3] Amyas D. Connell had a successful partnership with Basil Ward and Collin Lucas established in 1933. The partners worked separately but their International Style buildings along with Connell's involvement in the M.A.R.S. group (Modern Architectural Research Group) were remarkably important to the introduction and development of the Modern Movement in England.

3. Research

3.1 Guggenheim Museum

The archival research undertaken by WASA/Studio A consisted of review of previous documentation and of archival photographs, drawings, specifications and correspondence. [4] The original schematic design drawings and progress sets, construction drawings, design drawings by FLW, shop drawings by contractors and additions and alterations drawings were consulted, in addition to archival photographs and construction specifications. Archival correspondence and specifications were particularly revealing sources.

Since the significance of the building and of the architect is already well established, the research focused on possible answers to technical issues. It aimed at clarifications regarding the structural layout, building assembly, materials composition and specifications along with information regarding the chronology and extent of interventions occurred over time.

3.2 High and Over

Archival research was undertaken in local and national archives[5]. Since the original construction documents and specifications for High and Over were not found, archival publications were of paramount importance to indicate what the original plan-form, design and finishes were. Period photographs were the primary source for the identification of original character defining features, many of which have been lost or altered.

The significance of the architect and house are, as in the case of the Guggenheim, well documented. Review of the previously submitted planning applications were essential for the understanding of alterations occurred over time.

4. Recording and Monitoring

4.1 Guggenheim Museum

Given the complexity of the building's form and lack of accurate electronic background drawings that could be used by interdisciplinary team[6], a laser survey for 2D and 3D output of selected areas was undertaken. [7]

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[4] Primary research undertaken at the Research Library of the Getty Research Institute (GRI) in Los Angeles, CA and at the SRGM Archives provided invaluable information on the building's assembly and construction details.

[5] Research was undertaken at the Royal Institute of British Architects-RIBA, British Museum Library, Chiltern District Council, Amersham Museum, supplemented by online research and oral and film records.

[6] Team responsible for the exterior restoration and building enhancement works for the SRGM: Architect - Wank Adams Slavin Associates LLP (WASA/Studio A); Structural Engineer - Robert Silman

Archival research review allowed for the creation of drawings that expressed the date of construction of the existing fabric. Drawings reflecting the types of materials used on the building's exterior (Fig 3) were produced along with the mapping of visible pathologies.

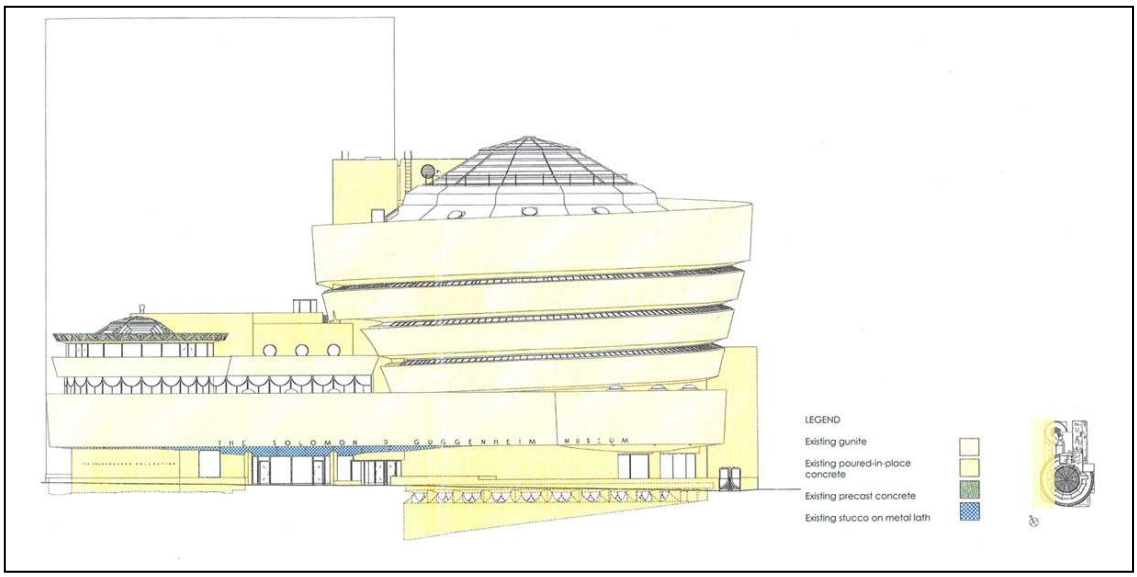

Fig. 3. Documentation of material substrate types. (Drawing by WASA/Studio A with permission of the Solomon R. Guggenheim Foundation.)

Survey sheets were created based on the 2D CAD background files, with a nomenclature system corresponding to sections of the building. The building's walls were exposed after removal of up to eleven layers of paint. The walls were marked up with chalk, cracks were measured and conditions were manually recorded according to a pre-established set of issues noticed on site. Completed survey sheets were scanned and the images were overlaid electronically onto drawings reflecting the location of steel reinforcement (Fig 4). This laborious and yet fairly low-tech exercise yielded graphic evidence of the relationship between pathologies or previous repairs and the layout of the structural reinforcement. This was the first time since the building's construction that the concrete and shotcrete surfaces were fully exposed. The survey

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Associates, P.C (RSA); Exterior Envelope Consultant - William B. Rose & Associates, Inc (WRA); Architectural Conservator - Integrated Conservation Resources (ICR); Project Director - Paratus Group (PG); MEP Engineers - Atkinson Koven Feinberg Engineers LLP (AKF); Construction Manager - F.J. Sciame Construction Co. Inc, Concrete Repair Contractor: Nicholson and Galloway, Inc.

[7] Quantapoint, the appointed surveying contractor used its own patented 3D laser scanning technology for 2D and 3D output. Arnold Animations was Quantapoint's 3D model sub-contractor. The 3D models served as basis for a 3D Finite Element Analysis (FEA) which was undertaken by the structural engineers (RSA).

sheets became a relevant record of the extent and type of issues developed over almost fifty years of the building's life.

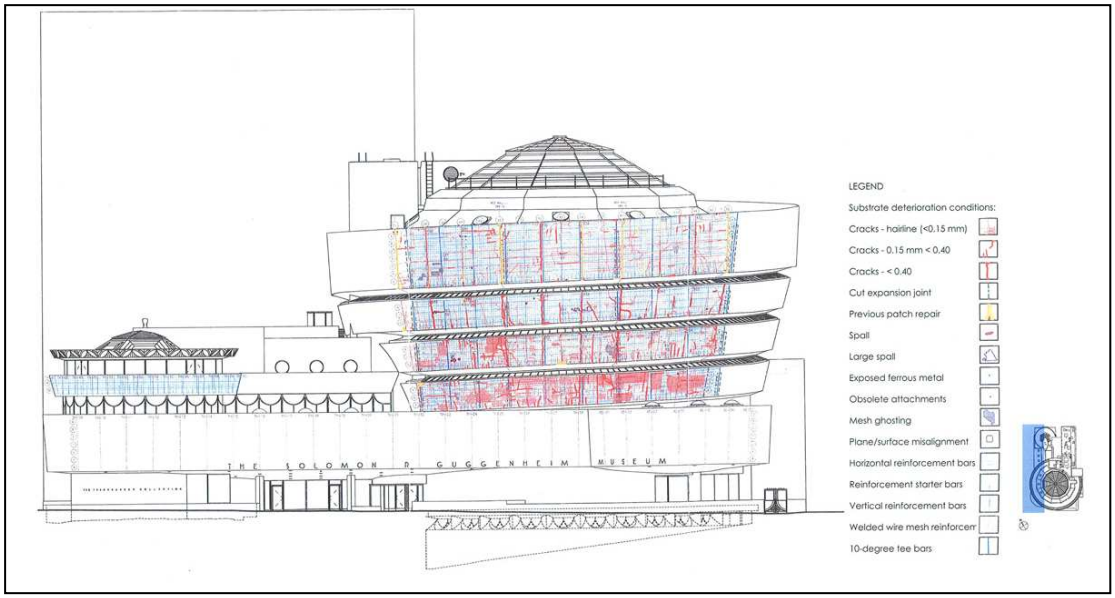

Fig. 4. Overlay drawing showing the correlation between pathologies and the steel reinforcement layout. (Drawing by WASA/Studio A with permission of the Solomon R. Guggenheim Foundation.)

Given the extent and types of concrete problems noticed on site, the client's brief and the landmark status of the building[8], a comprehensive monitoring program was implemented. The reasons for failure of previously executed repairs and of peeling and blistering coatings were also studied. All these pathologies were considered in light of changing weather and environmental conditions on the exterior surface of the building.

The monitors consisted of tilt meters and crack meters, string and linear potentiometers. Temperature and relative humidity (T/RH) sensors were installed along with a weather station at roof level to log the environmental temperature, relative humidity and wind direction. The sensors were installed in clusters and their location was determined by the physical stresses noticed on the building's shell in an attempt to correlate the physical and structural behavior of the fabric (mostly shotcrete or cast-in-place concrete) to the changing environmental conditions. Non-destructive testing such as ground penetrating radar was used to identify the location of embedded reinforcement.

[8] The SRGM was designated a New York City Landmark on 14th August 1990. http://www.neighborhoodpreservationcenter.org/db/bb_files/1990Guggenheim.pdf, accessed 22/02/2011 and was designated a National Historic Landmark on 6th October 2008. http://www.nps.gov/history/nr/listings/20081017.HTM, accessed 22/02/2011.

Advanced technologies were extensively used as demanded by the project's complexities, but only when absolutely necessary[9].

4.2 High and Over

Archival research materials, drawings and information supporting planning applications from 1951 until 2008 were considered in order to construct a sequence of alterations that occurred over time leading to the creation of morphological plans (Fig.5).

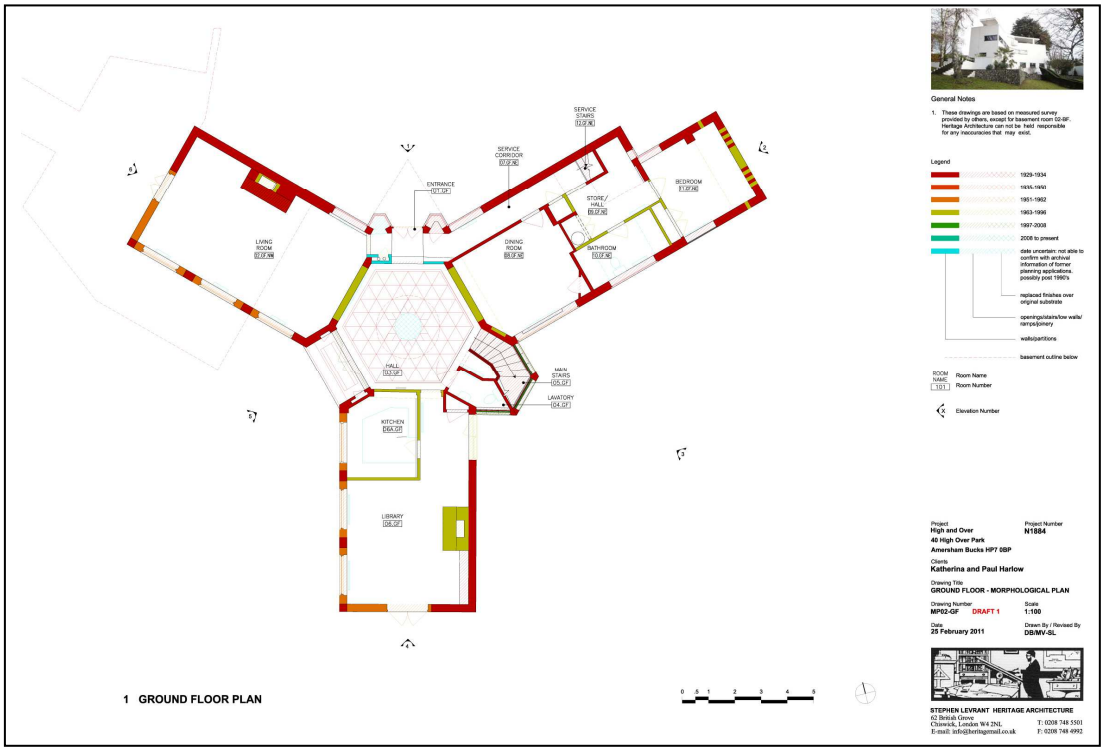

Fig. 5. Morphological drawing reflecting different periods of construction of architectural elements. (Drawing by/courtesy of SLHA)

It was clear in the case of High and Over that the changes that occurred over time significantly impaired the special interest of the building and, even though the house was listed in 1971 with alterations, the later work does not withstand the test of criteria for listing [10] . The documentation provided sufficient information for possible

[9] The possibility of performing the crack mapping survey with electronic digitizers (tablets) was ruled out due to initial cost investment and staff training implications. The option for combined CAD-hand drawn documentation proved to be satisfactory.

[10] The Secretary of State sets out in the DCMS – 'Principles of Selection for Listing Buildings', 2010 statutory criteria for listing based on architectural and historic interest, age and rarity, aesthetic merits, selectivity and national interest. English Heritage's criteria outlined in 'EH Conservation Principles, Policies and Guidance' (2008) corroborates and further elaborates on the criteria by recommending consideration to evidential, historical, architectural and communal values.

reinstatement of character defining ground floor features without conjecture[11]. The documentation focused on identifying where original fabric was extant and on recording later additions (the early 1950's, 1963 and 2008 were the most significant periods). The intent was to identify areas of less material integrity that could be explored for the implementation of services upgrade or new design as required. The morphological plans were used as a close basis from which significance was interpreted, leading to proposals that advocated a combined conservation approach which included selective reinstatement, refurbishment and new design (Fig.6).

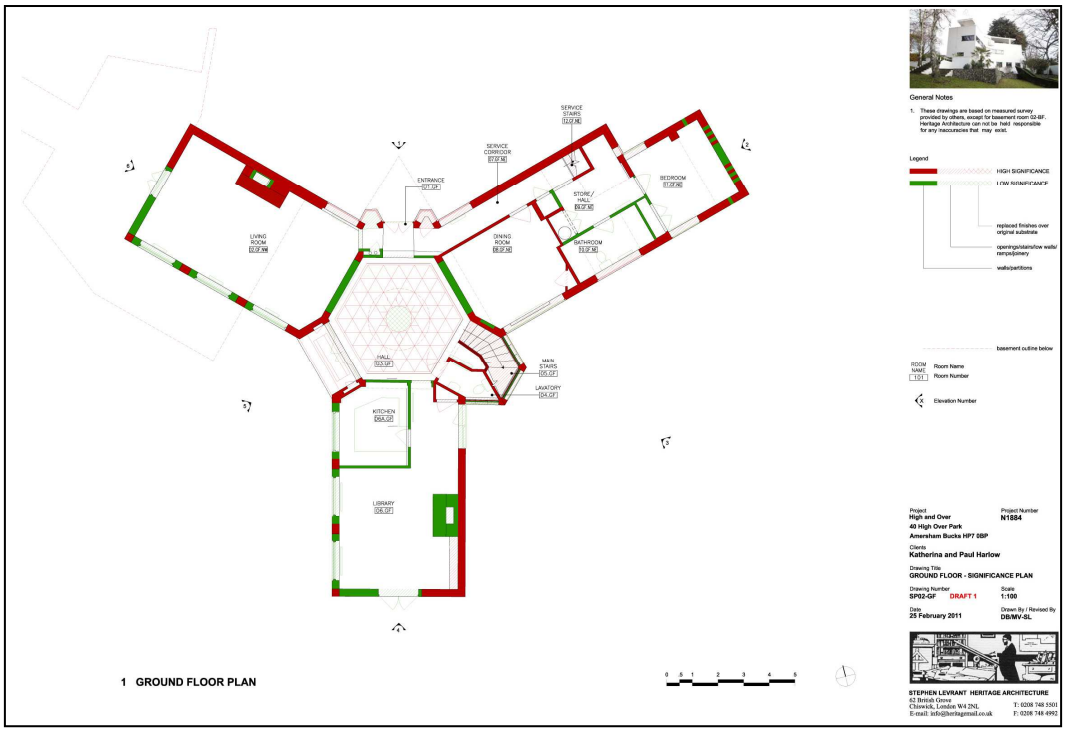

Fig. 6. Significance drawing. Red indicates original construction. Green refers to later, low significance alterations. (Drawing by/courtesy of SLHA)

[11] When preserving heritage of the recent past, authenticity and material integrity as addressed in International Charters for Conservation is tested against the preservation of the architect's design intent. In the case of the Guggenheim Museum the retention of the building's alterations as a "timeline of its history" (Jerome, 2009) was a sensible approach. Nonetheless, other character defining features such as the evidence of craftsmanship were reinstated and improved performance was favored against perpetuation of design or materials which proved to be flawed. A similar balanced approach was recommended for High and Over where the design intent of the prominent architect was the core of the building's special interest. Selective reinstatement was suggested along with retention of past alterations that did not undermine the building's significance. The necessary systems upgrades or new design was recommended to better accommodate the clients' needs, as the building had to function as their main residence.

5. Tests, Material Analysis, Opening Ups and Mock-Ups

5.1 Guggenheim Museum

While the structural monitoring of the building went on, selective opening up works to determine the condition of the embedded steel were undertaken. Simultaneously, numerous paint samples analysis were performed while shotcrete samples were collected, analyzed and replicated by several manufacturers of cement patching materials. The samples were then submitted to intense laboratory weathering tests[12].

5.2 High and Over

At High and Over, where the extent of building pathologies was far less alarming and easily correlated to the causes, the need for testing was deemed (to date) unnecessary by the team. In spite of recommendations for paint analysis to match the original paint colors, the clients opted for a match based solely on descriptions given in the archival articles and on a sample collected at the main central hall. The need for mock-ups was envisioned for areas of proposed reinstatement of architectural features such as decorative metal trims, aluminum base boards and window surrounds.

A minor campaign of opening up works was devised for the ground floor level, in order to verify the structural feasibility for the reinstatement of wider 'strip' windows in the living room and library, as originally built. Likewise, opening up works were proposed to confirm the feasibility of reinstating the glazed folding doors in the central hall.

6. Considering alternative documentation strategies

Technologies and equipment at the disposal of conservators today were not generally developed having heritage conservation as target market. Several technologies have been adopted without a good understanding of how equipments function or what is being measured, leading to production of faulty data. Effective gathering, processing and interpretation of data are essential. As an example, the wide spread use of electrical moisture meters and infrared thermography have been proven inaccurate to detect levels of moisture content in materials exposed to hygroscopic salts[13], a common issue in buildings old and new. Nonetheless, simple techniques such as *in situ* temperature

[12] This process was guided by the materials conservator ICR. MAPEI was selected as a single-source manufacturer for the types of materials required: steel corrosion inhibitor, crack filler, a patching compound and coating system. Products used were: Mapefer 1k, Planitop XS and Mapelastic.

[13] Barros, Debora. "The Electrical Moisture Meter and Infrared Thermography: Assessing the Effectiveness of Two Non-Destructive Techniques for Moisture Diagnosis in Structures Contaminated by Hygroscopic Salts" Master of Science in Historic Preservation Thesis, Graduate School of Architecture, Planning and Preservation, Columbia University (May 2005).

measurements by using a handheld infrared thermometer on a regular grid pattern might effectively indicate areas of moisture ingress and active leaks[14].

The issue of non-destructive investigations (i.e. infrared thermography) versus more intrusive methods (i.e. drilling into the fabric for the installation of RH and temperature sensors to measure moisture content) should be considered in light of the quality of the information yielded and based on the impact caused onto the built significant fabric. Some of the questions to be raised are: What is the best methodology to investigate the cause of the problems? Are there alternatives for the chosen methods? What are the time and cost implications of each option? How much precision is required?

7. Conclusion

The role of documentation as a fundamental step for the successful outcome of heritage projects is undeniable. However, in light of project conditions where usually time and budgets for completion are rather limited, it is important establish early on which issues merit high-tech scientific investigations and which ones can be dealt with by relying in simpler, man-power based alternatives.

The creation of the documentation drawings as exemplified are a simple and yet effective documentation exercise which requires minimal and widespread technology. The documentation can be hand or CAD drawn, or be a combination of both. The main cost implication in this approach is the number of labor hours spent on research, field surveys and production output. These techniques provide graphic and easy to grasp evidence on how pathologies relate to materials types and subsurface conditions. They can also be used for the creation of morphological studies and serve as basis for significance analysis and impact assessments, demonstrating how proposals might potentially affect the special interest of heritage assets[15], as required for discussions with conservation bodies or with the wider constituency. Finally, the documentation strategies discussed provided records of the buildings at a specific time for the present

[14] Significant changes of temperature (around 3°C) can indicate an infiltration or leak, or a rising damp problem, and can be checked with the aid of a hand-held infrared thermometer in lieu of renting or purchasing the more complex and costly infrared thermography equipment.

[15] In the UK Planning system, Planning Policy Statement 5 (PPS 5) sets out the type of information required in heritage based planning/Listed Building Consent Applications. Policy HE6 addresses Information requirements for applications for consent affecting heritage assets in policy HE6.1, which says: *"Local planning authorities should require an applicant to provide a description of the significance of the heritage assets affected and the contribution of their setting to that significance."*, and adds: *"The level of detail should be proportionate to the importance of the heritage asset and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset."*. Policy HE6.3 emphasizes the pivotal importance of documentation by urging local planning authorities to *"…not validate applications where the extent of the impact of the proposal on the significance of any heritage assets affected cannot adequately be understood from the application and supporting documents."*

and future generations, information which should be archived and made available to others.

Whether using high or low-tech documentation techniques, the amount and type of information collected should be relevant and manageable, ultimately leading to a sensible and proportional response to the project's demands.

In the UK Planning context, the requirements for recording and documentation are clearly set out in Planning Policy 5 (PPS5) [16] which implies that an applicant should provide a '*proportional response'* that allows for an understanding of how the works will impact the special interest of the building. It adds that only the information necessary for such, and no more, should be submitted.

The documentation undertaken at High and Over to date and at the Guggenheim Museum, reflect careful consideration of the clients' briefs and projects goals, of the problems at hand and of documentation and monitoring alternatives available which reflected a proportional response to the project's demands and to the buildings' needs.

5. Acknowledgements

I thank Stephen Levrant (SLHA) for supporting the publication of the work undertaken to date at High and Over. I am indebted to Pamela Jerome (WASA/Studio A-Columbia University) for supporting my academic and professional efforts before, during and after my period of employment at WASA/Studio A. Finally, I am grateful to Sylvia Fisher (UnB) for being a continuous source of support and inspiration.

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[16] PPS5 Policy HE6: Information requirements for applications for consent affecting heritage assets states in HE6.1 that "*Local planning authorities should require an applicant to provide a description of the significance of the heritage assets affected and the contribution of their setting to that significance."* And adds: "*The level of detail should be proportionate to the importance of the heritage asset and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset.".* Policy HE6.3 emphasizes the pivotal importance of documentation by urging local planning authorities to "*…not validate applications where the extent of the impact of the proposal on the significance of any heritage assets affected cannot adequately be understood from the application and supporting documents."*

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