



Experts Meeting

The Buildings of Louis Kahn: Conserving Exterior Wood

An experts meeting organized
by the Getty Conservation Institute
and the Architectural Archives,
University of Pennsylvania,
May 12–13, 2015

Sara Lardinois and Laura Matarese



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LOS ANGELES

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The Getty Conservation Institute (GCI) works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research, education and training, field projects, and the dissemination of information. In all its endeavors, the GCI creates and delivers knowledge that contributes to the conservation of the world's cultural heritage.

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Front cover: Detail of the exterior wood detailing at the Norman and Doris Fisher House, designed by Louis I. Kahn, 1960–67, Hatboro, Pennsylvania. Photo: Sara Lardinois, J. Paul Getty Trust, 2014. Image use courtesy of Charles Firmin-Didot.

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Introduction

The meeting “Conserving Exterior Wood at the Buildings of Louis Kahn,” held in May 2015, was convened by the Getty Conservation Institute (GCI), Los Angeles, in association with the Architectural Archives of the University of Pennsylvania. It brought together a small number of building owners, professionals—including facility managers, architects, and conservators—and students involved at the time in the conservation of several buildings designed by the architect Louis I. Kahn with exterior wood elements.

Background

The GCI works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The institute serves the conservation community through scientific research, education and training, field projects, and the dissemination of information. In all its endeavors, the GCI creates and delivers knowledge that contributes to the conservation of the world’s cultural heritage.

In 2012, the GCI launched the Conserving Modern Architecture Initiative (CMAI), which aims to advance the practice of conserving twentieth-century heritage with a focus on modern architecture through research and investigation, development of practical conservation solutions, and distribution of information through training programs and publications.

The Architectural Archives of the University of Pennsylvania preserves the works of more than four hundred designers from the seventeenth century to the present. Major collections include the comprehensive archives of several of the twentieth century’s most significant designers, including Louis Kahn. The Louis I. Kahn Collection resources include all drawings, models, photographs, correspondence, and project files from the architect’s office. Purchased by the Commonwealth of Pennsylvania from the Kahn estate in 1975, the collection was placed on permanent loan to the university by the Pennsylvania Historical and Museum Commission and opened to the public in September 1979. The Kahn Collection attracts a stream of international visitors and has served as the basis for innumerable publications and exhibitions. The archive has also become an invaluable resource for owners, facility managers, architects, and conservation professionals working at Kahn-designed sites, and facilitates an informal network of the stewards of these sites.¹

In 2013, the GCI entered into a collaborative partnership with the Salk Institute for Biological Studies to conserve one of the major architectural elements—the teak window wall assemblies—at the institute’s Kahn-designed campus in La Jolla, California (1962–65). The scope of the GCI’s work for the Salk Institute Conservation Project included historic research, preliminary condition assessment, laboratory analysis, and an on-site trial mock-up program to better understand the assemblies and to test preliminary treatment recommendations. The work later informed the detailed designs prepared by the Salk Institute’s

FIGURE 1.
Salk Institute for Biological Studies,
1962–65, La Jolla, California. View
of the main plaza prior to conserva-
tion of the teak window wall assem-
blies, photographed 2014.



FIGURE 2.
Detail view of the teak window
wall assemblies set within the
concrete walls of a north study
tower prior to conservation,
2013.



conservation architect, Wiss, Janney, Elstner Associates, Inc. (WJE), and the subsequent construction project involving the window wall assemblies, which was completed in 2017 (figs. 1, 2).²

While conducting research for the Salk Institute Conservation Project, staff from both the GCI and the Salk visited the Architectural Archives. William Whitaker, the archives' curator and collections manager, arranged excursions to several residences in the Philadelphia area designed by Kahn and a meeting with architectural conservator Andrew Fearon, who was working on the conservation of the exterior cypress wood at Kahn's Steven and Toby Korman House in Whitemarsh Township (1971–73), through the Architectural Conservation Laboratory at the University of Pennsylvania (figs. 3, 4).³

FIGURE 3.
Steven and Toby Korman House,
1971–73, Whitemarsh Township,
Pennsylvania. View of the north-
west entrance elevation with its
cypress wood detailing prior to con-
servation, photographed 2014.



FIGURE 4.
View of the Korman House from
the west during the conservation
project, 2015.



Based on the research, site visits, and conversations with Whitaker and Fearon, it became clear that the window wall assemblies at the Salk Institute demonstrate a language of custom exterior woodwork that is significant within Kahn's larger body of work. In addition to the Korman House, other Kahn-designed buildings that demonstrate this language of exterior woodwork include the Samuel and Ruth Genel House in Wynnewood (1949–51; fig. 5), the Bernard and Norma Shapiro House in Narberth (1958–62), the Margaret Esherick House in Chestnut Hill, Philadelphia (1959–62; fig. 6), and the Norman and Doris Fisher House in Hatboro (1960–67; figs. 7, 8), all located in Pennsylvania, and the Class of 1945 Library at Phillips Exeter Academy (the Exeter Library) (1965–72; figs. 9, 10), located in Exeter, New Hampshire.

FIGURE 5.
Samuel and Ruth Genel
House, 1949–51, Wynnewood,
Pennsylvania. View from the
entrance elevation with vertical
wood siding and rubble masonry,
from the southeast, photo-
graphed 2015.



FIGURE 6.
Margaret Esherick House, 1959–
62, Chestnut Hill, Philadelphia.
View of the entrance elevation from
the northwest, photographed 2015.
Apitong wood is used at the win-
dows and entry alcove.
Photo: Paul Savidge.



All of these buildings are of or near the age when substantial maintenance and repair are required: in the case of the Exeter Library, repair projects have been carried out in recent years. While the environmental conditions and details of each building are unique, the owners and facilities managers of these sites face a number of common conservation challenges for the exterior wood, including:

- current appearance of the wood and reconciling Kahn’s intent with what can be achieved in the specific environments of each building;
- removal of past surface treatments that detract from the significance;
- erosion and loss of original material;
- fungal growth and insect damage;
- design deficiencies that have led to moisture infiltration or other damages; and
- decisions for ongoing maintenance and repair strategies.

As the Salk Institute and Korman House were in the midst of conservation work, the GCI and the Architectural Archives determined that it would be beneficial to organize a meeting so that these various project teams could share information, and to extend the invitation to owners of other Kahn sites with exterior wood. As time was of the essence on projects that were under way, the meeting was organized within a relatively short period of time—less than three months.

Meeting Goals and Objectives

The purpose of the meeting was to bring together Kahn experts, conservation and architectural professionals, wood scientists, and site managers and owners to share information on conserving the exterior woodwork at Kahn buildings with the intent that the collective knowledge and expertise may benefit and potentially improve current and future projects at these sites. Specifically, the objectives of the meeting were to:

- identify the heritage significance of the exterior woodwork at buildings designed by Kahn;
- identify philosophical and practical conservation issues;
- discuss potential conservation principles, policies, and solutions; and
- identify areas for potential future work, such as further research and scientific investigations.

Participants

Participants involved in the conservation and investigation of exterior wood at Louis Kahn buildings were invited to the two-day meeting along with staff from the GCI and University of Pennsylvania. Attendees included owners and facilities managers of several Kahn buildings, the curator and collections manager of the Louis I. Kahn Collection at the Architectural Archives, architectural conservators, wood scientists, historic preservation practitioners and students, and preservation architects who were or had recently been dealing with the conservation of exterior wood at Kahn buildings. Also in attendance was Henry Wilcots, an architect in Kahn’s office from 1964 to 1974. After Kahn’s death, he worked with his colleague David Wisdom on the capital complex in Dhaka, Bangladesh, which was completed in 1983. During his time in Kahn’s office, Wilcots also worked on Temple Beth El in

Norman and Doris Fisher House, Hatboro, Pennsylvania, 1960–67

The Fisher House, designed and constructed for Norman and Doris Fisher and their family, is a US National Historic Landmark. Located on a shady wooded site adjacent to Pennypack Creek, approximately 30 miles inland from the coast, the house is subject to a freeze/thaw climate and periods of high humidity. The exterior material palette for the two-story structure consists of cypress wood vertical siding, an exposed rubble limestone foundation, lead-coated copper,

and glass (fig. 7). “With its smooth surface and meticulous joinery, the woodwork on the exterior is comparable to that of handcrafted cabinetry.”⁴

The exterior wood siding was originally left unfinished (or with only a colorless wood sealer applied), and it is understood that it was Kahn’s preference to allow the wood to weather naturally, or silver, over time. However, this natural weathering process proved challenging to maintain, and beginning around 1980, the Fishers began to experiment with wood preservatives and other surface treatments with colorants to return the cypress to its freshly milled



FIGURE 7. Norman and Doris Fisher House, 1960–67, Hatboro, Pennsylvania. View from the east prior to conservation, photographed 2014.

appearance, sometimes described as a “honey” color (fig. 8). The later coatings have been described as providing a “distinctive warm coloration of the house, falsely associated by many as a hallmark of Kahn’s residential designs.”⁵ These coatings were applied regularly, every two to four years, by the Fishers. Over time, the coatings began to build up and peel, and green algae and mildew grew on the wood. The Fisher family left the house to the National Trust for Historic Preservation, but it was later returned to private ownership. In 2014, the current owners, Charles Firmin-Didot and

Bianca Sforzi, began a conservation project, first testing different methods for removing past surface treatments, including organic strippers and simple water and brushes. After cleaning, a new protective coating that has less impact on the natural appearance of the cypress wood was applied to the wood at several of the building elevations. The owners would later experiment with leaving the east and south elevations unfinished, with no oil or stain applied and only a localized treatment (quaternary ammonia) at areas with algae.



FIGURE 8.

View of the entry to the Fisher House from the west, 2015. Recent conservation efforts have attempted to return the cypress used in construction to its original appearance.

Class of 1945 Library, Phillips Exeter Academy, Exeter, New Hampshire, 1965–72

In 1965, the Phillips Exeter Academy completed its search for “a new architect capable of designing a significant contemporary building” by selecting Kahn to design a new campus library.⁶ The Class of 1945 Library consists of a three-story central hall surrounded by mezzanine floors with book stacks and study carrels adjacent to the exterior windows. The window assemblies, set within the exterior brick walls, consist of

glazed sashes with flush wood panels below (fig. 9). Similar to the Salk Institute, teak is used for the exterior, and oak paneling is used for the interior.

The campus is located 8 miles inland from the Atlantic coast and less than a quarter mile west of the Squamscott and Exeter Rivers. Ocean-related weather events are common, although sea fog is not typical. Like many of the other sites discussed during the meeting, the teak was originally left unfinished and had, over the years, weathered to a gray patina. Opinions on its appearance varied greatly—some at



FIGURE 9.

Class of 1945 Library, Phillips Exeter Academy, 1965–71, Exeter, New Hampshire. View from the northwest, photographed 2014.

Photo: Ron Anthony.

the academy loved the color while just as many others despised it. Additionally, for decades after construction, both the roof and teak window wall assemblies leaked, resulting in deterioration of the internal framing lumber of the window assemblies.

In 2002–3, the academy carried out a major repair project for both the roof and window assemblies. The teak boards were removed to replace deteriorated framing and install additional waterproofing details to prevent future moisture

intrusion. More than 90% of the teak boards were salvaged and reinstalled. The teak was cleaned and brightened, and a teak oil was applied to give a fresh appearance. The oiled teak has a darker appearance than unfinished teak, and it weathered differentially, depending on orientation and height above ground, in a relatively short period of time (fig. 10). Retaining the “uniform” appearance of the oiled teak requires continuous maintenance, with the treatment being reapplied on a four- to five-year cycle.⁷



FIGURE 10.

Detail view of the lower portion of a teak window assembly on a south-facing elevation at the Exeter Library, showing weathered surface treatment that has been cyclically applied to the teak since 2003, photographed 2014. Photo: Ron Anthony.

Chappaqua, New York, which has wood-clad walls set within a concrete frame. Owners of Kahn-designed homes with exterior wood detailing were invited to observe the meeting.

The following were in attendance:

- Ron Anthony, Director, Anthony & Associates, Inc.
- Andrew Fearon, Chief Architectural Conservator, Materials Conservation
- Dorothy S. Krotzer, Director, Building Conservation Associates, Inc.
- Sara Lardinois, Project Specialist, GCI
- Courtney Magill, graduate student, Historic Preservation Program, University of Pennsylvania
- Laura Matarese, (graduate intern, 2014–15), GCI
- Frank G. Matero, Professor of Architecture, School of Design at the University of Pennsylvania
- Kyle Normandin, Associate Principal, WJE
- Deborah Slaton, Principal, WJE
- Garry Van Gerpen, Vice President of Scientific Services, Salk Institute (retired December 2015)
- William Whitaker, Curator and Collections Manager, Architectural Archives, University of Pennsylvania
- Henry N. Wilcots, architect, Office of Louis I. Kahn (1964–74)

Meeting observers included Marlyn Ivory Arouh, homeowner, Genel House; and Paul Savidge, homeowner, Esherick House.

Meeting Format and Structure

The first day of the meeting involved visits to several local Kahn buildings with exterior wood to observe and discuss details and conditions, past and current treatments, and conservation challenges on-site. The buildings visited included:

- Samuel and Ruth Genel House;
- Bernard and Norma Shapiro House;
- Steven and Toby Korman House;
- Norman and Doris Fisher House; and
- Margaret Esherick House.

The second day consisted of a meeting held at the Architectural Archives to discuss exterior wood conservation challenges and potential solutions. It was organized into two sessions. The first session featured presentations from three of the meeting participants in relation to issues of the conservation of exterior wood at the Korman House, the Salk Institute, and the Pope-Leighey House (1940) in Alexandria, Virginia, a wood and brick Usonian-style home designed by Frank Lloyd Wright;⁸ and presentations on recent graduate theses on the preservation of historic wood buildings by students in the Historic Preservation Program at the University of Pennsylvania School of Design. The second session opened up discussion of particular conservation issues, significance of exterior wood, and philosophical and practical conservation issues and potential conservation solutions involving exterior wood of Kahn buildings. Participants also visited Kahn's Richards Medical Research Laboratories on the University of Pennsylvania campus (1957–65), which was undergoing a rehabilitation project at the time.

In advance of the meeting, the GCI prepared and distributed to participants several short case studies for Kahn buildings with exterior wood, describing the conservation challenges and solutions, as well as an agenda with specific topics to be discussed during the meeting's second day. The agenda and case studies appear in appendices A, B, and C at the back of this report.

The second day's discussions were recorded, and digital files (.mp3 format) are available at the GCI and the Architectural Archives. A transcript of Henry Wilcots's contributions to the conversation has been prepared (see appendix D of this report).

Limitations

The meeting gathered professionals involved in the conservation of exterior woodwork at Kahn-designed buildings to share their knowledge and experience in order to inform ongoing projects and practice. As such, the meeting was not intended to be a comprehensive workshop on the conservation of wood in modern buildings or the conservation of Kahn's architecture. This report is a summary of what was discussed during the meeting, and serves as a way for project teams and site stewards to share information. Thus, there are no direct recommendations or conclusions within this report.

The projects described in this report pertain to work that was ongoing in May 2015, and the discussions on treatments and policies should be understood within this context. By the time the report was published in 2019, conservation projects for both the Korman House and the Salk Institute had been implemented, and both are now in the monitoring and maintenance phase.

While treatment and policy recommendations for the conservation of specific buildings described in this report may inform what happens at other sites, they must be adapted based on the heritage significance of those places, their specific materials and details, the environment in which they are located, and all other factors impacting their state of conservation and future use.

The majority of case studies considered in this report are residences designed by Louis Kahn, with one institutional building, the Salk Institute for Biological Studies, as an exception. Meeting participants acknowledged that when it comes to management and maintenance, institutions generally have different practices than residences do. Kahn designed other institutional buildings with custom exterior woodwork, such as the Exeter Library building.

Authorship

This report was prepared by GCI project specialist Sara Lardinois and former GCI associate project specialist and graduate intern Laura Matarese. CMAI fellow Ana Paula Arato Gonçalves assisted with completion of the text. Susan Macdonald, head of buildings and sites at the GCI, and architectural conservator Andrew Fearon reviewed the report and provided additional input.

Notes

- 1 This summary paragraph about the Architectural Archives of the University of Pennsylvania was compiled from the university's website: <https://www.design.upenn.edu/architectural-archives/about>.
- 2 See case study, appendix B. For detailed information about the scope of the project and the results of the first phase of work, see Lardinois 2017.
- 3 See case study, appendix C. For information about the scope and results of the Korman House project, see Fearon 2018; Fearon, Jang, and Yin 2016; and Yin 2015.
- 4 VanSant 2013, sec. 7, p. 6.
- 5 Marcus and Whitaker 2013, 215–18.
- 6 Brownlee and DeLong 1991, 390.
- 7 For additional information on the teak window assembly repair project, see Ron Anthony's summary report of his site visit and conversations with the facilities staff at Phillips Exeter in appendix I (pp. 321–27) of Lardinois 2017.
- 8 Fearon and researchers from the University of Pennsylvania contributed to the conservation of the house, which involved comparative studies of various cleaning and treatments to protect the exterior Tidewater red cypress.

Cultural Heritage Significance

Several of the buildings designed by Louis Kahn that were discussed during the meeting have already been designated as historic resources in local registries (the Salk Institute and Esherick House) or national registries (the Fisher House). As part of that listing process, the overall historic or cultural significance of the sites was assessed, and the buildings were found to have a number of historic, associative, and aesthetic values. For example, the US National Register of Historic Places nomination for the Fisher House found it to be “an important residential example of the Modern style and the work of a 20th century master [Kahn].”⁹

The conservation management plan for the Salk Institute, which was under preparation at the time of the meeting, found the site to be significant as (1) an outstanding building by one of the most important architects of the late twentieth century; (2) an outstanding example of an innovative research laboratory; and (3) an outstanding example of landscape design, with significance being further enhanced through association with Dr. Jonas Salk and other leading scientists.¹⁰ The exterior woodwork is a significant element in these sites that embodies and demonstrates some or all of these values. This section discusses the cultural significance of the exterior woodwork in Kahn’s designs, which, in turn, will inform the development of conservation policies and potential conservation solutions so that the cultural significance of the buildings can be retained.

Significance of Kahn’s Exterior Woodwork

Understanding Kahn’s use of wood on the exterior of his buildings is essential to assessing its significance as an element of a site, in the context of the overall significance of each site, and as an important design element in his larger body of work. It is an important first step in a conservation project and critical to developing and making informed decisions about conservation treatments.

The significance of the exterior woodwork had been previously identified and discussed in some of the cultural heritage registry designations for the sites and in scholarly texts.¹¹ For example, the National Register nomination for the Fisher House notes that the millwork “is finely detailed and reflects Anglo-American construction methods and designs. The millwork designs for the house are responsive to the inherent qualities of the wood, which accounts for the expansion and contraction of the wood with the changing seasons. The ‘trueness to form’ is achieved through handcrafted tongue-and-groove joinery.”¹² The nomination also notes that “masterfully crafted millwork details like those found in the Fisher House were a common design motif in most of Kahn’s late works. Similar millwork details can be found at most of Kahn’s projects from this period, both residential and institutional, including the Margaret Esherick House, the Salk Institute for Biological Studies, the Exeter Library, the Kimbell Art Museum, the Yale Center for British Art, and the Steven and Toby

Korman House. The millwork details for these projects are highly individualized and are reflective of the specific character of each project.”¹³

The meeting focused on the **aesthetic and technical significance** of the exterior woodwork, as maintaining these aspects of significance presented one of the greatest challenges to the conservation project teams taking part in the discussions.¹⁴ However, many other values contributing to the significance of the exterior wood at Kahn-designed buildings—such as historic and associative values—were not discussed in great detail during the meeting, but they do warrant further site-by-site and contextual analysis. For example, during the meeting, Wilcots recalled that spruce had been specified for the exterior wood at Temple Beth El in Chappaqua, New York (1966–72) because of its historical associations with the synagogues in Eastern Europe that were destroyed during World War II.¹⁵

Participants attempted to identify the key aesthetic and technical heritage values associated with the use of exterior woodwork at Kahn’s buildings—some of them common across many or all sites and others unique to a specific site. The participants also identified some common elements, components, and attributes that contribute to this significance, including Kahn’s design intent and philosophy in the selection and use of materials and the design details and construction techniques. These discussions are summarized in the sections that follow.

Kahn’s Design Intent, Philosophy, and Use of Materials

Use of Materials

The group recognized that Kahn’s selection of building materials and the ways in which he used them were important aspects of his architecture. In the architect’s own words, “it is important to honor the material you use.”¹⁶ Whitaker encouraged participants to think about what honoring wood—a natural material—meant by taking Kahn’s iconic “question to a brick” and asking instead, “What does the wood want?”¹⁷ The natural characteristics of wood include its cellular structure, grain, and growth rings; its color; and the way it changes over time due to weathering (the result of cyclic wetting and drying, exposure to UV light, and erosion), often varying by exposure. Different species of wood, including the teak and cypress used on the sites discussed, have different characteristics and weather differently depending on the environmental conditions at the sites where they are used. These characteristics are further discussed in the section “Color, Patina, and Variation in Appearance.”

While archival and anecdotal information indicates that Kahn was involved in the choice of materials for his designs, the group noted that it was somewhat unclear as to what level of detail Kahn was involved in material specifications. Wilcots recalled that on projects on which he and others worked, it was often the project architects, not Kahn, who would select the wood from the lumberyards. However, the group recognized that Kahn was an active collaborator and that he often drew knowledge from people working on-site.¹⁸

Wilcots believed Kahn would have approved of the saw marks on the wood. This preference for evidence of the fabrication process was corroborated by remarks made by Jack MacAllister, a project architect in Kahn’s office who played a significant role in the design of the Salk Institute and oversaw its construction. During a phone interview with the Salk Institute Conservation Project team, MacAllister recalled Kahn saying, “I like to see the evidence in something of how it was made,” such as the drag marks in extruded stainless steel.¹⁹

The Relationship of the Materials

The use of a limited palette of materials at a site is one of the characteristics of Kahn's works. These palettes include wood and other natural materials such as stone, which were also used in ways that express their origins and unique properties. In Kahn's own words, "natural materials have a way of blending together'...as opposed to manufactured ones that were consciously 'artistic' or 'whims of the manufacturer.'"²⁰

The meeting participants identified the relationship of the exterior wood to other materials at the sites as aesthetically significant. At several of the sites, such as the Salk Institute, Korman House, and Fisher House, no single exterior material takes precedence over another. At the Korman House, the relationship of the wood to the exterior setting—of green grass and trees in the summer and snow in the winter—was highlighted. In speaking about the relationship of the materials at the Salk Institute, MacAllister observed in that same interview with the Salk project team: "the marriage of—the consistency of—the total value of the building, from the concrete to the travertine to the grayed-out teak, I think is one of the really subtle beauties of the building. There's nothing that jumps forward of everything else. [The materials] all have the same kind of built-in patina, as it were, where they are all related."²¹

Color, Patina, and Variation in Appearance

Color and variations in appearance are important characteristics of the aesthetic significance of the exterior woodwork at Kahn-designed buildings. The participants discussed what Kahn may have intended for the color of the wood he used and what variations he may have anticipated as it weathered and changed over time, acquiring the patina of age. The group considered patina to be significant, contributing to the aesthetic values of the sites and embodying Kahn's philosophy on the use of natural materials.

It was generally agreed that Kahn most likely intended for the exterior wood at many of the sites to weather naturally. In many cases, he specified no varnishes, coatings, or paint that might obscure the unique natural qualities of the wood selected; instead, the exterior wood was left unfinished or with only a "colorless" sealer or varnish applied.

Kahn's preference for this appearance of unfinished and weathered wood may have been influenced by the vernacular architecture and fishing villages he saw during his travels along the New England and Canadian coasts, as well as from observing the development and construction of his mentor and collaborator George Howe's Fortune Rock residential project in Maine, with its cedar clapboards, silver-gray shingles, and stone that "merge seamlessly with the natural surroundings."²²

Kahn's views and use of natural materials, including wood, indicate he would likely appreciate the buildings aging and gaining patina. He was modest in his expression of materials and disliked the "prettiness" and "perfection" of the International Style of Mies van der Rohe and Le Corbusier. When asked about the teak window walls at the Salk Institute during a 1969 interview with John W. Cook and Heinrich Klotz, Kahn stated that they "are sort of a gray and they look almost like the concrete, and they look more so later on when they get to be really quite white. The walls will become very light."²³

The participants found it difficult and, to some degree, inappropriate to prescribe a specific color for the exterior wood at the sites—weathered colors of silver, gray, and brown were discussed. Wilcots recalled Kahn wanting elements to look like "pewter" or "oatmeal," and Whitaker remembered Kahn wanting a rug at the Shapiro House the color of "cigarette ash." These examples would seem to indicate a preference for tone and texture rather than a specific color.

The types of cuts of wood provide variability in texture, appearance, and color across a wood element or across an entire building facade. These natural characteristics of the wood also contribute to the aesthetic significance of the sites under discussion.

Wood, as a natural material, weathers differentially depending on orientation and exposure to the local environment, and these variations may also be considered a character-defining feature of wood. To some degree, variation by weathering is unavoidable. It is difficult to ascertain if Kahn expected such a wide degree of variation in appearance, but it is most certainly the result of his designs. Depending on their siting and environment, some sites have extreme variations in weathering across an elevation (fig. 11), whereas others have subtle, gradual transitions in variation. The participants agreed that strong or extreme variations in color, texture, and appearance of the exterior wood were to be avoided if possible, as such variations detract from overall visual integrity. However, subtle to moderate variations were acceptable.



FIGURE 11.

Teak window wall assembly at the Salk Institute prior to the conservation project, 2013. The weathering of the teak window wall assemblies and later surface treatments can vary considerably within a single assembly depending on exposure. Here, the left side of the assembly is protected by the concrete walkway above, leaving the right side more exposed.

Design Details

The group agreed that all sites being discussed at the meeting demonstrate a language of custom exterior woodwork, and that this design element is significant within Kahn's larger body of work. Key aspects of the custom woodwork are its human scale (sometimes set within more monumental architectural features, such as the concrete walls at the Salk Institute) and the design detailing and fabrication techniques. Site visits and previous scholarly research reveal that particular design details were used at several sites. For example, the Shapiro House, Fisher House, Salk Institute, and Korman House make use of vertical tongue-and-groove (T&G) siding boards, water tables, and drip rails (figs. 12–14). These details demonstrate an evolution in Kahn's creative process toward finding a solution to this design element, from the earliest work of these four sites at the Shapiro House to later work at the Korman House. Wilcots observed that some of these details were repeated time and again in the office.²⁴

FIGURE 12.

Exterior wood detailing, with vertical siding and horizontal drips above a rubble foundation and paneled window and paneled "wainscoting" beneath the window units, at the Fisher House during conservation efforts, 2015.



FIGURE 13.

Exterior wood detailing of a window wall assembly at the Salk Institute, 2013. Rows of narrow vertical T&G siding boards are separated by intermediate horizontal drips, with a deeper drip cap at the top and a sill at the bottom of the wall.

**FIGURE 14.**

Exterior wood detailing, with vertical siding, horizontal drips, and paneling below the windows, at the Korman House, 2015.



Some of the attributes of significance for the exterior wood detailing discussed at the meeting included the following:

- The exterior woodwork at the sites expresses a purity and distillation of form. The elements are refined and calculated, with dimensions having a high level of precision.

- The fine detailing of the exterior wood gives a human scale to these sites. This is particularly noticeable at the Salk Institute, where the finely detailed window walls sit within the monumental concrete walls.
- The detailing of the exterior woodwork demonstrates similarities to that of cabinetry. In many cases, the woodwork carries from the exterior and interior and vice versa, behaving as a unified piece—one complete unit and system in design and construction.
- The wood elements demonstrate human craftsmanship, rather than the sense of being machine-made. Experienced woodworkers and timber craftspeople were employed in the construction of several of the sites. Wood elements that are smaller elements set within larger brick or concrete walls, such as the window walls at the Salk Institute, were prefabricated off-site in cabinetmaker or woodworker shops. The craftspeople were most likely experienced in interior cabinetry and small-scale exterior design and construction, including window frames and doors. Their experience and skill carry through to the construction of the exterior wood building elements at these sites.

Summary of Aspects of Significance

Based on discussions of the various aspects of significance for building with exterior wood detailing, the GCI summarized the aspects of significance of Kahn's exterior woodwork.

Note: Not all sites demonstrate all of these aspects of significance.

- The exterior woodwork at Kahn-designed buildings is aesthetically and technically significant.
- The use of exterior wood demonstrates Kahn's philosophy that materials should express their origins as natural materials.
- The relationship of the exterior wood to other materials at the site is aesthetically significant. The color, tone, texture, and variation of the wood impact the wood's relationship to other materials.
- Variations in appearance of the wood through the use of different cuts of timber, the composition of the wood across an elevation, and the type of wood are exceptional components of the aesthetic significance of the exterior woodwork at Kahn buildings.
- Aging and weathering of wood as a natural characteristic is considered significant, contributing to the aesthetic value of the sites and embodying Kahn's philosophy on the use of natural materials.
- The exterior woodwork at Kahn-designed buildings demonstrates a language of custom exterior woodwork; this design element is significant within Kahn's larger body of work. The custom exterior woodwork design, similar to fine cabinetry, expresses a purity and distillation of form. The elements are refined and calculated, with dimensions having a high level of precision.
- The exterior woodwork is significant, as it carries from the exterior and interior and vice versa, behaving as one complete unit in design and construction.
- The exterior woodwork demonstrates the skill of the craftsperson.
- The exterior woodwork is the physical expression of the human element at these sites. A sense of humanism is expressed through craftsmanship, design details,

and use of a natural material. Kahn's works take advantage of the setting and site, connecting people to the place and its surroundings.

Notes

- 9 VanSant 2013, 13.
- 10 Wiss, Janney, Elstner Associates, Inc., Inskip and Gee Architects, and Liz Sargent HLA 2017, 75.
- 11 See Marcus and Whitaker 2013.
- 12 See VanSant 2013, 8.
- 13 VanSant 2013, sec. 8, p. 13.
- 14 According to Henry Wilcots, Kahn "immensely disliked the word aesthetics," and Whitaker noted it was a philosophical point—it was a term that might be applied to the design approaches of Mies van der Rohe or Le Corbusier, and in contrast Kahn attempted to be more subtle in his use of materials (see transcript of this discussion in appendix D, p. 106–7. However, in conservation charters and other guiding texts such as the Burra Charter, aesthetics is defined as one of the values that cultural heritage places may embody. Thus, the term has been used within the body of this report.
- 15 See appendix D, p. 98.
- 16 Lobell 1979, 40.
- 17 Kahn's question to a brick is from a hypothetical conversation on the nature of architectural materials. "If you think of brick, and you're consulting the Orders, you consider the nature of brick. You say to brick, 'what do you want, brick?' Brick says to you, 'I like an arch'" (Lobell 1979, 40).
- 18 See the discussion on this topic in appendix D, pp. 8–9.
- 19 See Lardinois 2017, 122.
- 20 From an interview of Kahn by Marshall Meyers, who worked in Kahn's office, titled "The Wonder of Natural Things." See Loud 1989, 156.
- 21 MacAllister, phone conversation with the Salk project team, December 5, 2013. For a transcript of that conversation, see Lardinois 2017, 121.
- 22 Marcus and Whitaker 2013, 29. For further discussion of these influences in Kahn's early professional career, see *ibid.*, 29–31.
- 23 Prown and Denavit 2014, 116.
- 24 See appendix D, p. 96.

Conservation Policies

Conservation policies translate general conservation principles into site-specific guidance for making decisions about how to use and conserve a site in ways that ensure its significance is retained and interpreted in the future. When developing policies, the following are considered: requirements and constraints arising from the significance of the place; the client's requirements and resources; feasible uses; the physical condition of the place; and other requirements imposed by external factors, such as building code requirements.²⁵

General Policies to Conserve Exterior Woodwork at Kahn's Buildings

During the meeting, the GCI presented a number of conservation policies developed for the Salk Institute to safeguard the exceptional significance of the Salk's teak window wall assemblies while enabling their continued use, repair, and maintenance.²⁶ Such policies were used to guide the further development of prescriptive treatment recommendations for the teak window walls.

Following the meeting, the GCI broadened some of the policies developed for the Salk Institute, utilizing what was understood about the significance of the exterior woodwork across many of the Kahn sites discussed. These generalized policies are presented below.

Note: While they may inform the development of site-specific policies for other sites, the policies for each site will vary depending on their design, significance, conditions, future use, and other factors.

1. To preserve and respect the exterior woodwork, recognized as an exceptional component of Louis Kahn's designs and body of work.
2. To respect and retain the complementary relationship of the exterior wood to other materials at the site, considering color, tone, and texture. In many of the sites, the palette is limited in tone, with little contrast between the exterior materials; however, there is more contrast between materials at the Shapiro and Esherick Houses.
3. To allow for the aging and weathering of wood as a natural characteristic considered to be significant, contributing to the aesthetic values of the sites and embodying Kahn's philosophy on the use of natural materials.
4. To preserve the expression of a language of custom exterior woodwork and humanism demonstrated through the use of natural materials, revealing their natural characteristics, design details and techniques, and scale and craftsmanship.
5. To allow for subtle to moderate variations in the appearance of exterior wood as a result of aging and differential weathering at a site. High or extreme variations in appearance should be avoided.

6. To maintain the hierarchy of design details, such as tightness of the T&G cladding, depth of sills, and depth of horizontal trims.
7. To allow the exterior wood elements to fulfill their intended purposes as barriers to the elements. To this end, design modifications may be considered where design or performance deficiencies have led to consistent failure or deterioration. Design modifications must not diminish the cultural significance of the element or the overall site.
8. To preserve and retain the way in which the exterior woodwork carries from the exterior and interior and vice versa, behaving as a unified piece that is one complete unit and system in design and construction (only for sites where such detailing is extant).

Notes

25 For further information on developing conservation policies, see Kerr 2013, 22–29.

26 For the policies specific to the Salk Institute, see Lardinois 2017, 72–74.

Conservation Challenges

Meeting participants identified a number of conservation challenges—technical, philosophical, and managerial—presented by some or many of the Kahn buildings with exterior wood. Many of these challenges are similar to those experienced at other heritage buildings, such as the technical challenges related to different agents of deterioration.

Agents of deterioration that affect the exterior wood include weathering, erosion, and other material loss; staining and moisture damage; biological growth and attack, including insect infestation; design and construction deficiencies that lead to water and air infiltration and other performance issues; and past maintenance practices and treatments. Challenges that are more philosophical in nature include preserving the aesthetic significance and the architect's intent for the design while retaining authenticity and integrity of materials. From a site-management point of view, it can be challenging for owners and facility managers to make the transition from a maintenance- or housekeeping-based approach to a conservation management-based approach as their sites age and become historically or culturally significant. Other challenges or considerations include reconciling conservation and environmental sustainability goals and the availability of skilled craftspeople to maintain and conserve the wood. All of these challenges must be addressed in the development of comprehensive conservation solutions for the sites.

The group agreed that the technical challenges were perhaps easiest to address, while the philosophical issues were the most difficult. Thus, the opportunity to discuss philosophical issues with other professionals facing similar issues was one of the most beneficial aspects of the meeting.

Agents of Deterioration and Change

The exterior wood at Kahn-designed buildings experiences a range of agents of deterioration and other forms of change, many of them typical for wood buildings and others more specific to Kahn's language of custom detailing or environmental factors. These agents of deterioration may detract from cultural significance, reduce expected life spans, and/or negatively impact performance. While these agents are classified by typology, they often work together, compounding the deterioration.

Weathering, Erosion, and Other Material Loss

Weathering of wood is the result of exposure to wet/dry and freeze/thaw cycles, ultraviolet (UV) light, and windblown debris, all of which gradually erode the surface of the wood. Although this form of deterioration often develops at a slow rate, forming a silver-gray patina on the surface of the wood and giving it a rougher texture, over time the resulting surface wear and fissures can increase the vulnerability of the wood to other, more aggressive decay agents. Rates of weathering and erosion vary depending on the type of wood, its

exposure, and the specific environmental conditions at a site—for example, the coastal marine environment of the Salk Institute versus the freeze/thaw climate of the Korman House. Differential weathering due to variations in exposure can have a negative impact on the aesthetic significance of a building.

Staining and Moisture Damage

At many sites, the exterior wood exhibits different staining mechanisms, including the following:

- Moisture staining at the base of the walls or beneath drip caps and rails
- Iron staining from fasteners exposed due to erosion of the wood surface, as seen at the Salk Institute

Biological Growth and Attack

The type of biological growth and attack varies according to the local environment, biological species present (native or exotic), natural resistance of the type of wood to biological attack, and the condition of the wood. Treatments added to the wood after construction, such as penetrating stains or surface coatings, may encourage biological attack by serving as food sources for certain types of fungi.²⁷ The following types were mentioned during the meeting:

- Insect damage from termites at the Salk Institute and carpenter bees at the Korman House
- Woodpecker and carpenter bee damage at the Fisher House
- Molds, mildew, and decay fungi:
 - At the Korman House, accumulative layers of past surface treatments trapped moisture, creating a favorable environment for mold fungi to grow. Brown rot decay fungi were also present.
 - Some types of fungi do not threaten the health of the wood but present more of an aesthetic problem, such as the black fungal biofilm at the Salk (figs. 15, 16). However, past cleaning efforts to remove the fungi from the surface have damaged the wood.

Design and Construction Deficiencies Leading to Poor Performance

Design details used for the exterior wood at Kahn's buildings present one of the key conservation challenges. The group agreed that these details contribute to the technical and aesthetic significance of the buildings, but that some of the design detailing as originally constructed was deficient, leading to moisture infiltration or other damages. This was due either to the inappropriateness of the original design for an exterior application or to modifications made during construction for cost savings, constructability issues, or other reasons. The following examples were discussed:

- At the Korman House, the tight vertical T&G wood siding boards expand and contract as temperatures range from 0°F in the winter to 100°F in the summer, with moisture infiltration exacerbating the problem. Anecdotes suggest that Kahn had the siding tightly built, with the expectation that it would open up over time (though the group questioned how much he may have anticipated it would open up). It was said that little reveals in the wood detailing and the shadows and patterns they created were important to Kahn.

FIGURE 15.
West-facing elevations of the Salk Institute, showing a black fungal biofilm at the base of the teak window wall assemblies prior to conservation efforts, 2014.



FIGURE 16.
Teak window wall assemblies at the Salk, showing fungal biofilm on the wood, 2014.



- At some of the sites, such as the Salk Institute and Korman House, the bottom edges of the vertical wood siding boards originally sat directly on horizontal sills, water tables, or ledges. There was no gap or flashing between the two components, and as a result, water sitting on the horizontal elements wicked up the end grains of the vertical boards, leading to staining and/or damp environments conducive to fungal or other biological growth.
- At the Salk, the wood window wall assemblies were partially preassembled off-site in the millwork subcontractor's shop. They were then delivered to the

site, craned into place, and the remaining components (interior wood paneling, sliding sashes, glazed side lights, and perimeter sealants) were installed in situ. According to Jack MacAllister, prefabrication was chosen as a means of reducing project costs and increasing quality.²⁸ However, the methods by which they were preassembled created performance and maintenance issues. For example, the T&G siding and other wood components were assembled in the millwork shop, with nails sometimes installed from behind or through the top or bottom of the assembly. As a result, it can be difficult to remove certain sections of the installed assembly for repair or replacement without inadvertently damaging adjacent wood components.

- Both the design drawings and construction shop drawings show flashing at the head and base of the window wall assemblies at the Salk; however, recent inspections show no flashings present. The reason for this omission is unknown, but it may be related to constructability or cost-savings issues. In any case, the omission led to water intrusion into the window assembly and other areas of the building, first reported just a year after construction was completed.²⁹ In some instances, once the water got into the wall cavity, there was no way for it to escape.
- At the Salk, projection of the horizontal drips (or water tables, as they are referred to in Kahn's architectural drawings) beyond the adjacent T&G boards was reduced during construction, impairing the ability of the window walls to shed water. The design and shop drawings showed them projecting $\frac{3}{4}$ inch from the T&G above and below, but sometime during construction—possibly after reviewing a first full-size in situ "pilot" window assembly for approval—the projection was reduced to $\frac{1}{4}$ inch, with a drip cap at the top of the assembly remaining at a $\frac{3}{4}$ -inch projection.³⁰ This reduction is shown on a sketch generated in Kahn's office in December 1964, several weeks after reviewing the in situ pilot.³¹ The reason for this change is unknown; perhaps it was to establish a visual hierarchy between the deeply projecting bottom sills and drip caps and shallower intermediate drips, or to address material shortages or cost overruns. In any case, the reduction has caused problems. With only a $\frac{1}{4}$ -inch projection, the outermost face of the intermediate drip that originally covered the tops of the T&G boards below has weathered away in some locations, leaving the face of the drip flush with the boards and the end grains of the boards exposed (fig. 17).
- Both flat- and vertical-sawn wood was utilized for the T&G boards at the Salk. It does not appear that the wood cuts were specified; rather, fabricators may just have been making use of the material that was available. In any case, the different cuts of wood weather differently: flat-sawn wood weathers relatively uniformly, whereas vertical-sawn wood does not, as the growth-ring bands are perpendicular to the face of the wood. The soft earlywood erodes faster than the adjacent, denser latewood, allowing the formation of microenvironments where fungal biofilm can take hold.

During the meeting, the participants discussed why some of the detailing was problematic from the start. Wilcots's biggest criticism of Kahn's woodwork is that the detailing of the exterior millwork should have been differentiated from that of the interior millwork but was not. For example, the flush detailing typically associated with interior applications has problems shedding water when used in exterior applications. As the buildings aged and the wood weathered, Wilcots observed, the problems of applying interior detailing to the

FIGURE 17. Detail view of window wall assembly, 2014. The outermost face of the intermediate horizontal drip (bottom of photo), with its ¼-inch projection, has weathered away in some areas, exposing the tops of the vertical T&G boards underneath.



exterior became apparent through performance failures and the like. In the earlier days at Kahn's office, experienced staff members including David Wisdom and Bert Webb would have challenged Kahn on this and made sure these elements were properly detailed. For example, Wisdom and Webb worked on the detailing of the Fisher House, which has not been affected by the same performance issues as some of the other properties have. However, as the office grew busier, less-experienced staff took responsibility for detailing projects, with less oversight from Wisdom or Webb than in the past. Additionally, for sites such as the Salk, the detailing of the wood windows was done in the San Diego office, far from the main office in Philadelphia. Wilcots recalled that "the only person out there [in San Diego] who could have guided them was Fred Langford, but his task was to get the formwork and concrete right." Whitaker corroborated this, saying that when he had asked Langford if he knew anything about the millwork, he said that he did not, because he was so busy with the shop drawing for the concrete.³²

Past Maintenance Practices and Conservation Treatments

As evidenced by the case studies presented, inappropriate maintenance or conservation treatments that were carried out in the past altered the appearance of the wood and sometimes inadvertently damaged it and/or exacerbated other deterioration mechanisms. Some of these practices are described below.

Cleaning

Past cleaning methods used at the Salk Institute to remove a disfiguring black fungal biofilm on the surface of the teak accelerated the erosion of the wood surface. Initially, a bleach-and-water solution was used, but over time more aggressive mechanical methods, including wire brushes, were used to increase the effectiveness of removing the robust fungus. These, in turn, accelerated the erosion of soft earlywood in vertical-sawn boards, creating a more hospitable environment for the fungal biofilm in the deeper grooves between denser

latewood. The Salk halted the use of wire brushes after they were found to be damaging to the teak.

Application of Wood Coatings and Penetrating Finishes

In nearly all of the Kahn sites that were discussed, the wood was initially left bare or, in some cases, a “colorless” wood sealer was applied. As summarized in “Cultural Heritage Significance,” the decision to leave the wood in its natural, unfinished state is thought to reflect Kahn’s desire to honor the natural characteristics of the wood and his preference for a variegated grayish color palette. Further, in many cases, the unfinished appearance of the wood contributed to the overall subtle palette of materials used at the buildings, which also included concrete, stone, stucco, and/or brick.

Kahn’s desire to let the wood weather, or silver, naturally was challenging to many of the building owners, and other environmental factors—such as the fungal biofilm at the Salk Institute—interfered with the weathering processes that Kahn may have anticipated. As a result, many of the owners eventually applied wood coatings or penetrating finishes with the intent of renewing the appearance of the wood, mitigating the effects of differential weathering, and/or protecting the wood from further erosion, staining, insects, and/or decay fungi. However, these coatings had an impact on the appearance of the wood and its relationship to other building materials. New maintenance and conservation challenges were also introduced. The treatments and their impacts vary widely across the different buildings discussed and are summarized below. Additional information can be found in the case studies in appendices B and C.

- **Korman House.** Steven Korman, who commissioned the house, had let the building weather for over twenty years. When his son Larry took over in 1999, he embarked on a repair campaign, replacing damaged cypress boards in kind with cypress obtained from Louisiana. His staff conditioned the wood, cleaning

FIGURE 18.
View of the Korman House, 2014.
Later surface treatments applied to
the cypress wood siding gave it a
dark red-orange color.



it every spring and putting a light natural sealer on it. These surface treatments included an alkyd-based Benjamin Moore product that gave the exterior cypress wood siding a dark red-orange color (fig. 18). Cumulative layers of this coating trapped moisture, creating a favorable environment for mold fungi to grow, which turned the wood black and dark brown, with areas of brown rot fungi.

- **Salk Institute.** Kahn's client, Dr. Jonas Salk, and his facilities staff preferred a more pristine look than Kahn himself might have.³³ In the mid-1990s, Salk's staff applied a two-part cleaner and brightener (TE-KA Scrubless Cleaner) along with a wood-oil sealer (Tip Top Teak) to the teak in an attempt to improve its appearance, retard further deterioration, and—perhaps most importantly—address the ongoing issue of the black fungal biofilm, for which cleaning practices were becoming less and less effective as the fungus grew deeper into the weathered wood. The sealer gave the wood a red appearance, which contrasted sharply with the adjacent concrete walls and other building materials (fig. 19). In some areas of the building, this caused a dramatic shift in appearance across the exterior face of a building elevation, or even a single window wall, as the sealer weathered away.
- **Fisher House.** Around 1980, dissatisfied with the appearance of the siding at their home, the Fishers began to experiment with surface treatments for the wood. Preservatives and colorants were added to the treatments in an attempt to maintain the original “honey” color of the cypress wood. Surface treatments were applied every two to four years until the early 2010s.³⁴
- **Genel House.** The current owners of the house reported that the exterior California redwood siding was a “peanut color” when they first bought the house, and later turned a “light gray.” A surface treatment has since been applied, giving the wood a dark red color and sheen, which contrasts with the adjacent random rubble masonry walls.

FIGURE 19.

View of north-facing sliding paneled shutters and windows at the west office wing of the Salk Institute, 2013. Later surface treatments applied to the teak gave it a dark red-orange color, similar to that shown at the Korman House in fig. 18. The change in appearance contrasted significantly with the adjacent concrete.



- **Shapiro House.** The vertical “Japanese” mahogany wood siding, primarily located on the rear facade and in recessed areas of the stucco walls on the other facades, currently appears to be unfinished. It has weathered differentially, depending on exposure.
- **Exeter Library.** In 2002–3, a repair project was undertaken to address persistent leakage problems in the teak window walls, which are set within the brick masonry walls of the library. A teak oil was applied to give the weathered material the appearance of freshly milled teak that was uniform across the elevations. The oiled teak has a brown color that is much darker than unfinished teak, whether freshly milled or weathered. Further, the finish weathers differentially in a relatively short period of time, depending on orientation (which elevation they are located at) and height above ground.³⁵

Balancing Conservation Actions with Preservation of Significance and Other Considerations

In addition to the challenges presented by deterioration and modifications, there are a number of philosophical challenges that require careful thought about how to (a) balance conservation actions with the preservation of different aspects of significance and (b) reconcile the architect’s intent and the current owner or stewards’ wishes with what is actually possible given the environmental realities of the site. These issues are elaborated upon in this section.

Balancing Conservation Actions with Preservation of Significance

In many of the sites discussed, the need to repair deteriorating wood elements or improve their performance for continued occupancy of the site may be in conflict with the conservation of their significance. The underlying causes of these deterioration processes may be considered culturally valuable and important contributors to the significance of the place. An example of this is Kahn’s use of interior millwork detailing for exterior elements. While the language of custom millwork in Kahn’s office is considered significant, this detailing had inherent performance issues, most significantly the frequent inability to adequately shed water or to prevent air and moisture intrusion into the wall cavity. Therefore, solutions must carefully balance the need to address deterioration and performance issues with the need to maintain the authenticity and integrity of design, materials, and workmanship. Determining the amount of allowable change to address these problems can be challenging.

Furthermore, many of these sites are architecturally significant and possess high aesthetic value. Thus, it is important to maintain visual integrity as well as material integrity. In maintaining material integrity, the typical approach is to do only as much as necessary, repairing or replacing only those elements that are deteriorated. Yet, taking this approach can result in a “patchwork” of new and old materials within an area or elevation of a building, impairing the visual integrity of the site. Finding the right balance between these two aspects of integrity requires careful consideration.

Reconciling Architect’s Intent, Owner/Stewards’ Wishes, and Environmental Conditions

An important challenge for the conservation of Kahn-designed buildings is the recognition of value in the aged or weathered appearance of the wood elements. However, some of

the buildings have weathered in ways that likely were not anticipated by Kahn. For example, Kahn could not have foreseen the growth of fungal biofilm at the Salk Institute, which has turned the teak dark black in damp locations, including the north-facing elevations and the base of the walls at west-facing elevations. The meeting participants observed that the uneven weathering of an architectural element can cause visual disruption. Therefore, the challenge lies in managing the weathering mechanisms to slow the rate of deterioration and avoid striking differences.

Further complicating the issue, Kahn and his clients often had different expectations for the appearance of the wood over time. As described in “Past Maintenance Practices and Conservation Treatments,” owners who preferred a more pristine look began to add surface treatments to the wood to “restore” its appearance or address some of the unexpected environmental challenges; this occurred at the Salk with the fungal biofilm (which is part of the environment and cannot be eliminated). The challenge, then, is to determine what is the appropriate appearance of the wood—balancing Kahn’s intent with the owner’s expectations and capacity for maintenance—and what is achievable with the wood species and in the site-specific environmental conditions.

As summarized in “Cultural Heritage Significance,” meeting participants spent a great deal of time discussing the appropriate color or tone for the wood, using the descriptions “cigarette ash,” “honey,” and others. The group felt identification of a wood color was important to retaining its relationship to the palette of other materials used. Though it might not be possible to identify an exact color for a wood species, especially as wood is an ever-changing material, it might be possible to identify a range of colors or tones that are appropriate.³⁶

While some conservation treatments may, at least initially, fulfill some site stewards’ wishes for a more consistent look, this will be gradually lost as weathering progresses, and in most cases, consistency cannot be maintained without frequent (and often costly) maintenance and retreatment.

Replacement Material Sourcing and Sustainability

Most of the sites need compatible replacement material for areas of wood that have deteriorated beyond repair. The amount of replacement material varies significantly by site. For example, in past repair campaigns at the Korman House, the majority of the cypress (approximately 80%) had been replaced in kind, mostly due to rot in the end grains of vertical elements. At the time of the meeting, the teak at the Salk Institute was original, save for a few areas where deteriorated T&G boards had fallen out of place and had been replaced.

The need for replacement wood that is both aesthetically and technically compatible with the original can be challenging, often due to the lack of available material on the market. Specific challenges at some of the sites are as follows:

- Availability of compatible replacement wood of the quality and quantity needed. Ideally, the wood should be compatible with both the species and cut (vertical sawn, rift sawn, etc.) of the original wood, if it can be determined that the cut was important to the design. The participants questioned if Kahn went as far as specifying the cut of wood to use on job sites, but the answer was not immediately clear.
- The often prohibitive cost of obtaining such compatible material

- Difficulties in obtaining old-growth or naturally grown wood (versus plantation grown) for a compatible match
- Making ethically responsible choices in retaining or replacing wood, considering the use of rare old-growth woods, sustainable harvesting practices, and the ethics of using reclaimed wood, which reduces the consumption of virgin wood but can create a market for demolishing historic buildings to supply the reclaim market
- Integrating the appearance of existing weathered wood and new replacement wood, especially when they are immediately adjacent or in close proximity to each other. The amount of time it will take for the new wood—even new wood that is of the same species and quality as the existing—to weather naturally to a more compatible match will vary and may be significant.

The Need for Skilled Craftspeople

The group observed that levels of repair and intervention varied significantly among the sites discussed and visited during the meeting. At first glance, many of these sites would appear to have very simple joinery, but in most cases it is far more complex, particularly where it is derived from fine interior wood cabinetry. For example, the dimensions of exterior window sills were described by one participant as possessing a “Miesian precision.” Thus, repair and conservation require a thoughtful approach and skilled craftspeople.

The level of craftsmanship required in the repair of historic architectural wood elements is difficult to find in workers in most regions, and all the more so in regions with a smaller inventory of historic buildings with fine wood detailing.

Transition from Maintenance to Conservation

Whereas in an ordinary building, a wood element showing signs of poor performance and deterioration might be replaced by a new one, selected to achieve better performance and fit within budgetary constraints, the appropriate repair solutions for a culturally significant element in a historic site must consider other criteria. Therefore, the decision-making process is different, as priority shifts from maintenance only to preservation of cultural significance. This shift in thinking can be a difficult transition process for both homeowners and larger institutions. However, it is not unique to Kahn-designed sites and is common to many sites of the modern era, especially as they approach fifty years of age, which is the time many are in need of their first major repair campaign. Fifty years also corresponds to the minimum age for sites to be considered eligible for listing in the US National Register of Historic Places, except in cases of exceptionally important sites.

Other Considerations

Other considerations include time and scheduling constraints; available funding; and compliance with current building and energy codes. It should be noted that as sites become eligible for listing in historic registries, they may be able to utilize the alternative provisions of governing historic building codes.

Notes

- 27 For example, the fungal biofilm at the Salk, identified as being composed of several types of fungi that evolved from a common ancestor, predominantly the order Capnodiales, thrives where there is moisture, and it has adapted to living on a variety of substances. As a result, many different types of materials can serve as food sources, potentially even the drying oils used in past surface treatments. For further discussion and analysis, see Organic Materials Laboratory Analysis Report I in *Lardinois 2017*, appendix G.
- 28 See the transcript of the Salk Institute Conservation Project team's discussion with Jack MacAllister in 2013 in *Lardinois 2017*, appendix B.
- 29 *Lardinois 2017*, 35.
- 30 The water table at the Fisher House was similarly detailed, with a 1-inch projection. Design drawings showing the water table date to September 1964 (see the drawing "Wall Sections: House for Dr. and Mrs. Norman J. Fisher" in the Louis I. Kahn Collection at the Architectural Archives), so it is likely that details for both sites were being developed in tandem.
- 31 See the drawing "Additional Wood Details," SK 12-14-64, in the Kahn Collection.
- 32 See the transcript of this discussion in appendix D, p. 96.
- 33 See the transcript of conversations between members of the Salk Institute Conservation Project team and Jack MacAllister, *Lardinois 2017*, 128.
- 34 For additional information on the Fisher House, see Booher 2009; Marcus and Whitaker 2013.
- 35 Representatives from the Exeter Library were unable to attend the meeting, and participants were not able to visit the site in New Hampshire during the meeting. Therefore, the information on Exeter is based on Ron Anthony's visit to the site in April 2014. A summary of his visit is included in appendix I of *Lardinois 2017*, 321–27.
- 36 See the transcript of this discussion in appendix D, p. 104–6.

Potential Conservation Solutions

During the course of the meeting, participants discussed a number of potential solutions and how they might impact significance. Many of these solutions were currently being considered, trialed, or implemented at either the Korman House or Salk Institute. Others were known to have been utilized at other sites designed by Kahn or with similar exterior millwork detailing. This section summarizes the considerations and potential solutions that were discussed; it is by no means an exhaustive compilation of all potential solutions.

This information is intended to provide guidance to sites grappling with similar conservation challenges. However, it should be remembered that these solutions were developed in response to the specifics of each site and should not be blindly repeated at other sites.

Since the meeting, conservation projects at both the Korman House and Salk Institute were implemented. Several publications, included in the bibliography at the back of this report, describe what was ultimately implemented at these sites.

General Considerations

- The significance of the site, and the relative contributions of its different elements and components to the overall significance of the site, should be well understood before developing solutions.
- A thorough understanding of the existing materials (wood species, existing surface treatments, etc.), their existing conditions, and weathering and deterioration mechanisms should be well established before developing solutions.
- Any proposed interventions should abide by the conservation principle of doing as much as necessary but as little as possible. Interventions should minimize repair and prioritize in-kind replacement where possible. Irreversible interventions should be avoided unless they have some greater benefit, such as addressing multiple agents of deterioration. Proposed solutions need to be carefully evaluated for their resulting impact on heritage significance.
- The meeting participants recognized that Kahn's design intent—primarily related to his intention for the natural weathering of the wood—may not have been achievable due to the inherent characteristics of the materials he selected, the detailing practices in his office, environmental factors, and/or the availability of in-kind replacement materials today. Other factors that have a bearing on maintaining or recovering design intent include the preference of the current owner or stewards for the appearance of the wood and maintenance requirements. It may be best to develop solutions that lie somewhere in the middle and that respect “what the wood wants to do,” reconciling Kahn's intent, the owner or stewards'

wishes, and what is actually achievable in the environment at the site, while recognizing that no one has control over the environment.

- Any interventions, such as choosing an appropriate finish or color for the wood, should consider the entire palette of building materials, the significance of each individual material, and its relationship to the others. No building material or element, including the wood, should be thought of in isolation.
- Balancing material and visual integrity can be challenging. Preserving one aspect of integrity may harm another aspect. One must determine which aspect is of greater importance to the overall significance prior to making any decisions about treatment.
- The age of the material and its patina may have value that contributes to the significance of the site.
- In determining the appropriate interventions, the long-term maintenance implications of any solution should be considered, as well as the site owner/stewards' resources for carrying out that maintenance. Solutions that minimize maintenance are generally preferable.
- All solutions, from selection of cleaning methods and surface treatments to sourcing of replacement wood, should strive to minimize environmental impacts. Some sites will be subject to more stringent environmental regulations than others; as a result, they may not have access to a full range of conservation and building products. For example, the Salk Institute is subject to the requirements of the California Coastal Act and the County of San Diego Air Pollution Control District. One consequence of this is the restricted use of coatings and solvents with high VOC (volatile organic compound) content.

Methodological Approaches

Interdisciplinary Approaches

- At the meeting, Frank Matero of the University of Pennsylvania School of Design emphasized the importance of taking an interdisciplinary approach to understanding the significance of these sites, diagnosing problems, and developing solutions. He acknowledged professionals in those disciplines who were in attendance: historians, archivists, architects, conservators, representatives from Kahn's office, scientists, and building owners.

Developing a Range of Solutions

- Before determining what the wood should look like or what the most appropriate treatment is, it is important to first identify the range of options for addressing conservation challenges. These may include options for the different methodological approaches, materials, and repair techniques. For example, at the Salk Institute, the range of solutions trialed during an initial mock-up phase considered the feasibility and efficacy of repairing the windows in situ and off-site in a workshop.
- In developing solutions to the conservation challenges posed by these sites, it may be necessary to think outside the box.

Trial Mock-Ups

The use of in situ mock-ups to trial and evaluate the range of potential conservation solutions is critical to selecting an appropriate intervention. The various project teams discussed findings from their experience with mock-ups at their sites. These are summarized below.

- Long-term monitoring of the mock-ups is required prior to selecting and implementing a solution for the site. This should be factored into the overall schedule for the conservation project.
- Mock-ups of different surface treatments may be tested and evaluated through exposure to natural, in situ weathering (figs. 20, 21), or through accelerated weathering devices in the laboratory (using a weatherometer). In situ testing may

FIGURE 20.

View of the Korman House, showing placement of in situ mock-up panels placed on the side of an out-building that were used to evaluate potential surface treatments for the cypress wood siding, 2015.



FIGURE 21.

View of the Salk Institute, showing in situ mock-up panels placed on the roof that were used to evaluate potential surface treatments for existing (left) and new (right) teak wood, 2015.



be preferable but requires a significant amount of time. Accelerated weathering produces results more quickly, though it yields results that are not exactly indicative of what happens in nature. Yet, this method is useful for providing a comparative evaluation across samples—one can get a sense of which treatments perform better or worse in reaction to agents of deterioration, such as UV light, heat, and moisture. Accelerated weathering will not give definitive information about the expected life spans of different treatments.

- Methods of measuring and assessing the performance of the mock-ups should be determined. Which qualitative and/or quantitative procedures are to be used? Which diagnostic tools? Methods discussed included the following:
 - Visual evaluation of potential stains or coatings, using an attribute-based system that ranked each of the different mock-ups from 1 to 4 in the following areas: longevity of finish, saturation, color sheen, penetration, ease of application, dirt accumulation, ease of cleaning, historical accuracy, color retention, and adhesion. This is a somewhat subjective method, but it is a simple way of organizing assessments from different members of the team.
 - Scientific evaluation using color corrected photography, scanning electron microscopy (SEM), etc., for quantifying color change; Fourier transform infrared spectroscopy (FTIR) analysis to monitor lignin; and contact angle measurements for water repellency before and after weathering.
 - In all cases, it is important to have an untreated mock-up as a control panel to which the other treated mock-ups can be compared.
 - Testing should be carried out before and after weathering, utilizing the same measuring devices for comparison.
- If evaluating the rate of deterioration of wood, it is important to first understand the industry standard rates of erosion for the wood on-site in order to best understand if standard rates of erosion are being halted or slowed. For example, Ron Anthony noted that the rate of weathering for teak is 7 mm (¼ inch) per hundred years, in European environmental conditions.

Addressing Agents of Deterioration

Weathering

As weathering is a natural process, no solutions were discussed that attempted to address weathering alone. However, some of the solutions explored in subsequent sections—to address biological attack, performance issues, or aesthetic concerns—also retard weathering mechanisms. Refer to the sections below.

Biological Growth and Attack

- Wood preservatives may be effective as preventive treatments and conservation measures. At the Korman House, Boracare with Moldcare, combined with a TWP linseed paraffin oil containing an added IPBC (iodopropynyl butylcarbamate) preservative, has been trialed. At the Salk Institute, Boracare is being trialed, but at the time of this meeting, its effectiveness in retarding the growth of the fungal biofilm is not yet understood.

- If using borate-based treatments, a sealant must be applied after treatment or the borate will wash away. At the Korman House, the selected wood preservative/stain helps to retain the borate and Moldcare and seals and stabilizes the wood.
- When replacing deteriorating wood pieces, if the cut of the wood is not highly significant to the design, changing it to a cut that is less conducive to biological growth may be considered.

Design and Construction Deficiencies

Considerations

- Modifying deficient design details often represents an irreversible change, potentially jeopardizing aspects of significance or integrity, such as the architect's original design intent or material integrity. Therefore, changes should be considered carefully and undertaken only if they can adequately address the deficiency.

Potential Solutions

- End grains wicking up moisture. Both the Korman House and Salk Institute trialed trimming the end grains in situ and installing flashing where possible to reduce moisture wicking up the end grains. At the Korman House, the trimmed end grains were also treated with a preservative. While this is not a reversible action, the meeting participants thought the benefits (particularly in the reduction of moisture, which resulted in less staining and biological growth on the wood surface) outweighed the minor change. When making a cut, it should be the minimum necessary to prevent capillary action and thus avoid having a significant visual impact.
- Reduced projection of the drips, impairing ability to shed water. If design modifications are made, they should be undertaken only after understanding the original design intent and when the improvement to overall performance can be demonstrated. Additionally, any modifications should respect the overall hierarchy of the various components in the design element. For example, the Salk project team looked at increasing the projection of the horizontal drips in areas where the rail and T&G boards needed to be replaced due to advanced deterioration of the original teak. As described in "Conservation Challenges," the intermediate drips had originally been reduced from $\frac{3}{4}$ inch, as shown on design drawings and in a construction photograph of the first pilot window assembly, to the $\frac{1}{4}$ inch that was actually built. Some of the specific issues and solutions explored to address this problem included the following:
 - It is important to understand why the change was made by consulting all the available documentary evidence. In the case of the Salk, this evidence included construction photographs of the pilot window installed on-site, field sketches and drawings generated by the architect, construction shop drawings, construction meeting minutes, and even the architect's yearly calendars (held at the Architectural Archives), which confirmed that Kahn traveled to La Jolla to observe the pilot window installation in November 1964.

- In cases where such changes were the result of a value engineering exercise or a switch to a standard available or stock piece, the group agreed there was a stronger case for going back to the full $\frac{3}{4}$ -inch projection.
- However, at the Salk, the reason for the design change was unclear. As the change was made after Kahn's visit and is documented in a sketch produced by his office, the change may have been made in part to satisfy Kahn's visual preferences. Perhaps he wanted to create a hierarchy between the deeper projections of the top and bottom of the assemblies and the lesser projections of the intermediate pieces.
- Because the reason for the change was unclear, the group felt it would be inappropriate to reinstate the full $\frac{3}{4}$ -inch projection. During the recently installed mock-up of an in-kind replacement of a severely deteriorated window wall assembly at the Salk, the intermediate drips in the mock-up were rebuilt with a profile projecting $\frac{3}{8}$ inch from the face of the adjacent T&G boards. This represents an increase of $\frac{1}{8}$ inch, which will improve the life span and performance of this intermediate rail while maintaining a hierarchy with the drip cap at the top of the wall (fig. 22).
- The Salk project team was concerned that implementing this change at only those deteriorated window assemblies may create a sense of asymmetry about the central plaza, as the assemblies at the north side of the plaza were

FIGURE 22.

View of in situ mock-up of an in-kind replacement of a severely deteriorated window wall assembly at the Salk Institute, 2015. This mock-up trialed trimming the end grains of the vertical T&G boards and increasing the projection of the intermediate horizontal drips. The installation of new flashings (visible at the top of this assembly) were also trialed.



typically deteriorated and in need of repair or replacement, while those at the south side were in good condition but slightly weathered. However, the field mock-up illustrated that this difference was not perceivable.

- **Installation of flashing and other waterproofing improvements.** If such improvements can be installed with minimal impact and can be proven to enhance the performance of the exterior walls or windows, it was agreed that they would have minimal impact on technical significance.

Cleaning and Removal of Past Surface Treatments

- Many cleaning products should be utilized only by professionals to ensure proper handling, application, dwell times, and removal and rinsing. Some participants noted that they would be hesitant to put cleaning products such as D/2 Biological Solution in the hands of homeowners who had no previous experience with these products.
- It is important to work with architectural conservators and product manufacturers to determine the appropriate surface preparation prior to applying new surface treatments. Some products require stripping of past treatments prior to application; others can be coated over following washing of the wood.

New Surface Treatments

Considerations

As discussed in “Conservation Challenges,” determining the appropriate and achievable color and appearance for the wood is perhaps one of the biggest challenges, at least from a philosophical point of view, particularly the question of whether to leave the wood in its natural state or apply a finish. While the answer will vary by site, nearly all meeting participants agreed that the orange appearance resulting from the application of various teak oils and wood stains was inappropriate, as it was quite the opposite of the natural weathered woods and negatively impacted the relationship of the wood to the overall palette of building materials at most sites. Considerations in determining an appropriate appearance, either with or without a new surface treatment, are as follows:

- Solutions that embrace weathering yet minimize contrasting areas or moderate variations will retain the significance of many sites. Solutions should aim for an evenness of tone and hue.
- If a finish or coating is applied, reversibility should be considered.
- Long-term maintenance implications of any surface treatment should be carefully considered.
- Certain coatings may actually provide “food” for certain types of biological growth. Therefore, a good understanding of biological organisms and their growth mechanisms and the components of the coating should be carefully factored into the decision-making process.
- Coatings can retard the weathering process. If no coating is applied, the implications of the weathering cycles and potential development of checks and cracks must be considered.
- Finishes may be considered to help integrate the appearance of new and old wood when they sit in close proximity to each other.

Potential Solutions

- At the Korman House, the wood was left to “weather in” for a period of time prior to a future application of a protective coating (not yet applied at the time of the meeting). The amount of time the wood ideally should weather before applying coatings will vary by site.
- At the Salk Institute, the owner is considering “resetting the clock” by returning the wood—both old and new (replacement)—to a fresh appearance and then allowing the weathering processes to take over.
- If applying a surface treatment, it must be determined whether a sacrificial coating or stain (which doesn’t weather away in the same way) is appropriate for the site.
- In choosing a treatment, it is important to consider products with proven track records. Manufacturers of such products are less likely to go out of business or “disappear” and more likely to be available for future treatments. This will allow for consistency in treatments over time at a site.
 - Andrew Fearon noted that the TWP series of products is one such example, having been long used by the National Park Service and US Army. TWP products are currently being tested in various applications, including at the Korman House, Salk Institute, and Frank Lloyd Wright’s Pope-Leighey House. At the time of the meeting, testing at the Salk was just getting under way.
 - Sikens is another manufacturer with a long track record. The Frank Lloyd Wright Conservancy recommends this company’s products for use on Usonian homes.

Replacement Materials

Material Sourcing

In addressing many of the challenges associated with selecting an appropriate replacement material (see “Conservation Challenges”), it is important to consult with suppliers and possibly visit their mills before specifying replacement materials, and to answer questions such as the following:

- Can the supplier produce the quality and quantity of replacement materials needed? Grading systems can be used to address issues of quality.
- How does the supplier address ethical issues such as scarcity and illegal logging? Certification systems can be used to ensure ethical standards are met.

Additionally, mock-ups can be used to test and evaluate the compatibility and performance of different replacement material options.

Integrating Old and New Material

Some of the options discussed during the meeting for integrating the appearance (color, surface texture, and dimensions) of new replacement wood with that of existing weathered wood are listed below.

- Waiting for the replacement wood’s natural weathering process to run its course in situ. The viability of this option will depend on how great the differences between the two are, its impact on visual integrity, and the site owner or stewards’ comfort level with this option.

- Allowing new replacement wood to weather on-site prior to installation.
- Artificially enhancing the weathering of the new wood; this was not viewed favorably by the meeting participants.
- Using a translucent coating or other surface treatment to integrate the appearance of both new and old wood.
- Modifying or planing the thickness of new wood elements to match the thickness of adjacent weathered surfaces. This can be fussy, time-consuming work.

Finding Skilled Craftspeople

Solutions proposed during the meeting for improving the level of craftsmanship at the sites are as follows:

- Training, including bringing in skilled craftspeople from other sites to train those working on a particular site

Conservation Advocates and Managing Expectations

As discussed previously, many of these buildings are just now being recognized as historic resources. In caring for the sites, their owners and stewards are transitioning from a maintenance-based approach to a conservation-based one. The group discussed strategies for easing this transition:

- Ensuring that owners, facilities staff, and other key members of institutions understand what is significant about their site.
- Making certain that owners/stewards are involved in and support the conservation process, from determination of significance, to the use of mock-ups, to arriving at a solution from the various options considered.
- Having a staff or board member who is an advocate for the architecture and works to carry on the legacy of any conservation projects. This is of particular importance for institutions such as the Salk.

As part of this, the group recognized the need to carefully manage the expectations of the site owners and stewards about the conservation process and potential outcomes. The following points were discussed:

- It is important to realistically allocate the necessary amount of time for research, installation and monitoring/evaluation of mock-ups, and construction.
- For many of the sites, removing previous surface coatings or stains and letting the wood weather naturally represents a dramatic change from the current appearance of the building(s). With that comes some concern, particularly for the close observers—those owners and facility managers who are on-site every day. For example, the process of removing past surface coatings at the Korman House and allowing the residual finish to slowly wash away and the wood to weather naturally was challenging for Larry Korman, who had previously maintained his house with a consistent coating. During this transitional process, as the wood weathered differentially by exposure, it was said that the house became “like a chameleon,” changing from season to season, even from day to night. Korman agreed that the previous orange color was “ugly” and wanted

to return it to a state consistent with what Kahn would have wanted; its removal was perceived as an immediate improvement. However, the time associated with implementing the new conservation approach—it was approximately eighteen months before the surface of the wood began to turn gray and stabilize—has required patience, as has the uneven appearance of the wood during this period. It was critical that the conservation team explain this process in advance, include Korman in the mock-up process, and be available to provide reassurance and answer questions during the weathering-in. In reflecting on the success of the process and the treatment, Andrew Fearon remarked that Korman possessed an unusual faith in the scientific endeavor of undertaking an experimental treatment, accepting the inherent unknowns of the process; he was committed to exploration and to understanding Kahn's intent for the site. His visionary quality in stewardship was shared by the entire team.

- Finally, it should be recognized that different owners and stewards will have different tolerances for the long process of letting wood weather-in naturally and maintaining it. For example, Larry Korman has embraced this process; other site owners may not, and may wish to pursue different solutions.

Meeting Actions and Areas for Future Work

The primary goal of the meeting was to bring together a multidisciplinary group of professionals with site stewards and owners for a discussion of similar issues that all parties may be facing at Kahn sites with exterior wood. Thus, there are no overall conclusions or recommendations to be drawn from the meeting; rather, this report provides a summary of what was discussed and is intended to assist each building's owner, stewards, and project team in making decisions specific to the care of the site. The group did agree to a limited number of meeting actions and the parties responsible for them, both of which are identified in this section.

During the course of the meeting, several research, dissemination, and training needs related to advancing conservation of exterior wood at Kahn-designed buildings were identified and are summarized in this section. No responsible party has been identified or assigned to address the needs. However, organizations such as the GCI and the Architectural Archives at the University of Pennsylvania, as well as the various consultants and students working on the Salk Institute and Korman House projects, may be well suited to take on some aspects of the work, either alone or in collaboration. In some cases, these needs are already being partially or fully addressed through the current work and initiatives of these parties and projects. Other identified needs may include research opportunities for future graduate students or other conservation professionals.

Meeting Actions

- Prepare a report summarizing this meeting. *The GCI has prepared this report, which will be shared with all participants and made available as a PDF publication on its website.*

Identified Needs

Research

- Carry out further research and assessment of the significance of exterior wood in Kahn's body of work, expanding on ideas summarized in this meeting report. This research may reveal more information about Kahn's attitude toward the weathering of wood.
- Pursue further development and refinement of conservation policies applicable to Kahn sites.

- Carry out further research on repair options for wood, including the following:
 - Cleaning options
 - Preventive measures for biological growth and insect attack
 - Other surface treatment options
 - Measuring the efficacy of repair options: qualitative and quantitative procedures, diagnostic tools, etc.
- Address the need for evidence-based information on the long-term efficacy of different wood treatments and how they weather over time. Product manufacturers often do not make this information available. This need could be addressed through long-term research, monitoring, and evaluation studies.

Dissemination

- Bibliography of existing texts on teak and its conservation
 - *The GCI has prepared a draft bibliography as part of its work with the Salk Institute. The bibliography is included in the project report detailing Phase 2 of the work. After completion, this report (including the bibliography) will be made available as a PDF publication on the GCI's website.*
 - During preparation of this bibliography, the GCI identified the lack of a robust body of literature on the conservation of teak.
- Literature review of existing texts on conservation of wood in modern buildings
- Published case studies on exterior wood conservation
- Journal articles, possibly focusing on scientific investigations and analysis of long-term monitoring of conservation solutions³⁷
- Development of a technical guidance note on conserving wood in Kahn buildings or more general modern buildings
- Lectures
- Symposium on conservation of Kahn sites, possibly expanding on some of the issues raised at this meeting that could be opened to a broader audience
- Creation of a network of owners of Kahn sites
 - *The Architectural Archives facilitates an informal network of Kahn building homeowners and is a main point of contact for other Kahn-designed sites; this could potentially be expanded and formalized.*

Training

- Training on conservation principles, methodologies, treatments, and/or skills for various audiences:
 - Clients, owners, and stewards
 - Architects
 - Wood experts
 - Craftspeople

Notes

- ³⁷ Several articles on the projects at the Salk Institute and Korman House have subsequently been published. See the bibliography in this meeting report.

Participant Biographies

Note: *The following biographies are current as of May 2015.*

Ron Anthony received an MS in wood science and technology from Colorado State University. He earned a BS in forest management and wood science and technology, also from Colorado State. Prior to forming Anthony & Associates, Inc., in 1999, he conducted research and consulted on wood properties and the use of wood in construction applications. Anthony & Associates focuses on evaluating the performance of wood in historic structures and conducting forensic investigations. Anthony's research activities have focused on nondestructive evaluation and materials testing to better understand how wood interacts with other materials and performs over time. He is the recipient of the 2002 James Marston Fitch Foundation Grant for his approach to evaluating wood in historic buildings.

Andrew Fearon has worked in the field of conservation since 1995, encompassing decorative arts, architecture, and archaeological materials. In 2006, he joined the Philadelphia-based firm Materials Conservation, where he currently serves as chief architectural conservator specializing in wooden materials, architectural finishes, and masonry. Among his recently completed projects are the exterior finishes of Jefferson's Monticello (Charlottesville, VA), the exterior masonry of the American Museum of Natural History (New York), the interior finishes of the Rodin Museum (Philadelphia), statuary at the New York Public Library, the Catholic chaplain's office at Eastern State Penitentiary (Philadelphia), and the interior finishes of the US Treasury Building (Washington, DC). In 2009, Fearon was instructor of the Architectural Finishes Practicum in the University of Pennsylvania's Summer Program in Cornwall, England; the following year he led a course in Historic Building Materials, part of the Architecture as Catalyst Program at the University of Minnesota. Since 2010, he has served as instructor of the Conservation Seminar in Wood as part of the University of Pennsylvania's Graduate Program in Historic Preservation. He is a professional associate of the American Institute for Conservation of Historic and Artistic Works.

Dorothy S. Krotzer is director of Building Conservation Associates' South branch in Philadelphia. A graduate of the University of Pennsylvania's Graduate Program in Historic Preservation, she has worked for more than a decade on a broad range of conservation projects throughout the United States, with substantial experience in the southeastern region. She has written several professional articles, including "Architectural Finishes: Research and Analysis," published as Practice Point No. 6 in the *APT Bulletin, The Journal of Preservation Technology*. Krotzer is former chair emeritus of the Architecture Specialty Group of the American Institute for Conservation of Historic and Artistic Works, as well as recipient of the 2005 Preservation Alliance for Greater Philadelphia Achievement Award.

Sara Lardinois is a project specialist in the Getty Conservation Institute's Field Projects department, managing the Salk Institute Conservation Project. Her other projects at the GCI include Contemporary Architecture in the Historic Environment, the Seismic Retrofitting Project based in Peru, Conservation and Management of the Tomb of Tutankhamen, and Shelters for Archaeological Sites with Mosaics. She holds an architecture degree from the University of Notre Dame in Indiana and received additional training at ICCROM in Rome. She is a registered architect in the state of California and a LEED accredited professional, as well as an expert member of the ICOMOS International Scientific Committee on the Conservation of Earthen Architecture (ISCEAH). Prior to joining the GCI in 2010, she worked at Architectural Resources Group, a San Francisco-based firm specializing in the conservation of built heritage in the western United States, with much of her work located in the National Parks, and also consulted on conservation projects in Turkey, Egypt, and Yemen.

Courtney Magill graduated from the University of Georgia in 2011 with dual BA degrees in art history and classical culture. She continued her research in art conservation through an internship with the curator of decorative arts at the Georgia Museum of Art and an apprenticeship with a private conservator in the Athens, Georgia, area. In 2012, she attended the Museum of Early Southern Decorative Arts' Summer Institute, concentrating on decorative arts of the Southern backcountry. The following year she participated in an American Institute for Conservation workshop on Ossabaw Island, Georgia, learning preventive preservation tactics through implementation at the Torrey Mansion. She is completing a master of science in historic preservation at the University of Pennsylvania in May 2015. Her coursework has focused on the theoretical, logistical, and physical approach to the conservation and preservation of historic buildings and sites, and has focused on conservation as it applies to building materials. Her thesis focuses on performance testing of hydrophobic and UV resistant protective treatments for the exteriors of historic log structures, and she will continue her research on-site at Grand Teton National Park in the summer of 2015.

Laura Matarese is a graduate intern in the GCI's Field Projects department, where she is involved in the Conserving Modern Architecture Initiative and assists in the Eames House and Salk Institute conservation projects. She holds a bachelor of liberal studies with honors from the University of Sydney and is currently a candidate in the university's Master of Heritage Conservation program. From 2013 to 2014, Matarese was a senior heritage consultant and historic heritage team leader at Archaeological and Heritage Management Solutions, an Australian heritage firm. Prior to this, she worked at the company as a heritage consultant for six years. In 2013, she was awarded placement in the US/ICOMOS International Exchange program and carried out building survey at the Presidio Trust, San Francisco, for three months. She is a member of the Association for Preservation Technology International, DOCOMOMO, and ICOMOS and an associate member of the ICOMOS International Scientific Committee on 20th Century Heritage.

Frank G. Matero is professor of architecture and former chair of the Graduate Program in Historic Preservation at the School of Design, University of Pennsylvania. At the university, he is director and founder of the Architectural Conservation Laboratory and a member of the Graduate Group in the Department of Art History, as well as a research associate of the University Museum of Archaeology and Anthropology. He was previously on the faculty of the Graduate School of Architecture, Planning, and Preservation at Columbia University; a guest lecturer at ICCROM in Rome; and a lecturer at the Polytechnic University of Puerto Rico. He did graduate work at Columbia University and at the Institute of Fine Arts, New York University. He is a professional associate of the American Institute for Conservation of Historic and Artistic Works and former cochair of its Research and Technical Studies Group, and serves on the editorial boards of the *Journal of Architectural Conservation* and *CRM: The Journal of Heritage Stewardship*. Currently he is editor in chief of *Change Over Time*, a new international journal on conservation and the built environment, published by Penn Press.

Kyle Normandin is an associate principal at Wiss, Janney, Elstner Associates, Los Angeles. He is qualified in the investigation and repair of historic and contemporary buildings and has investigated and surveyed several hundred structures involving failures of building components and materials. He is also qualified in the architectural conservation of masonry, terra-cotta, cast stone, stone, reinforced concrete, and paving systems. His work has entailed diagnosis, development, and construction phase administration of repairs for several historic structures. Normandin holds a BA in architecture from UC Berkeley and an MS in historic preservation from Columbia University. His professional affiliations include DOCOMOMO International Scientific Committee for Technology, US/ICOMOS, and the editorial advisory board for the *Journal of Architectural Conservation*. He serves on the boards of the Association for Preservation Technology International and the California Preservation Foundation.

Deborah Slaton is a principal with Wiss, Janney, Elstner Associates, Northbrook, Illinois. She has served as principal investigator for numerous preservation plans, historic structure reports, and cultural landscape reports for historic resources nationwide, including many modernist resources. Slaton holds a BA in art and art history from Northwestern University, and an MA in English and M.Arch in architectural engineering from the University of Illinois. She is author and editor of numerous publications, including the proceedings of the "Preserving the Recent Past" conference series on modernism. She

is author of the National Park Service Preservation Briefs on Historic Structure Reports and Repair of Historic Concrete, and coauthor (with David Patterson) of a monthly column on construction technology for *Construction Specifier* magazine. She is a fellow of the Association for Preservation Technology International, a director of the Historic Preservation Education Foundation, and a member of the Society of Architectural Historians' Heritage Conservation Committee.

Garry Van Gerpen is vice president of scientific services at the Salk Institute. He oversees five of the support departments at the institute: Facility Services, Information Technology, Security, Environmental Health and Safety, and Animal Research. Additionally, he is responsible for all capital construction at the Salk. Prior to assuming the position of vice president in 2007, Van Gerpen served as the Salk's senior director of facility services (1997–2007), assistant director of facility services (1991–97), and facility services manager (1988–91). Previously, he owned and operated a general contracting and construction company in north-central Iowa. He holds a BS in mechanical engineering from the University of Iowa.

William Whitaker is curator and collections manager of the Architectural Archives at the University of Pennsylvania. Trained as an architect at University of Pennsylvania and the University of New Mexico, Whitaker has worked for more than twenty years documenting and interpreting the work of Louis I. Kahn, the landscape architect Lawrence Halprin, and the partnership of Robert Venturi and Denise Scott Brown, along with other collections at the Architectural Archives. He has organized and cocurated over thirty exhibitions and lectured on a wide range of subjects related to twentieth-century architecture, landscape, and community design to broad audiences. Whitaker coauthored (with George Marcus) *The Houses of Louis Kahn* (Yale University Press, 2013), the first comprehensive study of the architect's house designs.

Henry N. Wilcots received the Congressional Gold Medal, the nation's highest civilian honor, in 2012. He was born in 1928 and raised in Des Moines, Iowa. A trusted associate of Louis I. Kahn's, Wilcots contributed to a number of major works during his ten years with the architect (1964–74), including the Levy Playground and Temple Beth El. Kahn's capital complex in Dhaka, Bangladesh, however, was the dominant focus of Wilcots's career. As an associate of the architect David P. Wisdom, who carried on some of Kahn's projects after his death, Wilcots oversaw completion of the thousand-acre campus, including design work for aspects of the program that remained undeveloped in Kahn's lifetime. The project opened to universal acclaim in 1983. Wilcots retired from practice in 2000.

A veteran of the Korean Conflict, Wilcots served for six years (1945–51) in the US Marine Corps and is counted among the Montford Point Marines, the Corps equivalent of the widely known Tuskegee Airmen. Wilcots and those Marines, all African Americans who trained at the segregated Camp Montford Point, North Carolina, and served in all-black units afterward, were later individually awarded the Congressional Gold Medal.

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Archives

- Louis I. Kahn Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission.
- Salk Institute for Biological Studies, Off-Site Storage and Archives.

APPENDIX A

Meeting Agenda



**Meeting to Discuss Exterior Wood Conservation Issues at Louis Kahn Buildings
Architectural Archives, University of Pennsylvania**
Tuesday and Wednesday, May 12–13, 2015

Final Agenda Issued: May 12, 2015

Summary

Several Louis Kahn designed buildings, including the Salk Institute for Biological Studies, the Margaret Esherick House, the Dr. and Mrs. Norman Fisher House, the Steven and Toby Korman House, and the library at Philips Exeter Academy, demonstrate a language of custom exterior millwork that is significant within Kahn's larger body of work. These buildings are of, or near, the age where substantial maintenance and repair is required. While the environmental conditions and details each building are unique, the owners and facilities managers of these sites face a number of common conservation challenges for the exterior wood, including the appearance of the wood (and reconciling Kahn's intent for the wood with what can be achieved today), removal of past surface treatments that detract from the significance, erosion and loss of original material, fungal and insect damage, design deficiencies which have led to moisture infiltration or other damages, and decisions for on-going maintenance and repair strategies. Some of sites have already carried out substantial repair projects, while others are in the process of working with conservation professionals to address these issues, although at different phases of investigation, trials, design, and implementation. The Getty Conservation Institute and the University of Pennsylvania propose to host a two-day meeting to discuss both the unique and common issues at these various sites and share information on research, testing, and conservation solutions being explored, tested, and implemented, with the intent that the collective knowledge and expertise of this network may benefit and potentially improve all current and future projects at these various sites.

Attendees will include owners and facilities managers of several Kahn buildings, the curator and collections manager of the Architectural Archives at the University of Pennsylvania, architectural conservators, wood scientists, historic preservation practitioners, architects, and construction/project managers who are currently dealing with the conservation of exterior wood at Kahn buildings, as well as Henry Wilcots, who worked in Kahn's office 1962-74 and then as a successor from 1974-83 during the completion of the National Assembly Building in Dhaka, Bangladesh. During his time in Kahn's office he also worked on Temple Beth El in Chappaqua, NY, which has wood clad walls set within a concrete frame.

The first day will involve visits to several Kahn buildings with exterior wood to observe and discuss details and conditions, past and current treatments, and conservation challenges on-site. The second day will consist of meetings to discuss exterior wood conservation challenges and potential solutions for the Salk Institute and other Kahn-designed buildings.

Agenda

Monday, May 11 –Arrival in Out-of-Town Participants in Philadelphia

Recommended accommodation:

Latham Hotel

135 South 17th Street, Philadelphia, PA 19103

T: 215.563.7474



Tuesday, May 12 – Site Visits to Kahn Houses in the Philadelphia Area with Wood Exteriors

- 8:45 a.m. Bus arrives and parks, curbside, at the Latham Hotel
135 S. 17th Street, Philadelphia, PA 19103
- 9:00 Depart for Genel House
(allow 20-25 minute travel time)
- 9:30 Site visit: **Samuel & Ruth Genel House** (1949-51)
201 Indian Creek Road, Wynnewood, PA 19096
(610) 642-8580
Homeowners: Marlyn Ivory Arouh and Dr. Albert Arouh
- 10:30 Depart for Shapiro House
(allow 15-20 minutes travel time)
- 10:45 Site visit: **Bernard & Norma Shapiro House** (1958-62) – EXTERIOR ONLY
417 Hidden River Road, Narberth, PA 19072
- 11:15 Depart for Korman House
(15 miles / 30 minute travel time)
- 11:45 Site visit: **Steven & Toby Korman House** (Kahn, 1971-73)
6019 Sheaff Lane, Fort Washington, PA 19034
Meet homeowner Larry Korman and Jeff Lapin, Director of Operations, on site
- Visit includes time to eat a box lunch on-site
- 1:45 p.m. Depart for Hatboro
(10 miles / 20 minutes)
- 2:15 Site visit: **Norman & Doris Fisher House** (Kahn, 1960-67)
197 East Mill Road, Hatboro, PA 19040
Dorothy Krotzer and Bill Whitaker to discuss previous studies and current project on site
- 3:45 Depart for Chestnut Hill
(10 miles / 30 minute travel time)
- 4:00 Quick coffee stop at Dunkin Donuts
240 S. Easton Road, Glenside, PA 19038
- 4:30 Site visit: **Margaret Esherick House** (Kahn, 1959-62)
205 Sunrise Lane, Philadelphia, PA 19118
Meet homeowner Paul Savidge on site
- 6:00 Depart for Latham Hotel
(12 miles / 30 minutes)



7:30 Group dinner, hosted by the GCI
Parc Brasserie
227 S 18th St, Philadelphia, PA 19103
Tel: (215) 545-2262

Wednesday, May 13 – Meeting

8:15 a.m. Attendees arrive at the **Architectural Archives of the University of Pennsylvania**
220 S 34th St, Philadelphia, PA 19104
(215) 898-8323

8:30 Meeting

- Opening remarks by Henry N. Wilcots
- Summary presentations on background and conservation challenges at:
 - Korman House, AF, SY, CM (1 hr)
 - Salk Institute for Biological Studies, SL and Salk Team (1 hr)

10:30 Break

10:45 Meeting continues

- Summary presentations on background and conservation challenges, continued:
 - Phillips Exeter Library, SL and RA (15 mins)
- Significance of custom exterior millwork within Kahn's body of work:
 - Can we clearly define *Kahn's intent* / sensibilities regarding the appearance of exterior wood? Is this consistent across all of his exterior millwork? As wood changes in response to environment—sometimes differentially or in unanticipated ways, particularly overtime—how can we best characterize Kahn's attitude towards these changes? What is our best documentation of these attitudes?
 - In heritage conservation, we often value not only the original intent but recognize and value the evidence of time (the patina) with original materials directly defining authenticity. How does this *age value* play a role with Kahn – is it consistent with his sensibilities identified. How does intent weigh against these values?
- Conservation issues, both shared and unique:
 - What does the wood want to do?
 - What are the primary agents of deterioration? Do design detailing or construction deficiencies play a role in the deterioration?



- Do past surface (or penetrating) finishes detract from the significance, due to their very use on wood that was meant to be left bare, color, sheen, or high to extreme variations in appearance as they weather?
- Should new surface (or penetrating) finishes be applied or the wood be left untreated? How to reconcile Kahn's intent to leave wood unfinished with owner requirements / expectations about appearance and environmental issues.
- What are the practical implications of untreated wood? If left untreated, can we predict the serviceable life of a given wood species within a given context? Do we accept replacement as a viable alternative to the *retention of original material*? Is it ideal to prolong the serviceable life of the wood even if for the most practical financial considerations?
- Where replacement material is needed, and original and new materials are adjacent to one another, how can some degree of visual consistency be achieved?
- Many Kahn sites possess high aesthetic value. Thus, while treatments may be tailored to the specific conditions in an area of a building (following principles of minimal intervention and to maintain material and workmanship integrity), care must be taken to apply a similar treatment across and façade or area of a building, so as to not create a patchwork appearance.

12:15 p.m. Lunch (boxed lunches delivered to the Architectural Archives)

12:45 Depart Architectural Archives to walk to Richards

1:00 Site visit: **Richards Medical Research Laboratories (Kahn, 1962)**
Followed by potential visit to the Architectural Conservation Lab, time permitting

1:45 Meeting continues

- Common conservation issues, continued.
- Potential solutions, both shared and unique:
 - Is it possible to extend the *serviceable life* of wood through treatment and/or cyclic maintenance?
 - How can the *primary agents of deterioration* each be addressed through treatment formulation?
 - How best to *correct design or construction deficiencies* or implement performance improvements without negatively impacting significance?
 - Can the treatment *be sustainable, easy to implement with low environmental impact? Cost effective?* What are the proposed *maintenance cycles*?



- Can a treatment satisfy project requirements related to (1) *design intent*, (2) *age value*, (3) *retention of original material*, (4) *serviceable life*, (5) *addressing all agents of deterioration*, (6) *correcting design or construction deficiencies*, (7) *sustainable/easy to implement /eco-friendly, cost effective within a reasonable maintenance cycle*? What is the ideal balance?
- Conservation policies for protecting the cultural significance of exterior millwork at Kahn buildings, while enabling continued use, repair, maintenance, and performance improvements.
- Next steps:
 - Potential formation of network, information sharing, etc.

5:30

Meeting concludes

APPENDIX B

**Case Study: Salk Institute for
Biological Studies**

**EXTERIOR WOOD CASE STUDY:
SALK INSTITUTE FOR BIOLOGICAL STUDIES**

Laura Matarese and Sara Lardinois

Location	La Jolla, California
Date(s) of Design	1960–64
Date(s) of Construction	1962–1965
Materials Used	Exterior: Travertine, concrete, teak, lead, glass, COR-TEN steel, and stainless steel/nickel alloy metal frames at laboratory window walls.
Environmental Context and Setting	Located on a coastal bluff adjacent to the Pacific Ocean, less than ½ mile inland and 363' above sea level. Sea fog is common.



FIGURE CS-B.1 Salk Institute for Biological Studies, view of the teak window wall assemblies in the south study towers from the main plaza, 2014. Photo: J. Paul Getty Trust

Salk Institute for Biological Studies



FIGURE CS-B.2 View of the north and south office wings, from the southwest, 2013. Photo: J. Paul Getty Trust

Background

Design and Construction Chronology

- 1959: The Salk Institute for Biological Studies is founded by Dr. Jonas Salk, scientist and developer of the first successful polio vaccine. This same year, Salk commissions Louis Kahn to design the campus.
- 1960: Salk and Kahn first visit the site in La Jolla together in early 1960, and Kahn presents the first version of the project in March 1960.
- 1960–64: Design work ongoing, with a set of construction documents completed in 1963 and revisions ongoing through 1964.
- 1962–65: Construction of the main laboratory, office, and study buildings, with construction beginning prior to the completion of design, with the first concrete poured in 1962. The remainder of the original design proposal, including a meeting center and residential quarters, remained unrealized.
- 1990s: Construction of the East Building, designed by a team that included the firm of Anshen + Allen, and David Rinehart and Jack MacAllister, both of whom had worked with Kahn on the original design team. The new building provided additional space for scientific services and administrative support and also provided some of the features that were included in the original, but incomplete, design scheme for the site, such as an auditorium.

Exterior Wood Detailing Description

Approximately 203 wood window walls are extant on the north, west, and south elevations of both the study towers and west office wings on the campus of the Salk Institute. The window walls are prefabricated assemblies that consist of a combination of horizontal sliding window sashes, louvers, and/or shutters, often with an internal pocket to accommodate these sliding components and occasionally built-in shelving. Prefabrication was selected as both a means of reducing project costs and increasing quality, as the units were partially assembled in a local cabinetmaker's shop prior to being transported to the site and lifted into place by crane. They are constructed with white fir wood (*Abies spp.*) stud framing and sheathed with a layer of asbestos-cement (transite) board on one or both sides of the studs. The exterior face of the wall is clad with teak (vertical T&G boards, vertical trim boards, horizontal drip rails and caps, and sills; and the interior face is clad with oak paneling or gypsum board, all of which are attached to the transite board or studs with white fir or plywood furring strips. In some locations, solid teak members are used in a structural capacity, as at the window jambs in the study towers. Many of the original waterproofing details, such as copper flashings,

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which appear in the original design and approved shop drawings, were not installed, either due to budget cutbacks or constructability issues.



FIGURE CS-B.3 View of the southern west office wing, with prefabricated window walls being installed, circa 1965. Image: Louis I. Kahn Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission, scan 030.V.D.19.2_Mar65.



FIGURE CS-B.4 View of a south-facing window wall in the north study tower, October 1967. Image: The John Nicolais Collection, The Architectural Archives, University of Pennsylvania, scan aaup.260.I.D.36.12_Oct67.

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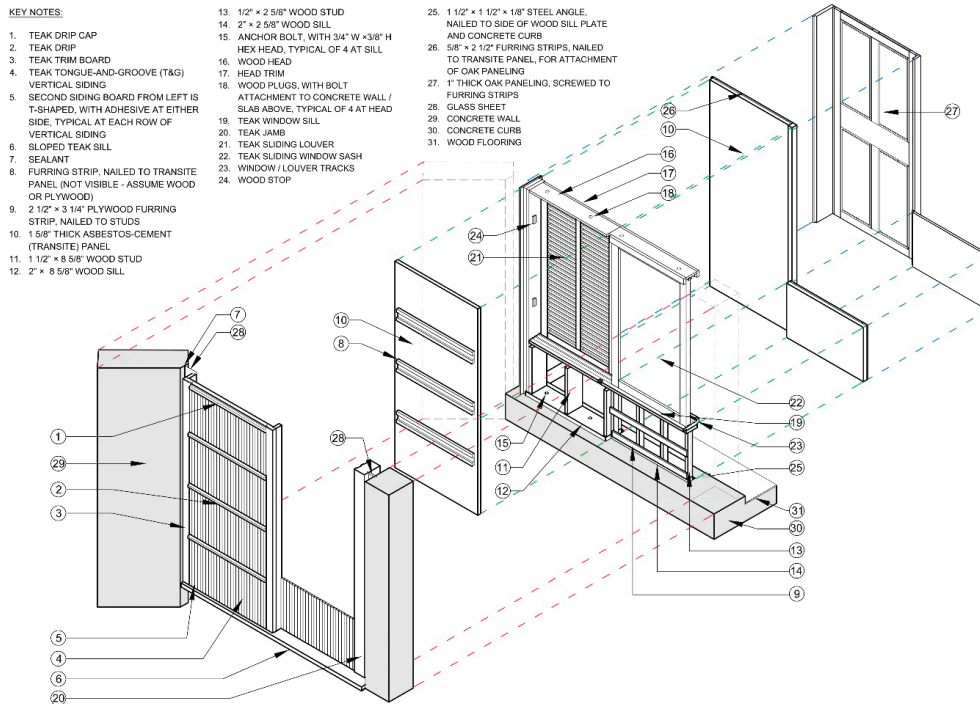


FIGURE CS-B.5 Exploded axonometric view, showing typical as-built conditions for a window wall assembly in the north studies. Image: J. Paul Getty Trust

Significance

Current Historic Status

The Salk Institute was listed as Historical Landmark #304 by the San Diego Historical Site Board (presently the Historical Resources Board) in 1991. It was landmarked on the basis of its association with both Louis I. Kahn and Dr. Jonas Salk; "its pivotal role in the metamorphosis of the economy of San Diego from near total dependence upon the military and aircraft manufacturing to a diverse one with a strong and growing medical and scientific research element"; and its architectural significance, citing its international renown as "an important work of modern architecture for both its dramatic siting atop a bluff with the ocean view framed by the paired buildings, and for its innovative design concepts, especially in the function of the laboratories and in the symbolism of the elegant central plaza." The designation specifically covers "all facades of both buildings, the view to the west which they frame, the upper terrace entryway with its ornamental grove concept, the central plaza with its watercourse, the lower terrace with its fountain, and the original amenities of these spaces such as steel gates and terrazzo seating areas."¹

The Salk Institute is not listed in the California Register of Historical Resources or in the National Register of Historic Places, nor has its eligibility for listing in the National Register been formally evaluated.

Other Recognition

In 1992, the Salk Institute received a Twenty-five Year Award from the American Institute of Architects (AIA). The Salk and other recipients of the Twenty-five Year Award were subsequently featured in the AIA's

¹ City of San Diego, Historical Site Board 1991, 1.

Salk Institute for Biological Studies

traveling exhibition, *Structures of Our Time: 31 Buildings That Changed Modern Life*, which premiered in 2002.²

Statement of Significance of the Window Wall Assemblies³

The window wall assemblies are an exceptionally significant element of the Salk Institute for Biological Studies. They demonstrate key aspects of Dr. Salk's philosophy envisioned for the institute as a place of a humanized science and Louis Kahn's design approach, as physical expressions of the human element and human scale within the monumental structure and also of a human "domestic" space. The window assemblies embody these concepts through several significant design characteristics including the use, detailing, and a limited color palette of materials. The materials are complementary to one another at the site—no material "jumps forward" of another. The use of natural materials at the Salk Institute, including the teak at the exterior and oak at the interior paneling, demonstrates a key development in Kahn's architectural philosophy—to use and honor the unique properties of these selected materials. Wood, a natural material, reveals its origins through color, texture, grain and natural finish, with subtle to moderate differentiations in appearance. The natural weathering of the exterior wood elements results in a sense of age and patina that would have been anticipated by Kahn. A sense of the domestic and human space is expressed in the architectural detailing, scale of the interior and exterior façades of the window wall assemblies and the functionality of the various sliding components (window sashes, louvers, and shutters).

The design of the window wall assemblies is significant within Kahn's larger body of work as it expands upon a language of custom exterior millwork established in his office. The design and construction of the window walls demonstrate a synthesis of industry and craft. The design techniques and details, some visible but others hidden within the exterior cladding of the assemblies, demonstrate the architect's design ideas of melding prefabrication with the workmanship of craftspeople.

Design Intent and Materiality⁴

Materials

- A characteristic of Kahn's later work was the explicit use natural materials of limited palette.
- Kahn routinely drew materials from nature.
- Materials were used in ways that expressed their origins as natural materials and their unique properties.
- It was part of Kahn's philosophy that "the beauty of what you create comes if you honor the material for what it is."
- Materials were deliberately left exposed to show their natural variations in color, hue and texture.
- At the Salk Institute, the use of wood together with concrete "often conceived as materials of opposite character, complemented each other . . . both were provocatively detailed in a way that moved back and forth between abstraction and structural description, resulting in a contrasting but complementary effect neither was allowed to stand in the background."

Choice of Teak

- Teak was purposefully chosen for the exterior cladding as it was considered a durable, maintenance-free material. It was intended to display its characteristics as a natural material and expected to weather naturally over time.
- During the design phase, several alternatives to the teak were considered as a means of reducing project costs. The only viable alternative, Honduras mahogany, was rejected by Jack MacAllister of

² American Institute of Architects 2014.

³ See Lardinois 2017, 21-25 and Getty Conservation Institute 2015.

⁴ Information in the section has been summarized from significance assessment in Lardinois 2017 and Getty Conservation Institute 2015. Refer to those reports for quotation citations.

Salk Institute for Biological Studies

Kahn's office because it "is very red in color and would create problems of appearance with the color of the concrete."

Attitudes towards Changes to the Teak

Architect Louis Kahn:

- Observations of the teak soon after the completion of construction: "I think the tone now, the concrete and the wood, blends together much."⁵
- On the color of the teak: They "are sort of a grey and they look almost like the concrete, and they look more so later on when they get to be really quite white. The walls will become very light" (Kahn in a 1969 interview with John W. Cook and Heinrich Klotz).⁶
- It is difficult to ascertain if Kahn expected such a variation in appearance, but it is most certainly the result of his design and he acknowledged this in the same 1969 interview by saying the upper windows "weather much more than the other ones."

Project Architect Jack MacAllister (based upon a 2013 oral history)⁷:

- When asked about the appearance of the teak, MacAllister noted that it should be allowed "to be a natural material and not something that is some super material that never changes . . . it would be a mistake to do anything that suddenly made the teak look brand new and kind of like a perfect material."
- On the teak aging: "Its weathering was really something we welcomed and we knew it would happen."
- On potential conservation treatments for the teak: "A solution that would put a shiny finish on it or would keep it dark would be inappropriate . . . it would be a mistake to do anything that would suddenly make the teak look brand new and kind of like a perfect material."
- On the teak and concrete: "The marriage of, the kind of consistency of the total value of the building from the concrete to the travertine to the grayed-out teak, I think is one of the really subtle beauties of the building. There's nothing that jumps forward of everything else. And they all have the same kind of built-in patina as it were, where they are all related."

Salk Institute (Dr. Salk and Facilities Staff)⁸

- The presence of this fungus on the teak particularly troublesome to both Dr. Salk and his institute—in 1968 is was described as giving the building "the appearance of a 5 o'clock shadow on all of the panels that do not get much sunlight." Facilities Staff, Salk Institute c. 1968
- Dr. Salk's dissatisfaction with the appearance of the teak—the fungal biofilm and strong variations in appearance—led to the application of surface treatments in later years which were intended to protect the teak and minimize variations in appearance (pers. comm Van Gerpen 2014).

Reconciliation of Kahn's Intent (as understood) with Owner Expectations and Environmental Conditions

- Neither Kahn's intentions for the teak (as a maintenance-free naturally weathered material) nor Dr. Salk's intentions (to mitigate strong variations in appearance) were able to be fully realized at the Salk Institute. Yet the significance of the window walls lies in a middle ground between the intentions of the client and architect—that materials at the site complement and not 'jump forward' of one another, to honor and express the materials' natural properties, to develop a patina and sense age with the building and to accept, based on the design and environmental conditions, the subtle to moderate differentiations in appearance including, color, texture and detailing.

⁵ Latour 1991, 216.

⁶ Prown and Denavit 2014, 23.

⁷ See transcription of interview with Jack MacAllister in Appendix B of Lardinois 2017.

⁸ See log of Salk facilities staff correspondence and maintenance files in Appendix A of Lardinois 217.

Salk Institute for Biological Studies

Current Maintenance Program

- The Salk's Facility Services department, led by Senior Director Tim Ball and overseen by Garry Van Gerpen, Vice President of Scientific Services, is responsible for maintenance of the teak window walls.
- The teak was cleaned on a 2–3 year cycle through to 2009. As the Salk Institute considered a more serious repair project for the window walls, this cleaning process was halted circa 2009. At the current time, the only cleaning being undertaken is the washing of the window glass several times a year.
- The Salk Institute is currently undertaking a comprehensive conservation program for the window wall assemblies (see 'Conservation Program' below).

Conservation Challenges

- Differential weathering, which results in variations in the grey weathered appearance and different rates of erosion in the surface of the wood. In the most severe areas, nearly 1/3 of the surface depth of the T&G boards has been lost. Sourcing of replacement materials for those teak elements deteriorated beyond repair is also a challenge.
- Discoloration of the teak due the presence of a black fungal biofilm, which composed of several types of fungi (*Capnodiales* order), most likely coming from the surrounding Eucalyptus trees. It thrives where there is a water source, and thus the heaviest growths appear on the north-facing elevations and above the horizontal drips and sills. Past cleaning efforts to remove the fungus have contributed to the deterioration of the teak.
- Moisture staining above horizontal elements. The vertical T&G boards are in direct contact with horizontal drip caps, rails and sills, without any type of gap or flashing to reduce moisture wicking up the end grains.
- Variation in color, most frequently the result of previous sealer applications, which gave the teak a red appearance.
- Variable drywood termite damage to the interior framing and furring strips, with more limited damage to the exterior teak elements.
- Lack of flashing and perimeter sealants, as well as effective weather-stripping, which allows for air and moisture infiltration.
- Presence of hazardous materials, including the cement-asbestos boards used as structural sheathing.

Conservation Program

Earlier Repair and Conservation Actions

- Cleaning of teak, with a bleach solution, trisodium phosphate (TSP), and wire brushes, beginning in 1967, to address the fungal biofilm which was first reported in November 1966, less than eighteen months following the window wall installation. The teak was cleaned approximately every two to three years.
- In the mid-1990s two-part cleaner and brightener (TE-KA brand Scrubless Cleaner), along with a wood oil sealer (Tip Top Teak) was applied to the teak in an attempt to improve its appearance and retard further deterioration. The wood oil sealer gave the wood its red appearance which is still visible in parts of the building today.
- Limited application of preventive and remedial treatments to address drywood termite infestations.
- Various weatherproofing retrofits at the perimeter of the sliding window sashes.

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Current Conservation Program, 2013–

- In fall 2013, the Salk Institute partnered with the Getty Conservation Institute (GCI) to develop a conservation project for the teak window wall assemblies. Phase 1 of the project, which included historic research, a significance assessment, a preliminary condition survey, laboratory testing, and the development of preliminary treatment recommendations was completed in August 2014. Anthony & Associates consulted with the GCI on this work.
- Phase 2 of the project began in late 2014, with the development of a detailed scope of work for a trial mock-up program, which will explore the feasibility of implementing the recommended treatment typologies identified in Phase 1 and assess various aspects of the mock-ups. Implementation of the mock-ups was completed in April 2014; however, evaluation will be ongoing. The Salk Institute engaged Wiss, Janney, Elstner Associates, Inc. (WJE) to provide architectural, engineering, and conservation expertise and support during the trial mock-up phase. Rudolf & Sletten, a construction firm with a long history of working at Salk, served as the construction manager for the project, and ISEC was the general contractor for the work.
- WJE is currently preparing construction documents for the full project, which build upon the results of the trial mock-up phase. Construction is scheduled to begin in fall 2015.

Current Conservation Program, Phases 1 and 2

- Testing and mock-ups are being undertaken to formulate a treatment in keeping with Kahn's intent of the appearance of the wood.
- Six different mock-ups were implemented to explore three levels of intervention—minor, moderate and major. The intervention types were further refined following the initial results of the mock-ups. The scope of work for the refined interventions are as follows:

Minor intervention: In situ cleaning and repair of existing window wall assemblies exhibiting minor to moderate erosion at the teak cladding and no termite damage

- Clean and potentially brighten teak, removing past surface treatments as required
- Trim bottom of T&G boards in situ, to reduce moisture intake through the end grains and inhibit the growth of the fungal biofilm
- Potential application of topical treatment to further retard the growth of the fungal biofilm and/or better integrate the appearance of historic and new wood
- Treat existing wood framing and furring to increase resistance to future termite infestation
- Contain existing transite boards in place; or, potentially replace interior transite board removed for inspection of wall cavity with non-asbestos containing alternative
- Install head flashings (pending final assessment of Mock-Up 2) and replace perimeter sealants
- Clean / repair sliding sashes and repair / retrofit hardware
- Install weather stripping at sliding windows and frames; further explore options for reducing water infiltration at the window sill
- Retain existing sash glazing; or replace glazing to address concerns about user safety and thermal / solar performance

Moderate intervention: In situ cleaning and repair, with limited replacement of teak, at existing window wall assemblies exhibiting moderate to severe erosion at the T&G boards only and no termite damage

- At existing teak to remain, clean, potentially brighten, and remove past surface treatments as required
- Replace deteriorated T&G boards and drip rails in-kind (with bottom of T&G boards trimmed

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to reduce moisture intake and inhibit growth of the fungal biofilm); replace associated furring with material with improved resistance to termites; construct as a removable panel type of system for ease of installation and improved access to the wall cavities for future inspection and maintenance.

- Potential application of topical treatment to entire exterior wall surface to further retard growth of the fungal biofilm and better integrate appearance of historic and new teak
- Treat existing wood framing to increase resistance to future termite infestation.
- Contain existing transite boards in place; or, potentially replace interior transite board removed for inspection of wall cavity with non-asbestos containing alternative
- Install head flashings (pending final assessment of Mock-Up 2) and replace perimeter sealants
- Clean / repair sliding sashes and repair / retrofit hardware
- Install weather stripping at sliding windows and frames; further explore options for reducing water infiltration at the window sill
- Retain existing sash glazing; or replace glazing to address concerns about user safety and thermal / solar performance

The level of visual consistency that can be achieved between adjacent historic and new teak elements in this type of intervention, both immediately following the conservation project and as the wood weathers, is unknown at this point and is pending further analysis of all mock-ups.

Major intervention: Removal of existing window wall assemblies exhibiting both severe erosion of all teak elements and termite damage and reconstruction using in-kind materials

- Replace existing teak in-kind
 - Replace damaged wood stud framing with pressure-treated or acetylated wood, for improved resistance to termites
 - Replace transite boards with non-asbestos containing alternative
 - Modify architectural details to retard moisture infiltration and growth of the fungal biofilm, incorporating concepts that prove to be successful in Trial Mock-Up 3, such as trimming the end grains and introducing a drainage plane in the wall assembly
 - Construct new assembly—in part or whole—as a removable panel type of system for ease of installation, introduction of base flashing, and improved access to the wall cavities for future inspection and maintenance
 - Potential application of topical treatment to further retard the growth of the fungal biofilm and/or better integrate the appearance of historic and new wood
 - Install head and pan flashings and replace perimeter sealants
 - Clean / repair existing sliding sashes or replace in-kind, providing new hardware
 - Install weather stripping at sliding windows and frames
 - Reuse existing glazing salvaged from original sash; or replace glazing to address concerns about user safety and thermal / solar performance.
- Trials have also commenced investigating a range of finishes that may be used on historic and new teak. Finishes trialed on sample panels of original salvaged and new teak include:
 - Unfinished (both cleaned and uncleaned; cleaning new wood was trialed as a means of better integrating adjacent historic and new teak elements.
 - Wolman Woodlife Classic Clear Wood Preservative
 - Sansin Wood Sealer
 - Nissus BoraCare with Sansin Wood Sealer
 - TWP 400 Series, Light Cedar 415

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- TWP 1500 Series, Pecan 1520
- Sansin SDF, Naturals, Suede 19
- Sansin SDF, Transluents, Custom Tinted
- Messmer's U.V. Plus for Hardwoods, Natural

Susceptibility tests carried out at the GCI indicated that finish products containing an IPBC fungicide are effective on the fungal biofilm present at the Salk. The borate-based products, both with and without mold care additives, have not proven to be effective against this fungus in laboratory testing.

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FIGURE CS-B.6 View Mock-Up 1.A (Minor intervention with in situ cleaning and repair, with investigation and treatment of interior framing), prior to treatment, September 18, 2014. Photo: J. Paul Getty Trust



FIGURE CS-B.7 View of Mock-Up 1.A, at completion of treatment, March 30, 2015. Various cleaning trials were carried out, utilizing sodium percarbonate and detergent solutions, as well as D/2 Biological Solution. The effectiveness of sanding was also testing for the removal of the fungal biofilm and improving the overall appearance of the wood and its ability to take a penetrating surface treatment. Several "colorless" treatments were applied across the base of the wall including water repellent preservatives and borate-based treatments with sealers. Photo: J. Paul Getty Trust

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FIGURE CS-B.8 View of Mock-Up 1.B (stripping tests only), at completion of treatment, February 17, 2015. Investigations included trialing various non-toxic or low-toxicity chemical and mechanical strippers to remove past surface coatings. Clockwise from top left: mechanical sanding (150 grit) and partial 3M Safest Stripper Paint and Varnish Remover; Soy Gel Professional Paint Stripper; Citristrip Safer Paint and Varnish Gel; Sponge-Jet Sponge Media for Sensitive Substrates (White Media Sponge, profile of <6microns) Jet; and 3M Safest Stripper Paint and Varnish Remover only. Photo: J. Paul Getty Trust

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FIGURE CS-B.9 View Mock-Up 2 prior to treatment, September 18, 2014. This mock-up was originally intended to explore the feasibility of removing the exterior teak cladding for cleaning and repair in a shop, installation of performance-based improvements, and reinstallation of teak after completion. Based upon what was learned of the teak assembly and fastening details in Mock-Up 3, the team determined it was not feasible to remove the teak cladding without significant damage to it. Given that minimal to no moisture damage was observed in the internal framing this location, limited improvements were carried out with the teak in situ. Photo: J. Paul Getty Trust



FIGURE CS-B.10 View of Mock-Up 2, near completion of treatment, March 30, 2015. Similar cleaning and surface treatments to Mock-Up 1.A were also carried out at Mock-Up 2. In addition, the use of an oxalic acid based brightener was used, which removed the moisture stains remaining after cleaning. Performance-based improvements included trimming the ends of the T&G boards in situ (by 1/8" or 3/16") to reduce moisture uptake through the end grains and installation of head and modified base flashings. Photo: J. Paul Getty Trust

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FIGURE CS-B.11 View of Mock-Up 3 (replacement of severely deteriorated window wall with in-kind materials) prior to treatment, September 18, 2014. Photo: J. Paul Getty Trust



FIGURE CS-B.12 View of Mock-Up 3, after installation of new wall assembly, March 31, 2015. New teak (First European Quality grading) has been used for the sills, horizontal drips, vertical trims, and jambs, as well as the T&G boards (lower left two panels), and reclaimed teak has been used (top two panels at left and lower right panel below window). Photo: J. Paul Getty Trust

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FIGURE CS-B.13 View of Mock-Up 4, trialing finishes on existing weathered teak (top panel) and new FEQ teak (lower panel), May 4, 2015. Treatments trialed (from left to right) are untreated, Wolman Woodlife Classic Clear Wood Preservative, Sansin Wood Sealer (2 coats), Nissus Boracare with Sansin Wood Sealer, Gemini Coatings TWP 400 Series Light Cedar 415, Gemini Coatings TWP 1500 Series Pecan 1520, Sansin SDF Natural Suede 19, Sansin SDF Transluents Custom Tinted, Benjamin Moore Arborcoat waterborne exterior stain translucent silver grey 623-70, and Messner's UV Plus for Hardwoods Natural. These panels will be placed on the roof of the Salk Institute at southwest exposure to observe the weathering processes. Photo: J. Paul Getty Trust

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Preliminary Results

- The trial mock-ups helped the project team to better understand the construction of the window wall assemblies and determine the appropriate levels and methods for conservation of the window walls, as well as the logistics of carrying out any treatments. As a result, the range of treatment options has been refined as previously described. While they are tailored specific conditions present at individual window walls, care must be taken to implement a similar treatment across an elevation of area of the building, so as to maintain visual integrity. This will be looked at more closely following the results of WJE's detailed condition survey, which was carried out in late April 2015.
- A number of question remain at the current time, including:
 - The level of wood and fastener damage triggering partial or full replacement.
 - Sourcing for replacement teak—new FEQ teak or reclaimed teak.
 - Appropriate approaches for visually integrating historic and new teak when used within a single wall assembly (typical at a moderate intervention).
 - Long-term effectiveness /impact of brighteners in reducing moisture staining.
 - Appropriate level of sanding.
 - Recommendation for surface / penetrating finishes, if any.



FIGURE CS-B.14 View of North Study Towers, illustrating the range of conditions extant near the completion of the trial mock-up construction activities on March 30, 2015. From left to right: Existing weathered and uncleaned south-facing teak (no work undertaken at this window wall), cleaned and brightened west-facing teak at the center (Mock-Up 1.C), and a reconstructed window wall assembly with new FEQ and reclaimed teak, facing south (Mock-Up 3). Note that the south and west-facing windows typically have a more bleached appearance than the north-facing windows. Photo: J. Paul Getty Trust

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<http://www.aia.org/practicing/awards/AIAB089482>
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APPENDIX C

Case Study: Korman House

EXTERIOR WOOD CASE STUDY: STEVEN AND TOBY KORMAN HOUSE

Andrew Fearon and Shuyi Yin

Location	Whitemarsh Township, Montgomery County, Pennsylvania
Date(s) of Design	1971–1972
Construction Complete	1973
Materials Used	Exterior: Glass, cypress, and brick Interior: Douglas fir and oak paneling
Environmental Context and Setting	Located approximately 40 miles inland of the Atlantic coast and 10 miles west of the Delaware River. In a freeze/thaw climate.



FIGURE CS-C.1 Steven and Toby Korman House, April 2015. Photo: Andrew Fearon

Background

- The Steven and Toby Korman House was the last residential work realized by Kahn.
- It is Kahn's largest residential project, with a total area exceeding 6500 sq. ft.
- Originally Kahn was to design two houses on the property—one for Steven Korman and the other for his sister Lynne Honickman. The first official meeting between clients and architect occurred February 6, 1971. Lynne later decided not to pursue Kahn's services, and only one residence was

Steven and Toby Korman House

designed.

- The architectural services contracts with Kahn were signed three months later in May 1971.
- Kahn presented preliminary sketches to the Kormans on July 30, 1971.
- Drawings were presented to the Kormans on March 11, 1972 and were further refined following the meeting.
- On October 12, 1972, the Kormans signed a construction services agreement with E. Arol Fesmire to serve as the general contractor for the project. Fesmire had recently completed the construction of Kahn's Fisher House.

Significance

Kahn's last and largest residential work.

Current Maintenance Program

- Jeff Lapin (Director of Operations, Kahn-Korman House) is responsible for the maintenance of the house, outbuildings, and landscape.
- The house is very well maintained and is currently undergoing treatment to implement a new sustainable maintenance program for the exterior cypress.

Conservation Challenges

- Past surface treatments, including an alkyd-based Benjamin Moore product that gave the exterior cypress wood siding a dark red-orange color.
- Accumulative layers of the coating trapped moisture, creating a favorable environment for mold fungi to grow, which turned the wood a black and dark brown with areas of brown rot fungi. As a result, areas of the original cypress siding boards required replacement.
- The vertical siding boards were in direct contact with horizontal trims, without any type of gap or flashing to reduce moisture wicking up the end grains.



FIGURE CS-C.2 Photograph showing past surface treatment of the exterior wood siding, with a dark orange color, April 2014. Photo: J. Paul Getty Trust

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Conservation Program

Earlier Repair and Conservation Actions

- Prior to the current conservation program, actions had been undertaken to correct some of the design deficiencies, including installing flashings and cutting back the ends of the vertical siding boards in the 1990s when most of the Cypress was replaced.

Current Conservation Program, 2014–2015

- In 2014, the project team (Andrew Fearon, Larry Korman, Jeff Lapin, William Whitaker, and Shuyi Yin) developed a conservation program, including field testing and testing in the laboratories at the University of Pennsylvania, to address the surface treatments and fungal issues of the exterior wood.
- Testing and mock-ups were undertaken to formulate a treatment in keeping with Kahn's intent of the appearance of the wood, that is, to weather to a natural silver gray color.
- The removal of past surface treatments commenced in 2014.
- The darkened finish was removed by chemically stripping with benzyl-alcohol (SmartStrip™, Advanced Paint Remover, manufactured by DuMond Chemicals, Inc.).
- The wood is currently being left exposed to 'weather in' for a year, and after this time the intention is to treat it with a combination of the Boracare with Moldcare (Nisus) product to eliminate any future fungal and insect issues, followed by an application of TWP 1500 clear finish.

Laboratory Testing Program, Architectural Conservation Lab, University of Pennsylvania

- Various combinations of Boracare with Moldcare and TWP 1500 series have been tested in the lab and field to inform the selection of a final finish for the house. The objectives of the investigations are to test the effectiveness of various coatings to protect the exterior wood from UV degradation, how they perform in combination with borates and to predict color changes that may occur as the finishes weather. The coatings tested various formulations with different pigments and/or zinc oxides on new cypress wood, including:
 - Untreated, as a control
 - TWP 1500 (a clear color)
 - TWP 1516 (a rustic color)
 - TWP 1530 (a natural color)
 - TWP 1500 with 3% zinc oxide
 - TWP 1500 with 5% zinc oxide
 - TWP 1500 with 10% zinc oxide
 - TWP 1500 with Timbor
 - TWP 1516 with Timbor
 - TWP 1530 with Timbor
- The behavior of the different concentrations and types of pigment additives was tested using a QUV accelerated weathering tester, which simulated natural weathering conditions with UV lamps (UVB-313) and aqueous cycles. The various formulations were observed and checked every 100 hours over a total of 800 hours.
- Color measurement, X-Rite controlled digital photography, SEM (scanning electron microscope) surface morphology imaging, and borate retention turmeric tests were employed to qualify/quantify QUV performance.

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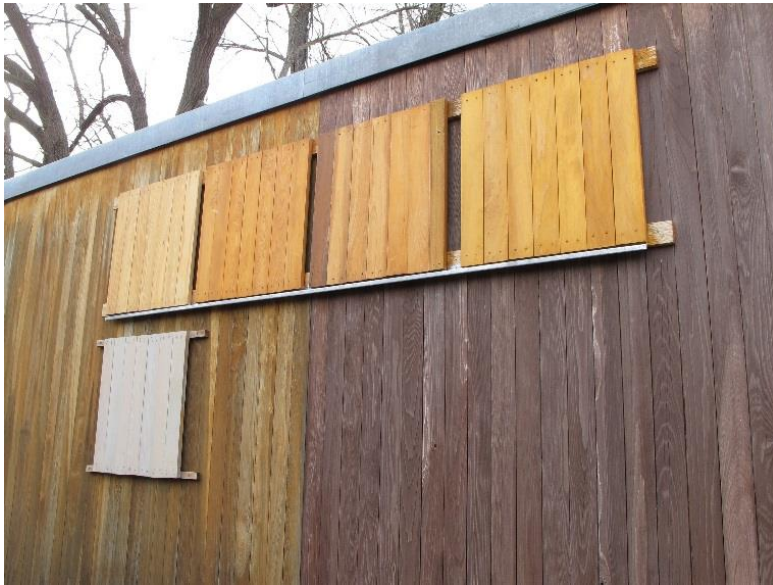


FIGURE CS-C.3 Test Panel of various finishes on sample boards at the site, April 2014. Photo: J. Paul Getty Trust



FIGURE CS-C.4 Test Panel of various finishes on sample boards at the site, February 2015. Photo: J. Paul Getty Trust

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FIGURE CS-C.5 Elevation showing the cypress siding, with surface treatments removed, in the process of weathering, February 2015. Photo: J. Paul Getty Trust



FIGURE CS-C.6 Field testing of TWP products on cypress since 2011 at Frank Lloyd Wright's Pope Leighey House, Alexandria VA. Jan, 2013. Photo: Courtesy of Frank Lloyd Wright's Pope-Leighey Project, Andrew Fearon, Pamela Kirschner and Ashley Wilson

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FIGURE CS-C.7 Field testing of TWP products on cypress since 2011 at Frank Lloyd Wright's Pope Leighey House, Alexandria VA. January, 2013. Photo: Courtesy of Frank Lloyd Wright's Pope-Leighey Project, Andrew Fearon, Pamela Kirschner and Ashley Wilson



FIGURE CS-C.8 Photograph showing past surface treatment of the exterior wood siding, with a dark orange color, April 2014. Photo: Andrew Fearon

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FIGURE CS-C.9 Finish removal Mock-up of the exterior wood siding, with a dark orange color upper left, May 2014. Photo: Andrew Fearon



FIGURE CS-C.10 View of cypress siding during finish removal with benzyl alcohol, May 2014. Photo: Andrew Fearon

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FIGURE CS-C.11 View of cypress siding during natural weathering process April 2015. Photo: Andrew Fearon



FIGURE CS-C.12 View of cypress siding during natural weathering process May 2015. Photo: Andrew Fearon

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Treatment Plan

- The selection of a conservation treatment for the exterior wood benefits from a combination of testing products in the lab and in the field. Long-term monitoring of the testing, prior to selecting a final treatment, helps to understand how the various treatment options perform and how their appearance will change over time under different weather conditions.
- The program resulting from testing evaluations is designed to be sensitive to Kahn's intent to allow exterior mill work to weather naturally to an unfinished silver gray.
- The selected TWP 1500 product is classified as an EPA registered preservative (linseed oil, paraffin oil, alkyd resin, cobalt/calcium driers and 3-Iodo-2-propynylbutylcarbamate IPBC), is low VOC < 350, and considered a sustainable finish – that is sacrificial or re-treatable and can be reapplied when needed in 2–5 year maintenance cycles (depending upon exposure) without abrasive preparation.
- The application of borates (Bora-Care®) and diecyl dimethyl ammonium chloride (Mold-Care®) is a preventive measure to control an assortment of fungi and insect species.
- The surface of the wood will be allowed to weather a minimum of 1 full year before gently scrubbing with a soft nylon bristle brushes and a quarternary ammonium solution (D2) to remove superficial mold/bio-growth and soiling prior to preservative application.

Sources

Marcus G.H and Whitaker, W. 2013. *The Houses of Louis Kahn*. Yale University Press: New Haven.

Some of the work in this case study was undertaken as part of the following thesis project;

Yin, Shuyi. 2015. “The Efficacy of a Borate and Penetrating Oil Preservative Combination for the Conservation of Exterior Wood.” Master of Science in Historic Preservation thesis, University of Pennsylvania. https://repository.upenn.edu/hp_theses/590/

Notes

1. For additional information on the Korman House project, please refer to these two publications which were published after the preparation of this case study:
 - Fearon, Andrew. 2018. “With the Help of Nature: Kahn, the Wood House and the Culture of Stewardship.” *DOCOMOMO Journal* 58: 40–49.
 - Fearon, Andrew, Jean Jang, and Shuyi Yin. 2016. “Going Grey: Mitigating the Weathering of Wood in the Architecture of Louis Kahn.” In *Wooden Artifacts Group: Postprints of the Wooden Artifacts Group Session, 44th Annual Meeting American Institute for Conservation, Montréal, Québec, Canada*, 101–11. Washington, DC: American Institute for Conservation.
2. The Korman House project team would like acknowledge that the work the Pope-Leighy Project team (Andrew Fearon, Pamela Kirschner and Ashley Wilson) on the conservation and treatment of the exterior cypress wood informed the development of conservation solutions for the exterior wood at the Korman House.

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Additional Images: Historic Photographs and Models



FIGURE CS-C.13 Model of Korman House, from the Louis I. Kahn Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission. Photo of model: Andrew Fearon

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Additional Images: Testing and Research Photos

Appendix A Samples Intervals Photo Documentation_S11/C/BM/TWP1500

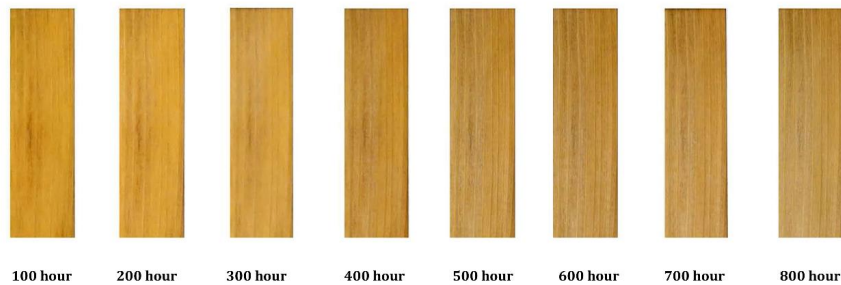


FIGURE CS-C.14 QUV color change documentation of Korman House cypress with TWP 1500. Photo: Shuyi Yin, U. Penn Thesis, 2015

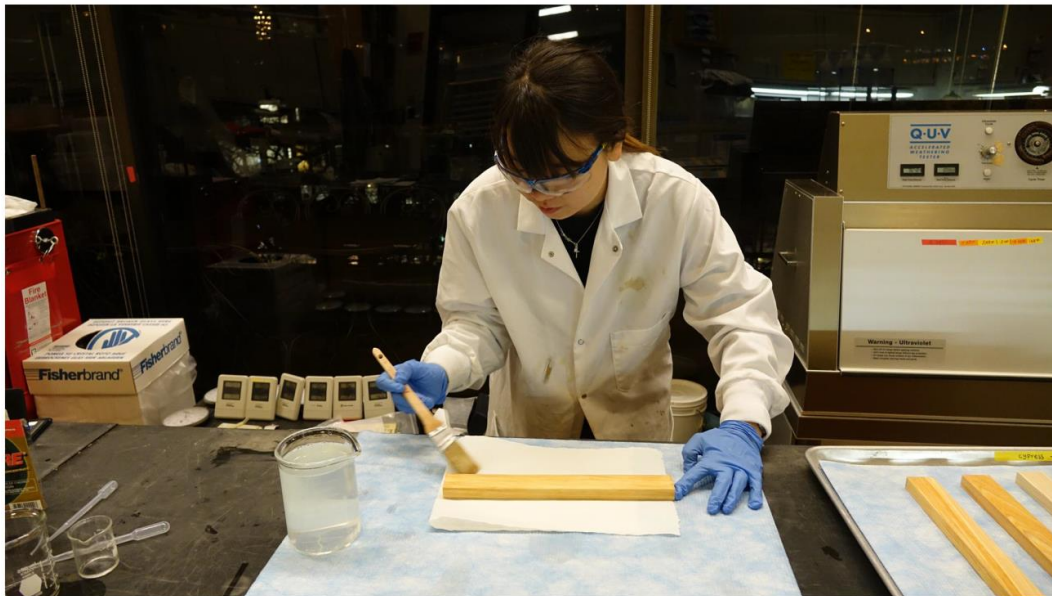


FIGURE CS-C.15 Preparation of Korman House cypress samples in Architectural Conservation Laboratory at the University of Pennsylvania. Photo: Shuyi Yin, U. Penn Thesis, 2015

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FIGURE CS-C.16 Preparation of Korman House cypress samples in Architectural Conservation Laboratory at the University of Pennsylvania. Photo: Shuyi Yin, U. Penn Thesis, 2015

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APPENDIX D

**Transcript: Conversations with
Henry Wilcots, May 13, 2015**

Transcription

Meeting to Discuss Exterior Wood Conservation Issues at Louis I. Kahn Buildings: Conversations with Henry Wilcots

Architectural Archives, University of Pennsylvania School of Design, May 13, 2015

Participants:

Henry N. Wilcots, architect, Office of Louis I. Kahn, 1964–74

Salk Institute for Biological Studies Project Team

Ronald Anthony, Director, Anthony & Associates, Inc.

Garry Van Gerpen, Vice President, Scientific Services, Salk Institute for Biological Studies [retired December 2015]

Sara Lardinois, Project Specialist, Getty Conservation Institute

Laura Matarese, Graduate Intern, Getty Conservation Institute, 2014–15

Kyle Normandin, Associate Principal, Wiss, Janney, Elstner Associates, Inc.

Deborah Slaton, Principal, Wiss, Janney, Elstner Associates, Inc.

Korman House Project Team

Andrew Fearon, Chief Architectural Conservator, Materials Conservation

William Whitaker, Curator and Collections Manager, Architectural Archives, University of Pennsylvania

TRANSCRIPTION

Transcribed by Laura Matarese; reviewed and edited by Sara Lardinois, 2016.

INTRODUCTION

The following is an edited transcript of discussions between Henry N. Wilcots and other participants during in a meeting about conservation issues at Kahn-designed buildings with exterior wood detailing. Mr. Wilcots worked in Kahn's office between 1964 and 1974 and, following Kahn's death, in his successor firm until 1983, seeing through the completion of the Capital Complex in Dhaka, Bangladesh (1962–83). The aim of the meeting was to bring together Kahn experts, conservation and architectural professionals, wood scientists, site managers, and owners to share information on conserving exterior wood at Kahn-designed buildings, with the intent that the collective knowledge and expertise may benefit and potentially improve current and future projects at these sites. Much of the conversation focused on the conservation efforts that were underway at the Salk Institute for Biological Studies in La Jolla, California (1962–65), and the Steven and Toby Korman House in Fort Washington, Pennsylvania (1971–73).

The entirety of the full day meeting on Wednesday, May 13, 2015 (see meeting agenda in Appendix A), was recorded, and digital files (.mp3 format) are available at the Getty Conservation Institute and the Architectural Archives at the University of Pennsylvania School of Design. The transcription that follows is only partial, focusing on conversations with Mr. Wilcots, as they shed light on the culture in Kahn's office and philosophical and technical approaches towards design, material selection, color palettes, and detailing. They also provide historical information about the development of other Kahn projects that Mr. Wilcots worked on, including the Capital Complex in Dhaka and Temple Beth El in Chappaqua, New York (1966–72).

Morning Meeting Session, with Presentations on the Current Projects at the Korman House and Salk Institute

Discussion of working in Louis I. Kahn's office

Henry N. Wilcots: I remember I was working on a detail for Dhaka [Capital Complex in Dhaka, Bangladesh] early on and Jack MacAllister came into the office and he saw. . . I can't remember what I was doing, but he looked over my shoulder and he said "Damn! That's what we should have done at Salk!" And, you know, I didn't know Salk at all. And I used to joke with Dave Wisdom—who was the chief draftsman at the office—and I told him one day "Dave, you know, I came into this office and I knew how to detail for water, and now I don't!"

Kyle Normandin: What was it that should have been done at Salk?

HNW: I can't remember what it was, but it had something to do with a water stop.

Sara Lardinois: What do you think was lost in the waterproofing knowledge in the office?

HNW: Design.

Looking at sample of an eroded tongue-and-groove teak board with a black fungal biofilm from a south-facing window at the Salk Institute

HNW: On that sample from Salk, are the striations in the wood from the cleaning and the [wire] brush?

Ronald Anthony: It's a combination of the physical weathering—so the abrasive process and weathering of the wood—and that was exacerbated by them cleaning it with a stiff brush.

HNW: Why I ask this question is because in Dhaka where we used Burma teak at the beginning on some windows, and during the first liberation war [1971] everything just deteriorated like crazy. The framework had never been treated with anything but it didn't weather this way [like Salk]. Now maybe it had something to do with that fungus [referring to the teak board from Salk on the meeting table], but we get a lot of rain out there.

RA: Part of it is because of the cut of the wood of this board to begin with. The fact this is vertical grain cut, so that exposes that lower density earlywood. So, it physically abrades. We're on the coast. There's a beach right there—it is literally sandblasted twenty-four hours a day. So, that speeds up the weathering process. But then when they did their cleaning before Garry [Van Gerpen] got there and they used a stiffer bristle brush, that softer wood that is in there, they are just taking more of it. So, the combination of all of those caused a loss of thickness of the wood more rapidly than if it was just left alone.

Discussion of color and variation in the wood looking at a PowerPoint presentation slide of a mock-up (identified as mock-up 2) at the Salk Institute, where the original teak was cleaned and brightened and different water repellents, preservatives, and other treatments were trialed

Garry Van Gerpen: My personal thoughts on that are I'd like the wood to look like the center under the window [where water repellents and sealers were applied to sanded and unsanded wood]. Not the upper part of the window [only cleaned and brightened; no water repellent or preservative applied]—that actually looks white washed. . . . I definitely don't like the real red areas that are in that corner. But the center part—something like that.

Andrew Fearon: What about the variation of the whole [window] unit? Would that [be acceptable to the Salk community]?

[...]

GVG: Just like that is now? I don't think so. I'm okay if we come up with a process or a guideline of—once it is done—how we do it and how we let it weather. With this project, I would like it to look uniform like that [referring to areas where the recent application of colorless water repellents and wood preservatives have renewed the appearance of weathered wood and mitigated variations in appearance]. You spend this much money, you go through this much effort to renew the materials, it should at least at one point in time, see it look like that. What happens after that . . .

RA: Even after that, you'd want it to have some consistency.

GVG: Yes, I'd want it to have some consistency. But, at one point in time, I'd like to see it look like that. I don't know if that is possible.

HNW: That point is right. Because earlier in this discussion the thought hit me. What is it we are trying to do? [...] Let it age gracefully?

GVG: Correct. That was the title of my talk.

SL: But what does that mean to different people?

KN: That is a huge debate.

HNW: As an architect and as Lou would probably say, "Look, why would you want it to look like it came out of the factory yesterday? Because it has been here for a month it should be different".

KN: It is the endless debate Jonas Salk and Louis Kahn had.

Discussion of using new teak and historic teak together

HNW: I think you'd have to age it [new teak] before you put it in.

Discussion of best practices in Kahn's architectural office for detailing gaps at the bottom of vertical wood boards to reduce moisture wicking up the end grains

William Whitaker: Was there a rule when you had a detail like that, a specific dimension?

HNW: No. It was just a gap. There was no specified hard and fast rule.

WW: Yeah, you wouldn't do a half inch. But it wasn't, you had to do a sixteenth?

HNW: We were pretty loose about it. All that was required was a separation. That's all you wanted.

AF: Wouldn't butt up straight against?

HNW: No.

AF: You lift it off an eighth?

HNW: You want a separation.

Discussion regarding the horizontal teak drip rails at Salk that were modified during construction in December 1964, reducing the projection from the adjacent T&G boards from ¾” to ¼”

HNW: That’s a mistake. [. . .]. The problem is that the water is going to bead right there, it isn’t going to run off.

SL: Why do you think this change was made?

HNW: If Lou looked at it [pilot mock up of the windows installed in 1964 with the ¾” projection], ¾” may have been too thick.

AF: Too thick visually? It was a visual thing? It was too heavy?

HNW: Yes.

SL: You wanted the top to read stronger than the intermediate pieces.

KN: You didn’t want them to read all the same.

HNW: When you said the drawing [illustrating the reduced projection] came out of Lou’s office, was it Philadelphia or San Diego?

SL: It is dated the fourteenth of December 1964, drawn by PTK. And the pilot was put in in late November.

HNW: Peter Knack. He was the draftsman in the San Diego office. It [the modification] came out of Jack.

[. . .]

HNW: I can understand cutting it back when you see the whole thing because it is quite heavy, that line. You’ve got three of these divisions, and it looks pretty clunky.

Lunch Break

Discussion looking at Kahn’s charcoal drawings that Bill Whitaker brought out from the archives

HNW: Charcoal was an idea to develop but some guys thought that “this is what he wants”.

Afternoon Meeting Session

Discussion of the significance of the millwork

SL: Starting with the significance of the millwork in Kahn’s body of work, Henry, based on what we have been talking about so far, I want to ask you what you think about Kahn’s intent and what’s important about the millwork, in terms of detailing or weather or how the wood was meant to be used.

WW: What does wood want to be Henry?

HNW: It wants to be wood. And it doesn’t want to have artificial elements imposed upon it. My biggest criticism of Lou’s woodwork is that—and I mentioned it to a couple of you already—is the difference between interior work and exterior work, and he didn’t differentiate in that, and that has always bugged me. And after the building wears, you can see why he should have made it different. And, often times, when I think about it I’m surprised by

him not doing that because of certain people in the office that would have stayed on top of him about it. I mean, early in the old days there was a Bert Webb, Dave Wisdom. These guys knew what to do. They were very old school. They came along in the '20s and '30s, but yet, these kind of details slipped under the door. I think some of it had to do with other personnel that was in the office that weren't being guided by those who knew. So you'll see that his interior work is cabinetry, his exterior work is cabinetry, and it should not have been.

WW: Do you think the fact that the staff out in San Diego were quite young . . . Jack MacAllister...?

HNW: They were following Lou's detailing and cabinetry from other places, other designs other buildings.

WW: But they were off in San Diego. They certainly didn't have Dave Wisdom there.

HNW: That's true.

WW: They didn't have Bert Webb.

[. . .]

SL: He [Jack] was pretty young when he was doing that. Twenty-seven?

WW: Twenty-five, twenty-seven?

HNW: Something like that. I didn't know Jack until after it was over and he came to Philadelphia.

WW: The construction drawings, the drawings that are in '62 into '63 were all done in Philadelphia but things where they're modifying drawings, the formwork drawing that are done in the San Diego office. That's a much smaller office and didn't have the same presence.

HNW: And the only person out there who could have guided them was Fred Langford, but his task was to get the formwork and get the concrete right.

WW: I asked Fred if he knew anything about the millwork at Salk, but he says "I had no clue, because I was so focused on what I had to do." Basically, he was drawing all the time to get the shop drawings ready for the concrete.

HNW: See this not only happened at Salk. Then you come along and there's [Phillips] Exeter [Academy] and it is repeated! It's repeated, and the person who was running that was following previous details.

WW: So just another point that, I think you told me you talked to Lou about this issue about bringing interior millwork to the exterior and so this was something he was confronted with any number of times, but it was still something he rather doggedly pursued perhaps to the detriment of the long term. . .

HNW: Right. I don't think that Lou—I'm out on a limb—I don't think that Lou ever looked at his buildings long-term. He looked at it as a finished thing, he could walk up to it and say it's finished, they could dedicate it, and he could go onto the next one.

SL: So what do we think then, if we read, maybe it's not directly attributable to Lou, but we read that teak was selected because it was thought to be a durable, long-term material, relatively maintenance free? That is thinking it the long term.

HNW: That's true, in that respect for that material, but for the building as a whole. Look what happens. How many buildings are up around the world 25, 30, 40 years and all of the sudden it's something else? Your bank now is a

daycare center. As an example, so, I don't know what kind of business we're in. I like a lot of old stuff. I'm an old barn guy myself.

LM: In what way was Kahn confronted by the millwork when you spoke to him?

HNW: We just discussed things. He would ask me questions about it, about all sorts of things. In our quiet drinking moments we would talk about things. And that's when I'd say to him about things like this; why are you doing cabinetry work outside? But Lou wouldn't always answer.

RA: If he did answer what would he say?

HNW: He likes it or something, I don't know what he would say.

RA: Something non-technical but I like the look of it, something like that?

HNW: Yeah. He was asked about the certain sizes of things. I remember once in Dhaka he was asked about the openings. The students, faculty, professors standing around waiting for the great answer of why he did the circles and he just paused and said 'I liked it'.

KN: The interesting thing about the windows you just said, about why cabinetry on the outside. Because we have always referred to the pieces as cabinetry because of the way they are crafted. Sara brought that up in her presentation.

GVG: Well they definitely carry inside. All the panels, shutters.

KN: But I think they carry outside too. The fact that they were prefabricated and used in a different way on site. They're all sliders. To these days it is very difficult to get a slider window to operate, even if it is done in metal.

HNW: The other day I was looking at [the Fisher House windows]. I don't know if the manufacturer Pella makes that screen anymore. It was a great invention that Lou used all the time.

WW: They've been cleaned at the Fisher House recently, so that with maintenance they work better.

HNW: I know I talk about Dhaka all the time, but there we started in the hostels, which are the brick buildings which were meant for ministers, secretaries and judges and what not. That wood, I don't remember it being teak. I don't think it was teak. I think it was the local wood, because the cost and there is a certain hierarchy in building—especially out there—and brick buildings didn't rate teak. Now the teak that was used at the time in the parliament building [at Dhaka] for the windows—it was put in and it was from Burma. During the liberation war, like I was saying earlier, nothing was happening and they just deteriorated, got wrecked, some were standing open, some were rain soaked and it was just awful. So that when we went back out there after the war and especially after Lou had died, they came to me and they said "Look, there's no more teak". I said, "Wait, oh yes, you can get teak". No, teak was expensive. So we went to a Chittagong teak, which is a lower quality than the Burma teak. But it's sort of from the same area, separated by the river. And we used the Chittagong teak in some of the interior furnishings and panelwork and chairs and things. As far as the windows were concerned, there was no way the government was going to spend money on teak windows, so we had to go to metal. That's what you see today—the aluminum window frames. I think, in the early office buildings that had the wood when I left out there in '83, wood was still in some of the old buildings, as far as windows are concerned. But I'm certain they must have switched it over by now.

Discussion on the use of wood, Kahn's attitude toward the material, and how he specified materials

SL: The use of wood and wanting to honor its natural characteristics, does that sound right to you?

HNW: That's right.

SL: And I don't know how it works across the buildings but this palette of natural materials. . .

WW: So Henry let's talk for a moment about Kahn's attitude in choosing materials for a building, and the relationship of materials—for example brick and concrete, wood and stone. I wonder if you might give us a sense of Kahn's attitude in those circumstances, generally or specifically?

HNW: On Temple Beth El, Chappaqua.

SL: This is the one you worked on as well?

HNW: Right. He wanted spruce. I argued against it and got the contractor to help me argue against it, but we failed. He was bent on having spruce. And I think it came from the old synagogues of Eastern Europe. I can't swear to it, but I believe that's where it came from.

WW: I bet it did. Because he was very focused on honoring that, as a memorial to that.

HNW: But I kept trying to tell him how the spruce wasn't going to hold up, it was too soft to work with, it is going to be damaged before it gets up, but he wouldn't listen to me. The one thing that we did do [...] was on the corners of the building of where he didn't want a lap joint anymore, like on the houses. He wanted one piece of wood, but that wood could not be a column. So what we did is that we cut out the wood, into an L shape, thick enough to have the tongues and they went for that, so that the same dimension is carried on throughout and it's from the same stock. The contractor had a millworking outfit up there on Chappaqua, and if you walked in there, and you're shop inclined, you would just swoon over what they had there and the way they treated the wood. These craftsmen over there, they'd cut everything. He was really lucky with that. And then we had the interior, the building was basically concrete on the lower areas. And then at the top floor level, the main floor level, the only concrete are the concrete columns that come up at the four points and they come to a certain height, and above that height they were capped, and then from then on it was wood structure. So you see these real nice timbers which went on up into the clerestory. But the exterior was wrapped, from the first floor up, in vertical set spruce. The people up there decided to treat it before it had its chance to be itself. And now it's an orange building.

RA: When Lou Kahn picked the material and said "Okay, I want to use teak for this," and maybe it was durability, how much more detailed did he get, in terms of specifications? Here's the example I want to use. When we look at the Korman House, most of the pieces of cypress that are on there are flat sawn. But the slats on the Salk are not all flat sawn, they are not all vertical sawn. It is really whatever. It is almost as though whatever boards they had, they ripped them into the right widths and whatever growth ring pattern that was in there, they made those into slats and put the slats into panels. So, the question is, would have he thought that through—that mixed grain look is what I'm after in the panels or would he have said I want the panel to be teak and that would be the end of his thought process?

HNW: I don't know. He would have enjoyed the saw marks.

SL: The texture.

HNW: Because this is how it was made.

SL: That sounds familiar.

KN: So he really left it up to the craftsman then?

HNW: Yeah. When he would go out to a building and examine it he would pick up and he would say ‘No, no I don’t want this’. And maybe it was too pretty.

KN: But it sounds like when we were talking about Temple Beth El, and that you were describing what it was like to be in the shop with those craftsmen, what sort of criteria that Kahn wanted or people in the office wanted for the types of craftsmen that would work on the jobs? Were they looking for people who were very skilled?

HNW: No, no.

KN: Or were they looking for a fabricator?

HNW: No.

KN: Or just anyone who would do it?

HNW: The general contractor made the selection. On that job and I imagine others, we wouldn’t know anything about it, I just so happened to have had the opportunity to run that job and so I went to the contractor, I went to the mill, I went to the shop and looked at things. That’s just my nature. When they were at Kimbell [Art Museum], when they were looking for marble, they had a bids from Italy and elsewhere. So I went down to Carrara into the quarry to look at the marble and talked to the guys who were cutting this stuff up and they were telling me about sizes that were on the drawing. . .

KN: You couldn’t do it

HNW: Isn’t going to happen! That there’s going to be so much breakage, just in the shipping, it wouldn’t be affordable.

LM: What did Kahn ask for you to look for in the marble, what qualities was he looking for?

HNW: Something in it that I thought he might think would be right.

RA: To go back to that question about type of cut, do we know if there are any specifications on the Korman House where it said all of the cypress should be flat sawn?

AF: It is a question for Bill [William Whittaker]. But, I would say I would be surprised if he calls out for flat sawn.

WW: In my research, I haven’t looked that closely. There would be evidence in the archives here if he talked that stuff. The specs might have it, there might be additional. But, to some degree, in the stories I’ve heard—not specific to Korman—Kahn is using the intelligence of those he is working with, both in his office and on the job site. If he’s present and is communicating with them, he’s drawing from that knowledge. There’s a conversation that’s going on, often with masonry, mortar, brickwork, stonework—there’s a very active collaboration in knowledge. But, when it comes to millwork, I haven’t heard that many instances where you hear that Kahn is standing over some one, is talking that closely. Because maybe what is on drawings is what gets built. Not in the case at the Salk.

SL: At Salk, the millwork details came quite late in the whole game. I don't know if it is that they knew what they were going to do, they were repeating a standard language. Or they had to get concrete right first because construction started before design was done. The concrete pour was in 1962.

HNW: I arrived when Salk wrapped. I can believe that happened.

SL: That they just had to get the concrete out the door?

HNW: That's the way most jobs happen.

Discussion of interior oak at the Korman House, the Salk Institute, different cuts of wood, and qualities of the buildings (color and texture)

HNW: He would have asked for quartersawn. He would have asked for that

RA: For quartersawn on the oak?

HNW: Right.

RA: But for something like cypress or teak?

HNW: He may not have said anything. It may have been up to the spec writer Bill Lunt who was the spec writer for most of the jobs from that office.

LM: You mentioned that he liked the sawn look, what other qualities of the wood did he like generally or specifically?

HNW: It would have been the color and texture.

SL: Color is a very changeable thing.

HNW: He was thinking for all exterior buildings. He always saw gray. He would talk about the look of pewter.

WW: Let me emphasize a point here, when you said Kahn wasn't really thinking in terms of weathering, of building fifty years ahead, when he designed the building he had the silver gray in mind.

HNW: In his head, right.

WW: So that is the point I'm emphasizing, that materially the palette he's imagining is a silvery color.

SL: How that's achieved is another question.

WW: That's where he's beginning, right?

LM: Do you know if he was color blind?

RA: When you say color, do you mean uniformity in color?

HNW: No, no it could be within the range of the pewter, of the pewter color.

LM: Did he talk about pewter color?

HNW: Yes.

WW: But how about variability? What I've read it he was describing it as an old barn from what I've read. He was driving in the 1937 in Gaspé [Peninsula] in Canada and saw all the silver wood fishermen's huts, so I think this is also a part of his imagination of this very weathered look. But this variegation of surface—one board is slightly different from another, one brick different from another...

HNW: That wouldn't have bothered him except that, in fact, he looked for that.

WW: In terms of what?

HNW: In terms of wood, stone, marble

WW: But subtle, subtle differences?

HNW: Right.

WW: Not extreme differences.

HNW: Right, right. Getting back to the marble at Carrara, they didn't get the marble because he found this marble in Texas, Texas travertine, which has little fossil shells in it and he said that's what we wanted.

SL: Deborah, I know you've been thinking a lot about significance in the context of the CMP [conservation management plan], are there other things you've been thinking about?

DS: I'm very interested in this discussion of materials and Kahn's take on materials, so maybe we can spend a couple more minutes on that and how it applies to wood. You said, for example, with the stone, that he wanted the particular Texas shell stone with the fossils in it. From your experience on the project, do you have more of an idea of the effect was he wanted from the wood? Because I think you weren't entirely joking when you asked if he was color blind. And we seem to be getting at the idea that it wasn't so much the particular color, but the tone or the effect of the color. So going back to Salk, you know his mind set, so at the Salk we have the grayish white travertine, we have the warm gray concrete, and then we have the wood which over time either contrasts or doesn't with the concrete and looks completely different depending on what photograph you are looking at.

HNW: I would have to venture to say the openings, he saw the openings, and the openings were as if it were a curtain.

DS: You mean before the windows were installed?

HNW: Yeah, because he still saw this gray, [Jonas] Salk saw the red. This was a collaboration, so I don't think he was going to argue with Salk about the gray and just let it happen.

KN: And I like the way you put it, that it was very much a collaboration.

GVG: The concrete is not gray either. It is actually pink, very much pink.

DS: It's a tone.

SL: It's warm.

DS: It's a very warm color.

WW: When you talk to Fred Langford about choosing . . . that Kahn was so sensitive to color. This is getting to the idea of the color blind idea or tonal thing. The aggregates for the mix of the concrete. There were certain products that had a greenish tone versus others that had a warmish tone and he just universally rejected the greenish tone

ones. And he knew what they were, and he would just not accept those. You see contractors asking to switch things in because it's more convenient. It's cold, it's a 'no'.

HNW: I know that in the parliament building the worry was what was going to be the tone of the concrete because of the aggregate. They first started samples of aggregate of crushed brick, and that was rejected right out because of this pinkish tone that was going to come out of it. When he had the parliament building bounded by the red of the brick buildings he did not want red concrete. So we had to work hard to get them to bring gravel down from the Himalayas into Dhaka to use which was very expensive for them, to use gravel. And then the funny part about that is that you would get the guys to wash this gravel, to get off the sand and mud; and they would prepare these baskets to screen it and wash it off, but sometimes they'd forget. Look, you have two main contractors on the building, and the building was divided up with these two guys. So you're going to get different things happening. And you're trying to get these guys to work together, to say 'No, no, no, you know it has to be this way'. One guy, he wanted to have the [formwork] panels coated with a vinyl fabric, like linoleum or something like table cloth. The other guys says 'No I know exactly how to make the panels with the wood but I will have to get oil,' That's when Fred came in and said 'What's the oil going to do to the concrete?' And Lou wanted to have the concrete with these little fins on the concrete as a result of the formwork, because the formwork was tongue-and-groove but beveled. So, when they rip off the form, these little fins would be broken off. And once he realized that, he said 'okay don't worry about it, just keep going'. So you see the building gradually go up, you'll see the fins going away.

GVG: That was clearly a detail at Salk.

DS: A well-resolved detail. So, they didn't break off.

KN: For the most part, it still hasn't broken off. Well certain areas, but not very many.

WW: To go back to wood and to speak about Kahn and the clients and preferences that the clients might have had.

DS: And whether he listened.

HNW: I wasn't sitting there with them when they would discuss these things. Because usually, when the client would first come, it was only Lou and the client. And for several sessions it would be only Lou and the client, either at the office or the client's home, or wherever. When we would get around to the drawing of it and what the client might have wanted and if anyone happened to hear and sometimes the client would talk to whoever was on the board, just a passing by kind of thing and 'hint-hint'. Things like that might happen. Lou once told me, and I never understood if it was a compliment or just a 'stay out of my hair' kind of thing, but he said 'No matter who's in the office with me, you're welcome to come in and sit.' I just stayed away from that. I don't know what he was up to, but I just stayed away from it. I wouldn't do it.

SL: We know at Salk, with the story with the [concrete] pours, that Lou was happy to accept the first samples but Jonas kept pushing him. We don't know what their conversations about the wood with each other were; but we see it in other buildings materials at the Salk. That his client—at least a client like Dr. Salk—was able to push him a little further towards . . .

HNW: Yeah, I would imagine so. To get back to the original question on that, and that is that when Lou would get a commission, since we are talking about houses, I think he told the client what the house was going to look like. We're going to use cedar, we're going to use spruce, we're going to use this, we're going to use that. He told them and he convinced the client that this was the best material for this design.

RA: When Lou designed buildings, did he fully design those buildings or was it more conceptual and leave it up to the craftsperson?

HNW: No, he designed it. Lou worked with everybody. So you had the structural people there, the mechanical people there, the landscape and all that so that, and he listened to all [...].'

RA: I'm looking at the concrete at the Salk. We've got the fins and the pours and all those things are very meticulous about the appearance of the concrete; and, yet we have some of these things with the teak that we look at now and really the design details are missing. And you've said the same basic thing. I'm trying to rectify his meticulous nature with the concrete with the less meticulous nature...

DS: It wasn't necessarily that he didn't design the teak meticulously; it was value engineered out in many cases.

RA: So the wood was of less value.

DS: No, the overall budget did not allow implementation of things that he designed that would have made the teak survive better.

SL: When we asked Jack about that process, he said that 'the project was two million dollars over budget and I sat in a room for three days and I bled all over those drawings and I got the project in on budget'. Now, I'm sure if things were revisited . . . but you don't always make the best decisions when you're trying to keep a project on track, right?

DS: And also in trying to put it in the larger preservation context, he knew teak was a durable wood but he certainly didn't foresee the eucalyptus spores that would cause this black streaking. I feel that Kahn had a vision, Jonas Salk had a vision, and their visions came together and what we are looking at today is a result of those visions, but the building is aging and it has been subject to environmental factors and many other factors that weren't controllable as part of that design. So those are the things that we need to address in order to have a solution that's both respectful of their vision and maintainable by the stewards of the building.

WW: Henry, what guidance would you give in response to that? If Jonas Salk called Lou Kahn and spoke to him about this issue with the mold spore. 'We've got to do something here—this isn't working.'

HNW: He would have worked a different design, even possibly changed the species, or whatever. He could have put in lead-coated copper panels.

KN: And that is what he did at the Yale Center for British Art. He did not use wood.

DS: He did not use wood [for the exterior facades] there—that's a different solution. And this all informs how we go forward, both with the conservation plan but also with the details of how to resolve. . .

HNW: If he had a group of folks like you are, he would have sat around and listened to this. He would apply it. He would apply what he had heard. Not only would he have applied but he would have walked in the room like an expert on it. Only he knew this stuff. So yeah he would use that.

Discussion of longevity of the Salk Institute and its materials

GVG: We want it to last at least another fifty years. If you can make a fix and it lasts ten years, twenty years, that is not good enough.

DS: No. Serviceability, maintainability, sustainability. All of these things are factors and are highlighted by the importance of the building. The technical issues we can figure out. The challenging issue is the philosophical / aesthetic question where we want to respect the building, we want to respect the original design that was a consensus of views, but we also have to have something that the stewards can take care of.

HNW: But, I think he is on the right track though. That is that it's been fifty years now. If you plan for another forty years, and you go through each one of the panels and fix that panel and if you have to use new wood in that panel, you do and you mix it up with the old stuff. And you treat each panel as its own kind of a thing. And, it doesn't hurt in the variation around the whole building. You're not going to know it.

Discussion of color(s) that Kahn preferred in work

WW: There's a few things I've heard, the color of tobacco juice.

HNW: I've heard that one too.

WW: We saw at the Korman House, in the slides that Andrew was showing this morning, when it got so intensively red—I think we all agree that's off the chart. This image I showed you of the honey color at the Fisher House when it was new.

DS: That color looks like the new mock-ups [at Salk].

LM: Kahn said that a year into the Salk teak being up, that it was a honey color and he thought it blended well.

WW: We don't know what the honey color means, but essentially it is a newish raw look.

DS: It is warm.

WW: If a client is struggling with a constituency [. . .] Is there latitude there? If Kahn has this ideal of seeing wood in a certain state and the associations . . . he could be very romantic—the choice of spruce and its association with the shtetl and the wooden synagogues of Poland that were all destroyed. When we think of it in those terms, we have to build of spruce to say these things will endure. Of course, the seeds of its own destruction are there.

KN: I go back to this idea of a collaboration between Louis Kahn and Jonas Salk. Laura just said that Kahn was kind of accepting in the beginning when he was working with Salk, to have the color initially be honey and then transition, to lighten over time. I think there is a medium in there somewhere.

DS: There are several ways to look at the color and the consistency of color, which was also something Frank was saying on his way out the door [earlier in the meeting]. To have an overall evenness of tone or hue is one goal, and to refine the details as possible to avoid significant water staining and iron staining, which is part of the mock-ups as well, is another goal. Some of what is aesthetically disturbing to the observer, putting aside the black fungal growth, is that water staining and that water staining is a separate aesthetic issue. So, these particular technical concerns, aside from the color, impact how the observer sees the windows. I don't know that Kahn thought ahead to that.

HNW: What is so important about the color?

DS: We have to decide in order to know how to treat it. Is that what you mean?

HNW: No.

DS: Do you mean how does it inform design?

HNW: Right. Why are we so concerned about the color?

SL: I think it's the relationship to the other materials.

KN: To the concrete, the travertine.

HNW: Is this something you've read or heard? What's driving us to talk about the importance of the color, whether it's light or dark, red or not quite so red?

DS: We looked at all those houses yesterday and they were all over the map. We looked at those slides today, and they've even been more all over the map, historically. Everything to almost white to orange to almost black. We have a huge responsibility here—as Sara said, we're almost paralyzed trying to think about it. We want to get it to the right place in the range to respect how it should look.

RA: It goes back to very early on in the process when the GCI got involved. There were probably two factors related to color. One was this idea of, however you want to define it, of Kahn's intent coupled with Salk's intent. So, what do they want from the building? That was part of it. The other part are the current stewards of the building—what do they want it to look like? Even if we knew definitively if Salk and Kahn would have said we're fine with the north side of the building turning black and the south side turning blonde and the other side turning something else, I think the current stewards of the building would maybe not want that. Is that right?

GVG: No, if I knew that Jonas and Kahn, that is what they wanted and they were okay with that, then we would respect that. That's what we would do.

DS: But, we don't know.

[. . .]

GVG: I am okay with the decision of letting the wood age naturally and change colors. As we talked to Jack, we always knew the wood would be different in different zones.

SL: I think he said he would welcome it.

GVG: I just want it to start like it is new again, or that it is consistent, and then let it do what it is supposed to do. It is so different, you've got new wood on one side and old wood on the other side. It is going to age totally differently. It is going to be years and years before you get the consistency.

[. . .]

WW: Henry, the idea that there would be differential conditions around a façade, that would be alright for Kahn?

HNW: Yes.

WW: Under that walkway [at Salk], where you had that photograph where there was stain and it was different, Kahn's fine with that? I mean I am speaking to a specific image, but you know . . .

HNW: In that sheltered area? That looked pretty good.

WW: So the differential is not so bad, but the black mold and the tide lines, Kahn would have a problem?

HNW: The black mold and the discoloration because of the water seepage, that would bother him?

WW: So he would do things differently?

LM: The weathering shadow lines?

HNW: That would have been okay, because that's a natural kind of a thing happening, you're not controlling it.

GVG: I treated it three times to get it back to that color. Jonas liked the fresh look of it after cleaning.

[...]

SL: The other thing I wanted to say about color and what is so important about it? It is not even—should it be honey color? One of the things I think about a lot is how whatever color and the intensity of it changes the relationship of the window and the way it is set in the wall. When it is light, it doesn't pop out of the wall. But when they have this dark color—whether it is dark brown, dark red—it changes, the window wall steps forward of the concrete.

[...]

DS: The quote from Jack MacAllister that nothing should jump forward of anything else.

WW: That is a great quote. I like it very much. You start to understand the palette. It is actually a very subtle thing. You see the Korman House silvery. And to see that in relationship to the brick, that is a beautiful thing. And the same at the Fisher House. The stone is different from the wood, but they work nicely together.

SL: The color impacts the relationship of the materials.

Discussion of appearance and color

HNW: There was another color now I sit here and think about it. And that was oatmeal. He wanted it to look like oatmeal.

WW: Or cigarette ash. Another one. He tried to sell a Piaski handwoven rug to Mrs. Shapiro in her 2,000-square-foot, we can barely afford this house. The rug was going to cost more than her house and it had to be the color of cigarette ash, which is to say that is to say there is a little variegation in there, but it is a very muted color.

Discussion of the appearance of Salk and Kahn's philosophy

DS: Some of the questions we are still working on, like the issue of the biogrowth, are technical, so it is beneficial to do more research and look into it further and confirm through the mock-ups, but they don't require a larger group discussion. The philosophical / aesthetic question is what really benefits . . .

HNW: Let me tell you something, Lou immensely disliked the word *aesthetics*. He would not use it.

DS: What did he say when he meant *appearance*?

HNW: He would just not say *aesthetics*. It is a word he would not have in his vocabulary.

RA: Appearance? Look?

HNW: He said *appearance*, yeah.

DS: In that case, the philosophical question about the appearance is the difficult question.

WW: It was a philosophical point he was making, He [Kahn] would criticize people—his contemporary architects—who were fascinated with Mies van de Rohe and its perfection or Le Corbusier, these two great inspirations. He would criticize them—especially people following Corbusier—for making . . . they'll make his work prettier. So there was a humbleness or an attempt to be humble or modest or not overly ostentatious in the expression of material. It is his philosophical approach to detailing, to architecture in general. The fact that he could use concrete on a major building was an expression of that. The capital in Bangladesh, for an example. His exposed concrete, that is pretty radical when you think about it.

DS: The other point that was made this afternoon that is very revealing is the comparison between how careful and involved he was with the design and then the fact that some of the detailing or specifics or changes might have been worked out in San Diego by people who were less experienced. That information might help to explain some of the issues for the teak window wall assemblies and how they were built. That and the combination with the budget that was becoming a factor.

WW: The urgency of that decision-making, given Kahn's dramatically expanding practice around 1964, and the fact he is in Bangladesh, he's over there, he's flying here, he's going there. Guys are there, guys are in Dhaka. That core group of people—Bert Webb, Dave Wisdom—who were here in Philadelphia . . .

DS: When you stand back and look at the Salk overall, it is breathtaking and it is incredible that it was realized in that form. Then, when you begin to look at it the way we are looking at it, where we actually looking for what's wrong, and we're not necessarily thinking about what's right. You start to see these issues with the details, this is helpful . . .

HNW: I'm looking at it as how can I get the building maintenance right.

DS: That's what I mean, what's not performing well. Not what's wrong with the design, but what is having a problem in performance. That's the maintenance issue.

HNW: That's what I want to see. I think you guys are doing your job, really. You are not trying to make it perfect.

DS: That is a compliment. That is pretty helpful, to understand that you think Kahn would have appreciated the building aging and the materials changing as they age. There again, it is the distinction between a concrete, wood, and travertine building and a building made out of glass and steel, where if you let the steel corrode you lose the glass and you lose the building. It is a much more organic form, in terms of materials. We're happy to have any other guidance.

[. . .]

HNW: Let me say this to you folks. I'm pleased that Bill talked me into this. Because I always have reservations about this kind of a thing, but as I was coming back, the saddest part about it is that I'm not doing it. I just love this kind of stuff, to get into it. I want to get up on that crane with you.

KN: You are welcome anytime.

Discussion of Kahn, collaboration, and clients

WW: Kahn saw himself as *the* artist. Henry has said and others who work for Kahn—there was one architect in that office. Henry was not an architect, you be surprised to hear. Henry might be surprised to hear, but he said it that way.

HNW: When I walked in there and had been there for a few days, I realized that there was only one architect in the office [...].

LM: [At Salk, Kahn's] definitely the artist. But without the collaboration with Jonas, the idea of how the Institute embodies humanized science and the philosophy around how Salk wanted the Institute to operate, it wouldn't have ever happened. Because, it would have looked like Richards [Medical Research Building], which was unsuccessful, because there was no collaboration with the scientists, right?

WW: No doubt, in Kahn's best work, there was a client, and there was—more importantly—a certain rapport between architect and client.

HNW: He required a client. He couldn't handle competitions. To sign up for a competition or something like that, no, it wouldn't work. He required a client. You can see that in the difference of Ahmedabad [Indian Institute of Management] and Dhaka, because there was somebody in Ahmedabad. But, in Dhaka you were working with the stewards of the government. The government was the client, but the government never showed up. Or, the government was constantly changing. I don't know how many presidents I went through over there. There was always a coup.

Concluding remarks

HNW: I'm glad I'm here with you folks. I started thinking about things that happened years ago and I get all screwed up and I won't be able to sleep tonight. [. . .] I was thinking about Temple Beth El in Chappaqua and how Lou would talk to me about the structural wood that he used and its joinery and what he wanted to see and what he didn't want to see. So, what I did was develop some details and then wait for the contractor to send in shop drawings. And, then I would take his shop drawings and rework them and say 'this is what we want'. And the guy would scream 'you can't do it that way, it won't work!' But we would get him to think about what we wanted to do, and he'd come around.

