Louis Kahn, Fisher House, Hatboro, Pennsylvania, USA, 1960–1967. © Norman and Doris Fisher Collection, The Architectural Archives, University of Pennsylvania.

With the Help of Nature: Kahn, the Wood House and the Culture of Stewardship

BY ANDREW FEARON

Louis I. Kahn's attitude toward materials was expressed in his documented preference to allow exterior wood siding to be left unfinished and weather to a silver grey. Influenced by vernacular architecture of the American rural landscape, this natural treatment has proved a challenge for stewards, as exposure to the elements is gradually destructive. Like many works of the Modern Movement that retain their original siding, Kahn's wood-clad structures stand at a critical crossroads where the architect's intent and retention of fabric converge. A selected group of Kahn's residential works are examined with respect to the architect's employment of wood, the inherent conditions of each and the conservation efforts that are evolving in response.

Introduction

It's the beauty of what you create – that you honor the material for what it really is[1].

As Louis I. Kahn remains a central figure in post-war American Modernism, the extent of his contributions to the history of architecture are still being explored and understood. Influential on generations of architects for monumental works such as the Salk Institute for Biological Studies in La Jolla, California (1959-67) and the Yale Center for British Art in New Haven, Connecticut (1969-77), Kahn's highly organized spaces continue to resonate today both conceptually and materially. Although best known for his institutional and civic structures, nine of his private house designs were built between 1941 and 1974, all in the Philadelphia area where Kahn lived and worked. Experimental with concepts of planning, structure and order, they together represent the architect's regional connection as a significant typology within modern heritage. Recent scholarship evaluating these residential works brings a group of Kahn's wood-clad structures into focus. From the still growing reverence for his legacy extends a new interest in the conservation of his houses as a natural progression.

In contrast to the forceful drama of his institutional commissions in concrete, the houses of Kahn reveal a gentler framework for the human experience relying more heavily on the familiar elements of wood and local stone. Kahn's material vocabulary on a domestic scale references a consistent attitude toward traditional examples, often drawing from experiences of the rural and coastal landscapes of New England and Canada's Maritime Provinces. Like the weathered siding of an old barn, this commonality with vernacular forms transcends conventional historicism as an evolutionary thread that connects ancient worlds to the modern era. His philosophy dictating the application of natural materials is fully expressed in his documented preference to allow the exterior wood of these structures to weather naturally to a silver grey.

"Natural wood as it greys is so marvelous. I think a yellow house and green leaves looks awful, but a grey house and green leaves looks absolutely marvelous. We have to ask nature to help us out"[2].

Among this group of designs for houses with exterior wood are the following, these include a list of specifications for finishing that are consistent with the architect's documented comments on the subject of weathered wood:

Genel House (1948-1951)[3]
Exterior millwork and trim: clear Tidewater red cypress
Finish: one coat of boiled linseed oil

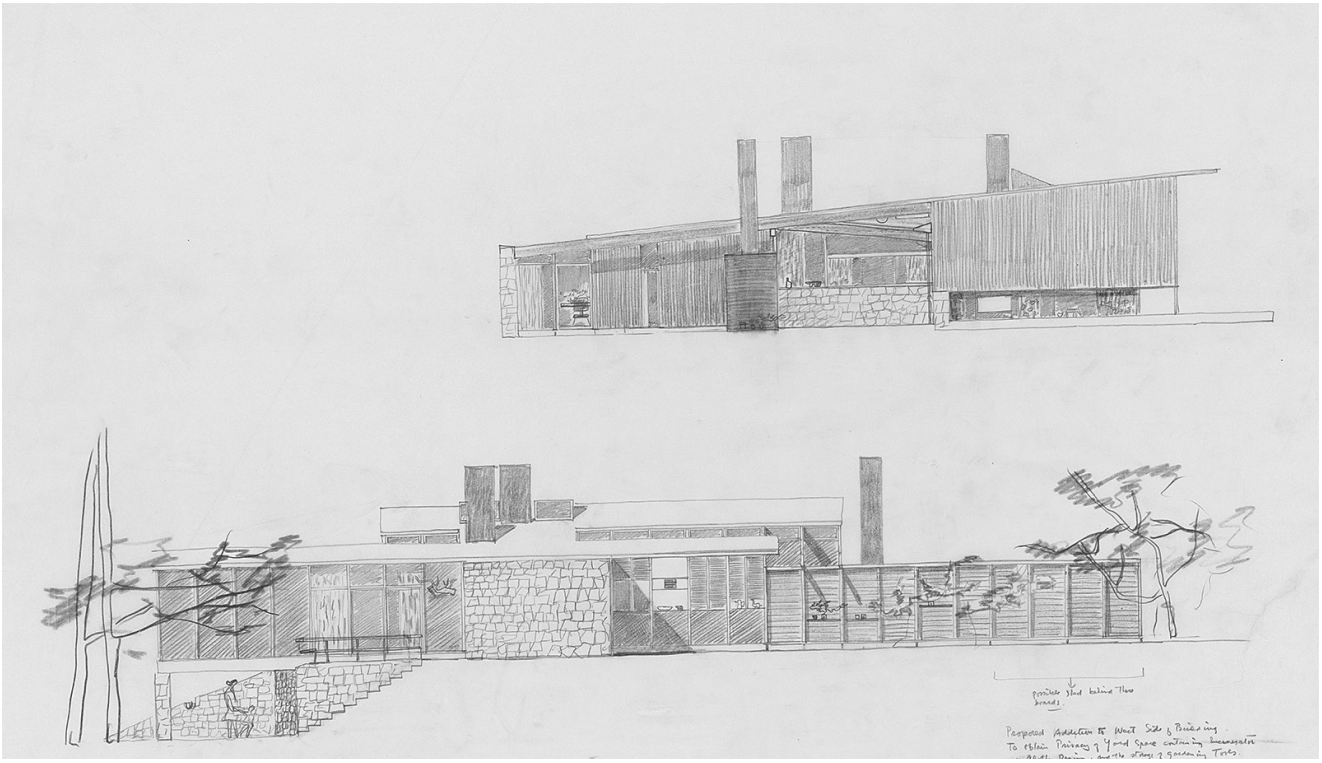
Fisher House (1960-1967)[4]
Exterior siding: T & G joint Tidewater cypress siding
Finish: two coats of natural (no color) wood sealer, Rez or equivalent

Honickman Residence (1973)[5], unbuilt
Exterior siding: 1 x 1 in. T & G cypress
Finish: none except for doors and shutters (two coats of colorless varnish-matte finish)

Korman House (1973)[6]
1 x 3 in. T & G cypress
Finish: none except on doors and shutters (two coats of colorless varnish-matte finish)

Kahn's intent for finishing can be described as minimal or natural in the case of the Genel House (figure 01), employing one coat of linseed oil, then later with the Fisher House, in

01 Louis Kahn, Genel House, Philadelphia, USA, 1948. © Louis I. Kahn Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission.



02 Louis Kahn, Fisher House, Hatboro, Pennsylvania, USA, 1960–1967. © Louis I. Kahn Collection, University of Pennsylvania and the Pennsylvania Historical and Museum Commission.

which he specifies two coats of clear Rez wood sealer. For his final residential works, as seen in the Honickman and Korman houses, the architect omitted a finish entirely for the surface of the siding, limiting treatment only to doors and shutters. This suggests that the architect was determined to allow the siding to weather naturally; in addition, paired with documentation on the subject, it is clear that Kahn embraced the process of weathering. This sensibility and commitment to a natural phenomenon took priority over the slowly destructive dimension that would soon become problematic for the second generation of stewards.

Sustainable conservation for modern wood heritage

The deterioration of wooden material in an exterior environment is a multidimensional problem involving hundreds of species of fungi and insects compounded by agents of weathering; primarily ultra-violet light and water. In architecture, the serviceable life of exterior wood to fulfill performance requirements both structurally and visually is directly defined by species, design, environment, and maintenance.

As part of a growing stewardship for modern heritage, the integrity and value of post-war 20th century sites

incorporate a new emphasis on the retention of original unaltered fabric. Universally vulnerable, wood is further exposed when experimental applications of modern forms and techniques push the bounds of traditional applications.
A holistic approach that addresses both bio-deterioration and weathering within this specific context provides the basis of new formulations for long-term sustainable maintenance. Through a combination of tested preservative applications, the serviceable life of exterior wood may be extended as a preventive conservation measure. A long precedence of cultural practice provides evidence that with proper cycles of topical applications, many species of wood may be preserved in an exterior environment for several hundred years or longer.

Kahn's use of wood on buildings exteriors, as seen through the lens of conservation, presents a unique challenge beyond the physical parameters of chemistry and environment. As a central element in his work, Kahn was deeply invested in the presence of materials exploiting their ability to engage through subtle surface qualities of texture and light. With deliberate anticipation, these surfaces become further animated by the movement of shadows, changing of the seasons, and the accumulative evidence of time. The unusual precision of his design process and dynamic nature of his forms together create a complex path for the heritage professional to navigate. Kahn's regard for change in the surface and character of materials as a virtue to affect human perception manifest as qualitative attributes, difficult to measure through the conventional metrics of science. Integral to the resilience of his structures are variables that require careful examination in order to tailor a conservation methodology with equal resilience, that may follow and evolve alongside changing materials and meaning.

03 Louis Kahn, Clever House, Cherry Hill, New Jersey, USA, 1959-1962.
© Matt Wargo, 2016.

04 Louis Kahn, Clever House, Cherry Hill, New Jersey, USA, 1959-1962.
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The Clever House

Modest in scale and monumental in form, the Clever House designed with Anne Tyng, is perhaps Kahn's most expressive application of wood for defining roof geometry and interior space (figure 03-04). Although pine for exterior and interior finishes appears on the 1959 plans presented to Fred and Elaine Clever, western red cedar (*Thuja plicata*) was the final species selected. The house located in Cherry Hill, New Jersey, can be seen as a direct evolution of the Trenton Bath House (1955), where Kahn and Anne Tyng delineate public and private, or "servant" and "served" spaces with single story concrete block pavilions and pyramidal roofs. The Clever plan departs only slightly from the symmetry of the bath house with additional ancillary rooms to enclose a central common area in a useful translation to the format of a home. The resulting interior of intersecting roof ridges and valley framing is a complex crystalline structure accentuated by the joint lines of the cedar tongue-and-groove. Referencing cathedral vaults, the ceiling is illuminated by triangular apertures creating a sense of verticality while retaining the intimacy of human scale akin to Anne Tyng's skillfully executed design for her Waverly Street house in Philadelphia (1964-67). The humble concrete block walls, chosen for both aesthetics and economy, together with the poured floor contrast the wood as a material of inherent warmth that functions to soften the environment for domestic use.

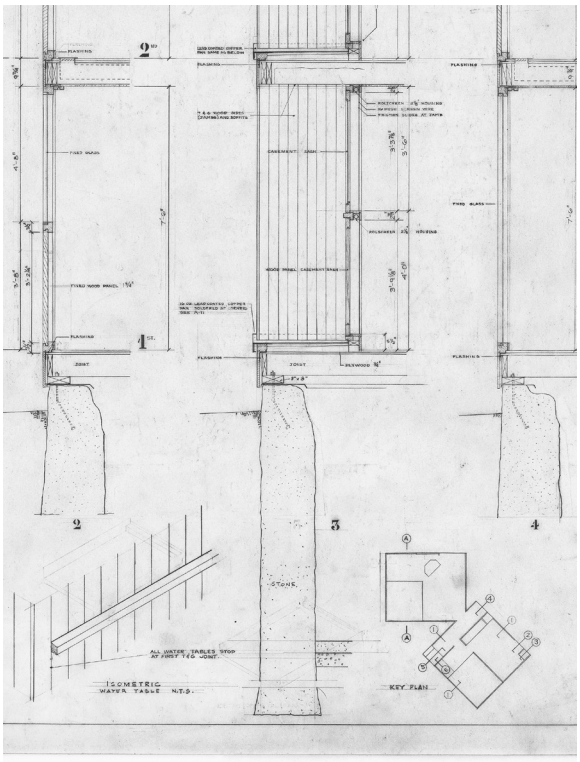
An assessment was conducted in 2016 to identify the conditions of the house and to specifically address the wooden elements. An assortment of conditions was found related to water infiltration from ground and roof; however the structure, and specifically the wooden siding, has survived

in a good state of preservation. These conditions may be summarized as follows:

- Previous infiltration via later roof flashing and poor perimeter drainage.
- Minor deterioration of interior beam ends and corrosion of steel connections.
- Ultra Violet light damage, previous paint and biological growth all pertaining to the exterior cedar siding.
- Decay of window casing, sills and exterior trim.
- Carpenter bee activity at fascia.
- Surface staining and discontinuity of unfinished interior cedar finishes.
- Previous repairs to exterior concrete block.

A prioritized plan to address the above has been partially implemented in 2017 with temporary measures for roof and drainage, some replacement of deteriorated elements, the full-scale cleaning of the siding, and carpenter bee treatment. An entire re-roofing project is scheduled for 2018 along with full perimeter drainage program and other landscaping items.

A strong policy to provide a high level of conservation for all original materials including the conditions of the interior surfaces has been initiated by the current owners Jennifer Smith and Kevin Lyons. A grey kalsomine paint applied to the exterior tongue-and-groove cladding by previous owners was failing, becoming chalky and reactive to the rising damp from the ground. This material was removed to uncover much of the original unfinished surface of the cedar. Mock-up areas of selected exterior finishes are currently being evaluated based on recent research and testing ranging from clear to light pigmentation for additional UV protection. The surface of the newly exposed exterior cedar currently appears warm and uniform and will be allowed to weather until 2018 spring to inform the direction for full scale preservative treatment incorporating borate-based preservatives as part of renewable long-term maintenance cycle.



05 Louis Kahn, Fisher House sections, Hatboro, Pennsylvania, USA, 1964. © Louis I. Kahn Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission.

The Fisher House

Nature is the maker. It is the giver of presences[7].

A seven-year endeavor from design to completion in 1967, The Norman and Doris Fisher House in Hatboro, Pennsylvania, represents a highly refined example of Kahn's wooden architecture. Vertical tongue-and-groove siding becomes the dominant feature of the exterior to enclose two voluminous cubes, one angled off the axis to the other. The continuous cladding is set against a rustic stone foundation, with finely crafted frame and panels serving to break up the severity of the surface planes. Horizontal elements of lead-coated copper flashing and highly ordered fenestration together emit a tranquil presence with the surrounding landscape, a sublime quality that distinguishes the house within the history of design (figure 05-06). Finished oak and cypress is used throughout the interior providing a reference to the exterior components but differentiated by the process of natural weathering. Kahn choose Tidewater cypress for the Fisher exterior, a species with which he had grown comfortable, having explored its attributes since the late 1940s and employed in both his Weiss House (1950) and the Genel House (1951). Bald cypress (Taxodium distichum), or Tidewater red cypress, specifically refers to the growth along the Gulf Coast found in tidal areas and is noted for its density and natural aromatic compound content that imparts resistance against decay and insects. Kahn's original specifications for the Fisher House indicate "two coats of clear (no color) natural wood sealer – Rez or equivalent" likely referring to an alkyd resin and linseed oil-based product. The Fishers' experimented with different surface treatment to maintain the exterior by cleaning the surface with bleach or detergent, and applying colorless linseed oil-based product such as Cabot 3000 in cycles of approximately four years.

In 1996, Doris and Norman's concerns about the long-term preservation led to a decision to leave the house to the National Trust for Historic Preservation. In 2011, the National Trust acquired the property, who then after a comprehensive study implemented an unusually extensive easement that included the protection of both the exterior and interior. After careful analysis incorporating the results of a 2010 strategic workshop held at the University of Pennsylvania with a panel of eighteen preservation professionals, it was decided that the house would be placed on the market in 2012. An assessment was then conducted to provide a long-term conservation program for the site, identifying only minor surface erosion to the exterior wood with biogrowth and carpenter bee activity. A recommended pro-

06 Louis Kahn, Fisher House, Hatboro, Pennsylvania, USA, 1960–1967. © Matt Wargo 2018.

07 Louis Kahn, Korman House, Whitemarsh Township, Pennsylvania, USA, 1971–1973. During treatment. © Andrew Fearon, 2016.

gram included the application of X-100 Natural Wood Sealer, a linseed oil-based formula developed in 1971 with the US Forest Product Lab. The house's current owners, Charles Firmin-Didot and Bianca Sforni, have been removing the residual warm toned finishes and testing recommended products for the siding. Based on recent research and understanding of Kahn's intent, they have allowed the surface of the Fisher House to naturally weather to a silver-grey tone before the selected tested materials are applied.

The Korman House

In 1973, a few months before his death, Kahn completed Steven and Toby Korman's commission to design a six-bedroom house in Whitemarsh Township, Pennsylvania (figure 07, 10). Designed simultaneously with the Honickman House (unbuilt), the Korman House was his largest and last residential work, representing Kahn's definitive vision for the American country house. The plans feature prominent brick chimneys that transfix the skyline akin to the greatly exaggerated exhaust flues of his Richards Lab. In the fenestration of the northeast, two stories of symmetrical glass panels open the main interior living space to rolling landscape and soft tones of morning light. Framed in wood, the material entirely clads the structure with vertical tongue-and-groove interrupted by traditional frame and panel construction. Employing vocabulary seen in the Fisher House, the placement of windows and wooden apertures suggest the activities within, echoing the routine opening and closing of shutters or double-hung doors common to the rural landscape of pre-industrial New England. Inland cypress has been used as the primary replacement material for the Korman House. Often referred to as yellow cypress, inland cypress is lighter in color, contains more sapwood, has a coarser texture, and is not as durable as the tidewater red cypress Kahn originally specified.

In 2014, an assessment of the Korman House was conducted to address a list of problematic conditions, among them the general appearance of the following most recent campaign of coatings:

- Coating with a high solid content film-forming linseed oil alkyd-based product with trans-iron oxide pigments appeared dark orange.
- Accumulative layers of the coating trapped moisture/mold, turning black in areas, and with a heavy appearance were inconsistent with Kahn's intent for natural weathered grey.
- Mold/fungi and cubical brown rot fungi were apparent.
- Consumed by deterioration, most of the exterior cypress had been replaced over the years with new cypress that was only moderately decay resistant.

A treatment program for the Korman House was formulated based on field test panel evaluations and laboratory work conducted to specifically address the weathering and bio-deterioration of exterior wood. In an effort to formulate a program for maintenance, a multiphase evaluation involving lab and field testing was employed. The natural environment was used as a primary treatment agent through a "weathering-in" process. The full treatment may be considered a stabilization of this weathering process that is sustained via maintenance cycles. The objectives of the research and laboratory testing program were to formulate a maintenance plan for the retention of the cypress siding defined by the following attributes:

- Promotes the greatest longevity of existing materials.
- Minimally invasive without abrasive or chemical preparation.
- Low Volatile Organic Compounds content /low environmental impact.
- Re-treatable as part of a maintenance cycle.
- Easy to implement/cost effective.
- Sensitive to the architect's intent to present the surfaces in a naturally weathered appearance.

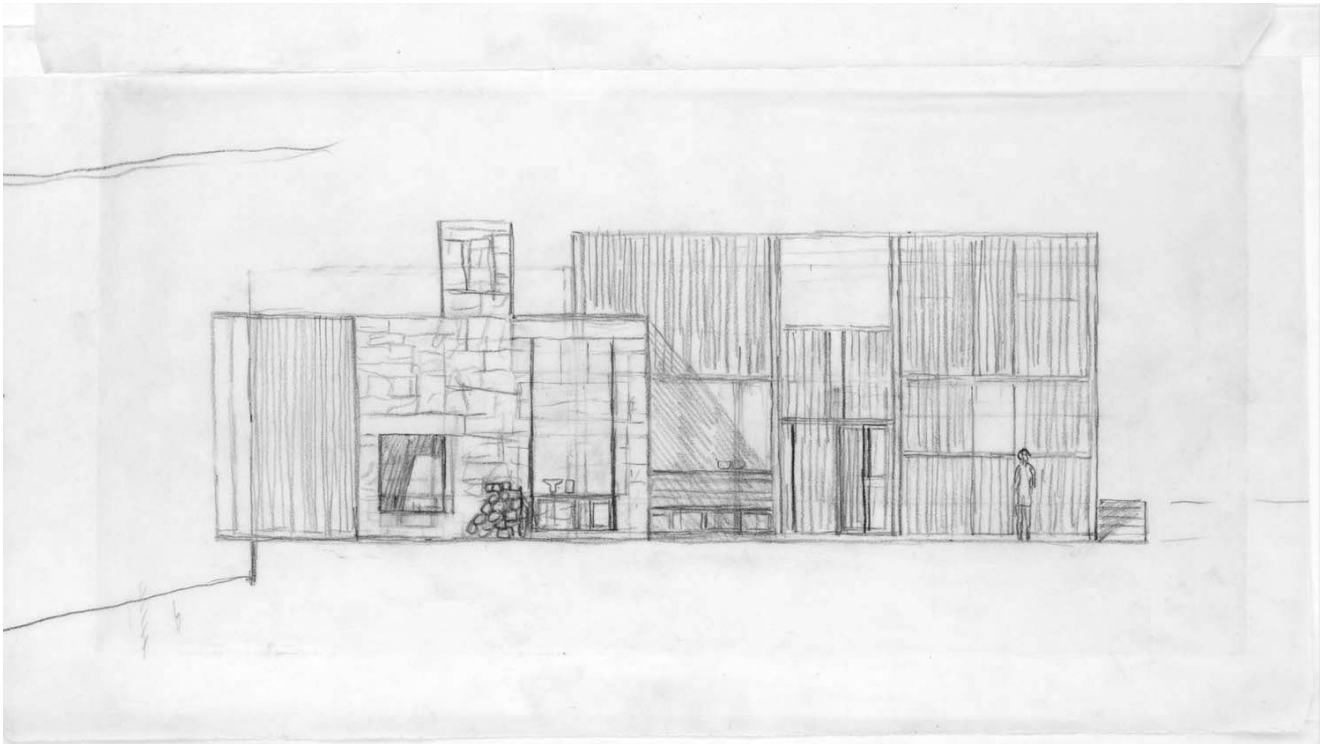
The preservative system tested employs two manufactured products that are readily available and easy to implement on a large scale through a minimally invasive, environmentally sound, cyclic maintenance program. Laboratory and field tests provide that Total Wood Preservative 1500 series penetrating linseed and paraffin oil combination with borates serve as an effective means to deter decay and mold-fungi. The addition of 9% titanium dioxide stain was deemed necessary to prevent UV damage and is chromatically sensitive to Kahn's intent. As a sustainable program, the penetrating oil system is preferable to film-forming coatings, as it is sacrificial, re-treatable without substrate preparation, and economical to implement. The estimated service life of applications may range from 3 years in high-exposure areas to 5 years in low-exposure areas.

Following the initial field testing, large-scale mock-ups of finish removal were implemented and further evaluated for effectiveness before full-scale removal in June 2014 (figure 11).

Upgrades have been made to the envelope such as providing insulated panels for the glazing, along with amenities to the interior, but the house largely remains intact under the careful stewardship of the Korman family. For the interior Kahn again employed wood as a primary material with prominent Douglas fir post and beams framing, and partitions railing, built-ins and flooring in oak. The brick of

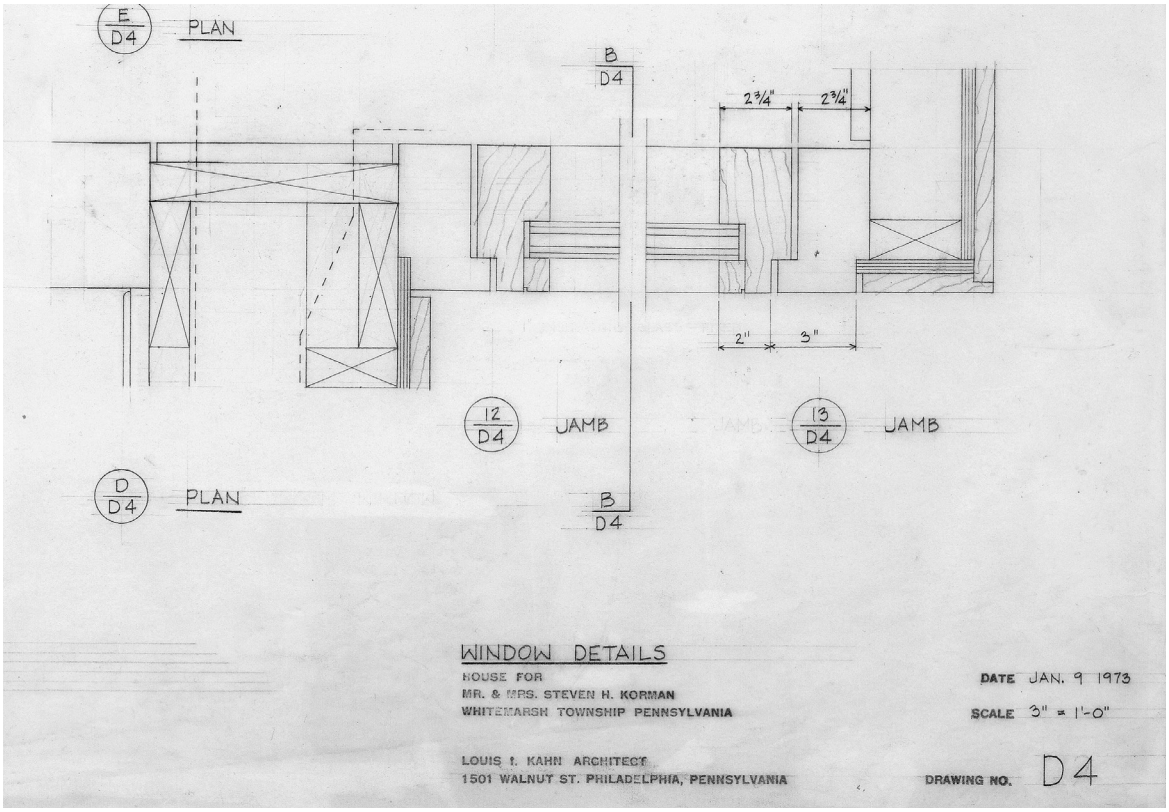
08 Louis Kahn, Fisher House, Hatboro, Pennsylvania, USA, 1960–1967. © Norman and Doris Fisher Collection, The Architectural Archives, University of Pennsylvania.

09 Louis Kahn, Fisher House, Hatboro, Pennsylvania, USA, 1960–1967. © Norman and Doris Fisher Collection, The Architectural Archives, University of Pennsylvania.



10 Louis Kahn, Korman House, Whitemarsh Township, Pennsylvania, USA, 1971–1973. During treatment. © Matt Wargo, 2014.

11 Louis Kahn, Korman House Drawings, Details of Windows, 1973. © Louis Kahn Collection, Architectural Archives, University of Pennsylvania.



Kahn's chimneys and interior fireplace inglenooks, although susceptible to past water infiltration, have required only minor patching and repair. The distinct 18th-century style grapevine joints of the brick pointing, like most of the original surfaces, have been well preserved.

The surface of the wood was allowed to naturally weather for 2 years before the application of the preservative and coating combination in April 2016 (figure 07). The second cycle of the reapplication of the penetrating oil is scheduled for 2019.

Conclusion

You can never build a home, because the home is made by the people[8].

In 2015 the Getty Conservation Institute and the University of Pennsylvania organized a meeting to specifically address the challenges of exterior wood on Kahn's buildings. The group included representative conservation professionals, owners of the Korman, Shapiro, Genel, Fisher, and Esherick houses and the team working on the Salk Institute. Henry Wilcots, an architect who worked in Kahn's office from 1962 to 1974, participated in the meeting to exchange current research and insights into the architect's design intent for exterior wood. As a result of the two days of presentations and site visits, common challenges and conditions were identified along with proposed solutions including preservative applications, ultra-violet light protection, mycology, finish testing, and product selection. A consensus was reached on Kahn's sensibilities to allow his structures to weather grey and the inherent issues to mitigate the slow deterioration while balancing design intent.

It is clear from the gathering of owners, architects, architectural historians, engineers, facilities managers, conservators, and material scientists that the concern for the requisite stewardship of Kahn's body of work is tangible and growing. Although different in scale, the Salk Institute, the construction details, conditions and identified deterioration mechanisms of Kahn's group of houses are closely related. The Esherick House recently completed an unusually sensitive interior conservation effort, receiving a well-deserved **docomomo** *Modernism in America Award.* A separate kitchen was configured by a team of architects, contractors and consultants, with minimal impact to the structure in an effort to reduce use of the important original kitchen by Wharton Esherick. The Getty Conservation Institute's *Conserving Modern Architecture Initiative* has been a model for conservation efforts, allocating resources and expertise of the highest level for the Salk Institute teak window wall assemblies' project. The Kahn Collection and the Architectural Archives has provided access to invaluable, primary source documentation with staff who have created a network that connects stakeholders from various constituencies. A comprehensive research effort on the subject resulted in William Whitaker's 2013 publication *The Houses of Louis Kahn* to which this essay owes a major debt. The University continues to explore the works of Kahn through the stewardship of campus heritage seen in the monumental renovation of the Richards Laboratories. Equally impressive are the initiatives taken by homeowners to seek out the best care possible for the Kahn houses, often performing or overseeing the treatment them-

selves, forming an even deeper relationship to the structures they inhabit in the process.

The retention of wooden heritage in a changing environment

Regarding the global problem of sustaining wooden materials, there is the increasing need to seek alternatives to replacement. Of primary concern is our growing sensitivity to original fabric encompassing a broader scope of heritage that now extends to well into the post-war era. As old growth forests are no longer available, and river or building salvage sources cannot sustain replacement species, fewer materials are available for heritage work. Tropical woods, high in extractive content and durable in the most extreme environment, are limited in supply, and are at risk of depletion or moving closer to a risk category. Patterns of climate change have heightened the risks to wood heritage by propagating the distribution of invasive insect species and decay fungi. Even the most staple species for building practices in North America alone have been subject to depletion by upset balances of ecosystems; we have seen the erasure of the American chestnut (*Castanea dentata*), and are currently threat to ash species (*Fraxinus*). Treated lumber chemistry within the industry is also shifting from toxic to low-toxic compounds, resulting in shorter service life or more frequent replacement. As topical treatments follow the same trend in toxicity, VOC laws will further restrict the use of necessary solvent additives. All of these factors emphasize the need to retain our existing wooden heritage materials by seeking new or revisiting existing alternative practices with lower environmental impact, such as natural preservative systems.

Old technologies for modern buildings

Cross-culturally, with a recorded history over 2000 years, topical preservatives have been in use to maintain wooden structures. From 3rd century China to 9th century Norway, the practice of applying natural oils and preservative combinations at regular intervals have been long instituted as social custom and technical practice. Many of these traditions rely upon linseed or tung oil as the base ingredient which in pure form are entirely non-toxic. Oil polymerization from heat alone instead of metal driers, thermal treatment, eco-friendly solvents such as d-lemonine, and food grade preservatives such as iodopropynyl butyl carbamate (IPBC) are all non-toxic, low-impact alternative materials that should see increased usage. It seems congruent to Kahn's ideals and interest in the evidence of process that we incorporate ancient practices and building technologies into the retention of his legacy. With the acknowledgment and value of the architect's intent, there is a need to balance the destructive weathering process with an intervention that imparts material stability while visually keeping within his formal vocabulary. Works of the immediate past provide the opportunity to employ preventive conservation measures through proper maintenance to mitigate the onset of irreversible deterioration. As modernist architecture embraces a natural process, the problem is universally shared by a broad range of wooden-built heritage to which more sustainable treatments and a growing culture of stewardship may offer solutions. Kahn's ideologies seeking transparency and truth in the application of traditional materials resonate across disciplines, generations, and cultures as model for precision in design. A renewal of these ideals opens a window of optimism amidst a changing landscape that we may enter and revisit the past to examine long tested technologies, finding inspiration in our origins as we look forward.

Notes

1 Louis Kahn, Lecture to Architecture Students, Pratt Institute, 1973 as quoted in Robert Twombly (ed.), *Louis Kahn: Essential Texts*, New York, WW Norton & Co., 2003, 277.
2 Louis Kahn, "In His Own Words", *Interior Design Magazine*, November 1974, 34.
3 Residence for Mr. and Mrs. Samuel Genel, Box unknown, Folder K12 8 Genel House, Louis I. Kahn Collection, Architectural Archive, University of Pennsylvania.
4 Residence for Dr. and Mrs. Norman Fisher, Box unknown, Folder unknown, Louis I. Kahn Collection, Architectural Archive, University of Pennsylvania.
5 Residence for Harold A. Honickman, Box unknown, Folder K12 8, Louis I. Kahn Collection, Architectural Archive, University of Pennsylvania.
6 House for Mr. & Mrs. Steven H. Korman, Box 36, Folder 030.II.A.36.24, Louis I. Kahn Collection, Architectural Archive, University of Pennsylvania.
7 Louis Kahn, "On Order & Design", *Perspecta 3: The Yale Architecture Journal* – Louis I. Kahn: Order and Form, Yale University, 1955, 46-63.
8 Louis Kahn, Lecture to Architecture Students, Pratt Institute, 1973, as quoted in Robert Twombly (ed.), *op. cit.*, 280.

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