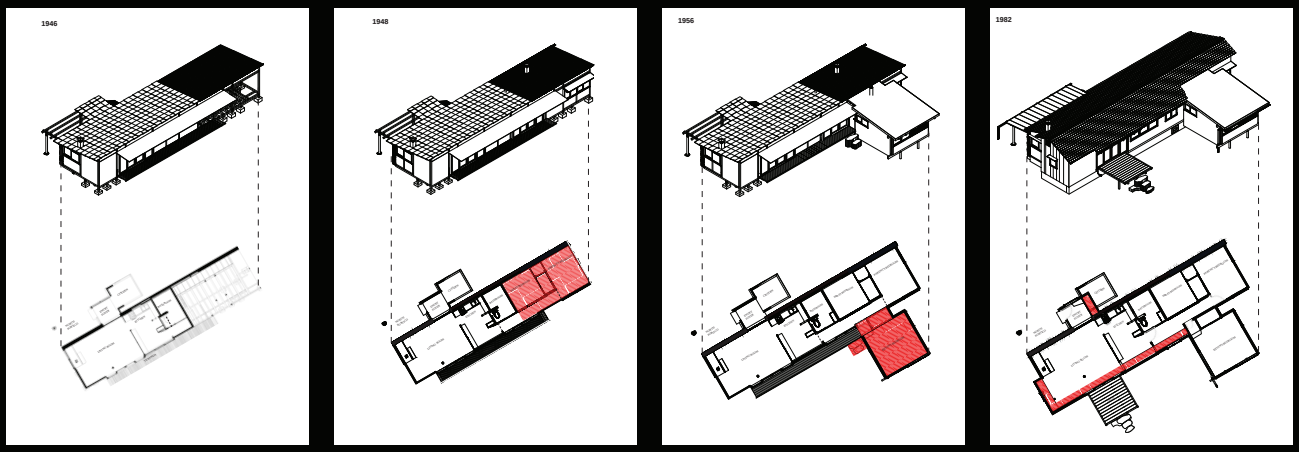
A HISTORIC STRUCTURE REPORT



THE GEORGE NAKASHIMA FAMILY HOUSE

NAKASHIMA WOODWORKER COMPLEX

1847 Aquetong Road, New Hope, Pennsylvania 18938

Historic Structure Report

George Nakashima Family House

George Nakashima Woodworker Complex

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The project was funded by grants from the Pennsylvania Historical and Museum Commission's Keystone Historic Preservation Grant Program and the Johanna Favrot Fund for Historic Preservation of the National Trust for Historic Preservation.

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Contents

Forward **VII**

NAKASHIMA FAMILY HOUSE: A DEVELOPMENTAL HISTORY **1**

Acknowledgments **3**

Introduction **5**

Part One: Historic Background and Content **9**
Early Years and Education 9
Steps into the Future 11
The Raymond's Summer Studio 14
Okamoto's House 16
Golconde 19
To Build for the Future 21
An "Inside Room in the Badlands" 25
Minidoka "Concentration Camp" 30

Finding "Hope" in New Hope **34**
Leaving the Camp 34
Life on the Raymond Farm 36
A New Beginning 39

Part Two: Chronology of Site Development and Use (1945-2020) **44**
Site Planning and Design Development: c. April 1945 to c. March 1947 44

House Construction, Phase One (prior to habitation): April 1946 to December 1947 **46**
Work in 1946 46
Fall 1947 48

House Construction, Phase One (post-habitation) April 1948 through December 1950 **50**
April to December 1948 50
September 1949-February 1952 52
Mira's Murals 53
The House as a "Showroom" (1948-54) 54
Site Expansion, 1954-60 54

House Construction, Phase Two; 1955-1956 **55**
c. May 1955-November 1956 55
Mira's Family and Return 56

House Construction, Phase Three: 1982 **58**
c. April to August 1982 58
Kevin's House 2004-2020 59

Evaluation of Significance **61**

Appendices **65**
Appendix-A: Known Houses of George Nakashima 65

HISTORIC AMERICAN BUILDING SURVEY DRAWINGS **66**

Cover Sheet **66**

Drawing Sheet 1: District Site Plan **67**

Drawing Sheet 2: Site Plan **68**

Drawing Sheet 3: Foundation Plan **69**

Drawing Sheet 4: Ground Floor Measurement Plan **70**

Drawing Sheet 5: Reflected Ceiling Plan and Furniture Plan **71**

Drawing Sheet 6: Roof Plan **72**

Drawing Sheet 7: Elevations **73**

Drawing Sheet 8: Sections A and B **74**

Drawing Sheet 9: Sections C and D **75**

Drawing Sheet 10: Sections E and F **76**

Building Evolution (1946-2024) **77**

BUILDING EVOLUTION DRAWINGS **78**

Phase One: Pre-habitation (1946-47) Post-habitation (1947-48) **78**

Phase One: The Stone Wall and Crawl Space **79**

Phase One: Foundation System and Floor Structure **80**

Phase One: Post and Beam Framework **81**

Phase One: The Original South Veranda **82**

Phase One: Mono-pitched Roof Assembly **83**

Phase Two: Construction of a Bedroom Addition **84**

Phase Three: Modifications **85**

Phase Three: Gable Roof Construction **86**

ENVIRONMENTAL IMPROVEMENTS REPORT **88**

Project Directory **89**

Part One: Introduction **90**
Background 90
Purpose of Scope 90
Applicable Guidance 91
Acknowledgments 91

Part Two: Analysis of the Current Interior Environment **92**
The Environmental Monitoring Program 92
Analytical Methods 94
Analysis of Source Moisture Control and Moisture Vapor Exchange 95
Analysis for Conformance with ASHRAE Type C Environment 98
Leaving the Analysis of Environmental Risks to Collections 102

Part Three: Recommendations **106**
Introduction 106
Existing Environmental Management and Monitoring 106
Building Envelope and Hygrothermal Performance 107
Preliminary Assessment of Potential Environmental Performance 108

COLLECTIONS ASSESSMENT FOR PRESERVATION SURVEY REPORT **111**

Project Directory **113**

Part One: Executive Summary and Overarching Issues **115**
The Nakashima Family House 115
The Assessment 116
Strengths and Opportunities 117
Issues and Concerns 118
A Way Forward 119
Acknowledgments 120

Part Two: The Building **121**
Methodology 121
Overview of the George Nakashima Woodworker Complex 122
Summary Description of the Buildings in the CAP Report 123
George Nakashima House (1946) 123
Lanai (1958) 129
George Nakashima Garage(1967) 129
Heating House (1977) 130
Present Uses of the Buildings 131
Climate 134
Situation of the Nakashima Family House and the Garage 136
Soils and Seismicity 138
Source Moisture Control 141
Existing Environmental Management and Monitoring 144
Building Envelope and Hygrothermal Performance 146
Preliminary Assessment of Potential Environmental Performance 149
Emergency Power Generation 151
Fire Prevention, Detection, and Protection 152
Security and Intrusion Detection 154
Introduction 155

Part Three: the Collections **155**
Collections Definition 156
Collections Vulnerabilities 158
Collections Environment 161
Exhibition 177
Collections Storage 178
Emergency Preparedness Planning and Response 180
Collections Stewardship and Preservation Planning 182
Staffing for Collections Stewardship 185

Appendices **186**

Appendix A: The New Orleans Charter 186
Appendix B: Heritage Reinvestment Plan 188
Appendix C: NCDC and ASHREA Climate Data 193
Appendix D: Environmental Monitoring and Diagnostics for Museums 207
Appendix E: Tables from ASHRAE Applications Handbook 218
Appendix F: Scope of Collections Information 223
Appendix G: Integrated Pest Management 297
Appendix H: Incident Command Structure and Emergency Response for Cultural Heritage 322
Appendix I: Information on Emergency Supplies Caches 375
Appendix J: House Keeping and maintenance of Collections Materials 393
Appendix K: Collections Management Systems 433

Forward

This study documents the historical and architectural development of the George Nakashima Family House in New Hope, Pennsylvania and its current environmental context and performance. The format for the study is a departure from the traditional Historic Structure Report given the intended application of the study to guide future conservation, interpretation, and management of the house. Each section of the document contains the relevant information on the social history of the construction and occupation of the house by the Nakashima family; the morphological evolution of the house through detailed measured drawings and photographs; and a performance evaluation of the building and its environment. Different formats were chosen by each specialist to best convey the information. Each investigation revealed a complex narrative interweaving personal, cultural, and practical decisions that allowed George Nakashima to create a truly hybridized modernist Japanese house on American soil.

The authors thank the Nakashima family and staff of the George Nakashima Foundation for Peace for the opportunity to engage with this remarkable structure. And to the Pennsylvania Historical Museum Commission and the National Trust for Historic Preservation for their financial support.

Nakashima Family House: A Developmental History

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INTRODUCTION

The Nakashima Family House (1946-50), a structure designed and built by architect and woodworker George Nakashima (1905-1990), is one of over a dozen designs built on the family property in New Hope, Pennsylvania between 1945 and his death in 1990. Known variously as "the House of George Nakashima" or simply as "Kevin's House," the Nakashima Family House as it is now known served as the primary family dwelling for 73 years.[1] As an example of American architecture it is rare in the use of craft techniques, particularly those associated with Japanese craft traditions, and exceptional as a site associated with Japanese-American heritage and history located in the Eastern United States.

Of paramount significance is the fact that the Nakashima Family House embodies the emergent moment where Nakashima's independent (or, perhaps, singular) search for enlightenment and understanding come alive through a nexus of physical action (through the work of the hands) and a striving for spiritual transcendence (through the engagement of the mind). He sought this not just as an expression of beauty conceived and built in piece of furniture, but through the creation of integrated environments.

His goal of creating integrated environments owes a clear debt to his knowledge and direct experience with Japanese architecture and vernacular building traditions. It was his practice as an architect in Japan, both as an apprentice of Antonin and Noémi Raymond, and through his independent designs, that he came to understand how Japan and its culture could transcend what he saw as the excesses of industrialization and materialism through an innate sense of refinement; Japan's vernacular culture and building traditions as a wellspring from which to distill the fundamental principles necessary to achieve the goals of simplicity and naturalness which he saw as a condition that primed Modernism. Nakashima's works in America, particularly those in New Hope, along with a body of work completed in the Northeastern United States by his mentors the Raymonds, and other of their key followers (such as Junzō Yoshimura and David Leavitt), constitutes a significant example of the adaptation (or translation) Japanese principles into the creation of a humane, regionally responsive modernism. By extension, this body of work is central to understanding and assessing the impact that Japan and its craft traditions had on postwar America. The larger context for this is a reassessment of the sources that inform the making of American architecture and that there is much to be discovered in looking not just to European examples, but also to the spatial sensibilities and craft traditions found in Asia and the cultures of the global south.

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[1] The family first inhabited the house on December 7, 1947 – absolutely and by coincidence – exactly six years after the Japanese attack on Pearl Harbor. Both George and Marion Nakashima lived in the house for the rest of their lives. Their son, Kevin, lived – except for a period of a few months when he studied abroad – the entirety of his life there. Upon the death of his parents, Kevin become the sole-owner of the house and it was, in turn, bequeathed to the Nakashima Foundation for Peace upon his death on November 7, 2020. Mira Nakashima lived in the house until the fall of 1959 when she left home to attend college.

Conceived of as an "experimental house,"[2] the Family House drew on his Japanese experience to present a compelling counterpoint to the far more dominant trend toward the use of mass-produced elements and processes in American residential construction. Sites like the Charles and Ray Eames House (1947-52) on the West Coast or the community built just 20 miles away by William Levitt and Sons – the developer's second "Levittown"[3] are touchstones of the post-World War Two era. While the former embraced the use of off-the-shelf machine-made parts – if, however, with a conscious, if subtle, environmental awareness, the latter expresses the far more reaching reality of American life associated with suburbanization, urban sprawl, and the degradation of humanity's relationship with the natural world. Nakashima's approach challenged this and found resonance with the emergent environmental awakening embodied in the writings of individuals like Aldo Leopold, whose venerated book, *A Sand County Almanack*, saw its first publication in 1949 just months after the Nakashimas settled into their new home.

Nakashima's emerging environmental awareness stems, in part, from a reverence among the Japanese towards nature. This knowledge was energized in Nakashima through a "second education" received, first on the job site of a project in Pondicherry, India, where he experienced a spiritual awakening under the guidance of the Hindu philosopher Sri Aurobindo. At Aurobindo's ashram, Nakashima learned that the physical act of working, of making, became a way of knowing, or being in the world, and in being at peace with oneself, and obtaining enlightenment. This introduced a profound spiritual dimension to Nakashima's work, which propelled him to seek out a "spiritual training to attain deep concentration resulting in union with the ultimate reality."[4]

Nakashima furthered his "second education" working alongside a master carpenter, Gentaro Hikogawa, a traditionally-trained Japanese carpenter, or *daiku*, that he came in contact with during their incarceration as Japanese-Americans during World War Two. The two men and their families experienced the degradation of life in the high-desert of Idaho at the Minidoka Relocation Camp, one of a number of sites that can only be called "concentration camps." Despite this degradation, Nakashima absorbed from Hikogawa a sense for the deeply spiritual, even sacred value that trees held for a Japanese carpenter, an ancient reverence for wood that ran counter to the twentieth century's obsession with mass production and synthetic, man-made materials. For Hikogawa, there was no distinction to be made between the work of the spirit and that of the hand.

These life threads merged in the countryside south of New Hope, Pennsylvania, an area once called the Jericho Valley – a place resonant with biblical associations tied to victory, faith, and the power of God. With the support of the Raymonds, and a community of not only artists, but of a landscape shaped by deep connections to the Quaker values of tolerance, social justice, and non-violence, the Nakashimas found a "New Hope," it was as if they were entering a promised land. This history brings a new focus, not only to the community of artists that the Nakashima's found themselves living among, but also values of Quakerism, and efforts associated with non-violence. Injustice (or racial

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[2] As were several other buildings on the site including the: Showroom, Conoid Studio, Arts Building, and Reception House.
[3] The 1952 publication of Nakashima's House makes note of this relationship. See: *House and Home* (Nov. 1951)
[4] *Soul of a Tree*, p. 138

prejudice) runs deep within the contours of American experience, and the Nakashima family's own experience – including that of their parents -- reflect the larger contours of Japanese American experience. The Nakashima Family House, along with the sites where African American families began the process of integration at Levittown (which was established with "White's only" policies) in 1956, shed a specific light on these realities as they played out in the Delaware Valley region.

***

The complex relationship between the living tradition and historic site, as the property transitions and continues to serve the making of furniture, compels the Foundation to lead the preservation of the building and the collection for the public benefit while continuing to serve George Nakashima's vision for peace. In exploring the cultural significance of the Nakashima Family House, this report aims to help the Foundation in its growing role as steward.

Part One of this report provides historical background and context based on information provided by the 2013 National Historic Landmark nomination, the CMP for Arts Building, and other sources, along with extensive new research using collections held by the Nakashima Foundation for Peace that have been made available for the first time, as well as archival materials held at the James A. Michener Art Museum Library and Archvies.

Part Two of this report provides a detailed timeline documenting the design and construction of the house and the alterations in terms of building and use that have occurred over time.

The final section evaluates the significance of the site and its intactness.

Lastly, since the focus of this study is the Family House of George Nakashima, a listing of all of his known home addresses, from his birth in 1905 to his death in 1990 are included in an appendix.

George Nakashima at the Family House in New Hope, c. April 1948 (Nakashima Foundation Archives)

PART ONE: HISTORIC BACKGROUND AND CONTEXT

The many publications about George Katsutoshi Nakashima (1905-1990) during his lifetime contributed to the legend and mysticism of the artist as a furniture maker; his work as an architect, however, is less represented. Although woodworking became for him a profession interwoven with a spiritual meaning, Nakashima was formally trained as an architect. After a short stay in Paris, he followed a career in this profession that led him to embrace modernist ideas in his early years, mainly through his association with Antonin and Noémi Raymond in Japan and India. These previous experiences, especially through his direct encounter of Japan's living craft traditions, proved instrumental to the architectural synthesis Nakashima exemplified in the Northeastern United States.

Early Years and Education

Born in Spokane, Washington, Nakashima was the first child of Katsuharu Nakashima (1874-1967) and Suzu Thoma (1880-1974). Nakashima's father was a college-educated *Issei*, or first-generation Japanese immigrant, who left home in search of a better life. He arrived in the United States in 1903, a single man, and found employment with the Oriental Trading Company whose offices in Spokane had contracts to manage Japanese laborers for the Northern Pacific Railroad.[5] While the great waves of migration to the United States at the turn-of-the-century brought Europeans to industrial centers in the Northeast, *Issei* (as the Chinese had before them) filled a need for labor on farms and railroads, in lumber mills, and on fishing boats from California and Hawaii, to the Pacific Northwest. Because of his command of the English language, Katsuharu was employed as an interpreter involved on a day-to-day basis with the Railroad's labor relations and management.[6] By law, however, he – and the Japanese community he served (numbering upwards of 500 men)[7] – were "aliens ineligible for citizenship."

Nakashima's mother spent six years as an attendant in the imperial court of the Emperor Meiji, before she came to America as a "picture bride." Marrying Katsuharu upon her arrival in Seattle on April 21, 1904, the couple was active in the civic associations of Spokane's Japanese population in an effort to strengthen the status of their community.[8] By 1912, the family relocated to Seattle, purchasing a one-story bungalow located at 3808 South Genesee Street; a structure that would remain in the family's ownership until 1936.[9] Nakashima's school years were centered here, and it was to this address that he would send communications from afar to keep in touch with family.

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[5] For Katsuharu's activities with the Oriental Trading Company, see: *Spokane Chronicle* (Sep. 6, 1904), p. 1 and articles in the *Spokesman-Review* (June 3, 1905), p. 7; (Nov. 1, 1906), p. 11; and (Nov. 4, 1906), p. 12.
[6] *Spokesman-Review* (Nov. 4, 1906): 12. The family's entry for the 1910 U.S. Census lists Katsuharu's occupation as "Manager R.R. labor gang."
[7] *Spokesman-Review* (Nov. 4, 1906): 12.
[8] The marriage occurred on board the S.S. Kanagawa Maru. Marriage Certificate 15248, filed July 1, 1904. Accessed via Ancestry.com on December 12, 2024.
[9] A notice of sale for the property appears in the *Seattle Star* on Sept. 2, 1936. It is clear, however, that Nakashima's parents had moved south to Portland, Oregon sometime before April 1935 when George lists a Portland address in immigration arrival records.

The "first" Nakashima family home. Located at 3808 South Genesee St., Seattle, the house stands on a corner lot with southern and western orientation. Note the pergola attachment on the west side to provide sun control and the lovely collection of plants on the porch. Photo, c. 1935, presumably taken around the time the family sold the house and moved to Portland, Oregon. (Michener Museum Archives; box 12, folder 26)

The summers of Nakashima's youth were spent laboring in salmon canneries or working on the railway gangs that were close to his father's initial American experiences.

By the 1920s, Katsuharu has improved his station in life and is working as a respected editor for the Japanese-language *Northern Daily News* or *Taikoku nippō.* Despite an atmosphere of increasing anti-Japanese sentiment, he has achieved a level of success that allows him to finance the higher education of his four children. For Nakashima, the 1920s were a period of professional training, first in forestry, and then into architecture. He attended the schools of architecture at the University of Washington, graduating 1929, and the Massachusetts Institute of Technology (MIT), where he obtained a master's degree in architecture in 1930. Both institutions imparted an education primarily adapted from the methods and theories of the École des Beaux Arts in Paris, although in the case of MIT, it was amalgamated with a polytechnic system. In Europe, Nakashima might have been exposed to rising modernist ideas during his sponsored stay at the École Américane des Beaux Arts in France, where he received the Prix Fontainebleau in 1928.

This first exposure to Modernism was supplemented with a second stay in Paris that began in April 1933. Nakashima recalled visiting Le Corbusier's Pavillon Suisse (1930-33) on a weekly basis and the, "aura of excitement," he sensed stemming from, "its use of new forms and a fresh use of concrete."[10] This student dormitory offered Nakashima a first-hand introduction of the modernist interests spreading through Europe; an experience that would be enriched greatly by his work in Japan and India. He arrived in Japan, the home of his ancestors, in March 1934.

[10] Nakashima arrived in Paris in March 1933. For a fuller account of his time in Paris and interest in the Pavillion Suisse, see: *Soul of a Tree*, p. 50-53.

Steps into the Future

Looking to the East, Nakashima moved first to Japan and took up residence with his mother's family – the Thoma – in their ancestral town of Kamata, a location that had been recently incorporated into the rapidly expanding urban center of cosmopolitan Tokyo. Their home was a typical farmhouse, perhaps several hundred years old, that was substantially built; it had a plan organized around the *oyabashira* or mother post, an element hand-hewn from native *kayaki*, or Zelcova wood. The house originally featured a thatched roof, but that had been replaced – by the time of Nakashima's arrival – with modern sheet metal. "The house was completely Japanese," he recalled, "with a wooden veranda running around the whole structure."[11] Most rooms were outfitted with *tatami*, Japanese grass mats which allowed for a flexibility of use, with an internal layout that would have followed principles of *kimon*, or Japanese geomancy; a set of common sense directives regarding orientation to climate that were grounded within cultural, if sometimes superstitious, structures). At night, futons and bedding were removed from large storage closets for use. In daytime, these would be stored so that the spaces could be used for daily life. Nakashima vividly recalled life in this traditional Japanese house – his home for just over three years – from the frigid cold of winter to, most especially, the "warm relationship" that he developed with his maternal grandmother.[12]

Nakashima's maternal grandmother at right, in her house at Kamata, c. 1934 (Nakashima Foundation Archives)

[11] George Nakashima, *The Soul of a Tree* (Tokyo, New York: Kodansha International, 1981), p. 56
[12] For Nakashima's recollections of his grandmother, see: *Soul of a Tree*, pp. 55-56.

Nakashima found employment in the office of Antonin Raymond, Architect in April 1934.[13] Antonin Raymond (1888-1976), recognized as a "Father of Modern Architecture in Japan,"[14] had established an office in Tokyo in 1921 in collaboration with his wife Noémi Pernessin Raymond (1889-1980). She, in turn, is now recognized as an important figure in design and architecture, not only in Japan, but also the United States.[15] Until that moment, the Raymonds had been working in different positions serving Frank Lloyd Wright (1867-1959), first in 1916 in Taliesin, Wisconsin and later in Tokyo (1919-20), mainly on the project for the Imperial Hotel in Tokyo.

The Raymonds' apprenticeship was influential in their practice, although they would ultimately break away from Frank Lloyd Wright by embracing Japanese traditional craftsmanship as "a process to be mastered on its own terms to meet contemporary needs."[16] The Raymonds considered Wright's use of Japanese inspired ornament in the Imperial Hotel as a vacuous mannerism completely separated from the local climate, traditions, people, and culture. In part, these opinions recalled Antonin Raymond's earlier training in Prague, where he was in touch with the ideas connected to the rediscovery of traditional folk architecture as a way to question contemporary eclecticism. Other influences drew on Auguste Perret's (1874-1954) use of concrete and Le Corbusier's (1887-1965) approach to collective housing, known through magazines, and by the Raymonds' first-hand exposure during their travels in France.[17]

In the hands of the Raymonds, Western modernist ideas were successfully synthesized with "fundamental principles" that they saw as central to Japanese craft traditions and culture. This awareness came through the Raymonds' direct encounter with Japanese craftspeople – a lesson which would ultimately be internalized by Nakashima (and further synthesized into his American work). Antonin Raymond hired European and Japanese architects and nurtured a climate of interchange, where modernist ideas were discussed and filtered with a vernacular vision, where the spirit of the *daiku*, or traditional Japanese carpenters, and the *Minka*, vernacular farmhouses, were admired and carefully studied. Noémi Raymond synthesized western furniture traditions with Japanese floor-centered living into the firm's residential and institutional designs. By joining the Raymond's office, Nakashima worked with architects such as Kunio Maekawa (1905- 1986), Junzo Sakakura (1901-1969), and František Sammer (1907-1973), and built a long-lasting network of professional connections and personal ties. More importantly, perhaps, was Junzo Yoshimura (1908-

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[13] For Nakashima's hand-written resume and a cover letter, dated April 2, 1934, see: "Nakashima", Sugiyama Collection, The Architectural Archives, University of Pennsylvania.

[14] As described in Antonin Raymond's obituaries published in the Japanese newspaper Mainichi Shinbun, 28 October 1973, and in the British newspaper Times, 22 November 1976. Kurt G.F. Helfrich and William Whitaker, Ed, Crafting a Modern World: The Architecture and Design of Antonin and Noémi Raymond (Princeton Architectural Press: New York, 2006), 29

[15] For an assessment of Noémi Raymond's work, see: Helfrich and Nakahara, "Rediscovering Antonin and Noémi Raymond," in *Crafting a Modern World: The Architecture and Design of Antonin and Noémi Raymond*. New York, NY; Princeton Architectural Press, 2006. pp. 15-21.

[16] Kurt G.F. Helfrich and William Whitaker, Ed, Crafting a Modern World: The Architecture and Design of Antonin and Noémi Raymond (Princeton Architectural Press: New York, 2006), 24

[17] In November 1932, the Raymonds visited the construction site for Le Corbusier's Pavillion Suisse, and that of the Salvation Army, and even as Noémi Raymond described it, "met the man in his atelier which is the most impossible sort of a corridor in an abandoned convent." Ltr., Noémi Raymond to Jeannette Allison, dated Dec. 2, 1932. AAUP, Raymond Collections.

1997), who guided Nakashima in his study of the Japanese spirit, traditions, and architecture, including travel to visit the shrines and temples of Kyoto. The Raymonds' publications also played an influential role, like *Antonin Raymond: His Work in Japan, 1920-1935* (1935) and *Architectural Details* (1938), which included detailing evolved from Japanese traditions that Nakashima reproduced "almost literally in both his buildings and his furniture."[18]

Staff portrait of the Raymond Architectural Design Office, c. 1935. Noémi and Antonin at center. Junzō Yoshimura stands to their right, arms crossed in white shirt and vest (with a colleague's hands on his shoulders). George Nakashima stands in the back-row (directly behind hunched-over colleague) where Masonori Sugiyama, wearing a dark vest, round glasses and goatee (directly in front of the hunched-over colleague) . To the left of the Raymonds sits Kunio Maekawa (in dark suit) who spoke fluent French through his time working in the office of Le Corbusier. Maekawa and Nakashima were close and assisted one another with independent projects. (AAUP, Sugiyama Col.)

Despite his Japanese parentage, Nakashima was likely seen as an outsider in the Raymond office by his Japanese co-workers who may have seen their American colleague as "tainted" by his foreign birth and Christian beliefs. Language skills – particularly in Japanese – were limiting factors for Nakashima. The fact is that Nakashima was more fluent in French than in Japanese, may demonstrate, in part, why his known work assignments in the Raymond office tended toward foreign clients in distant locations. Examples of the projects Nakashima worked on include: the Harry S. Janes House in Shanghai, China (1934); St. Paul's Catholic Church in Karuizawa, Japan (1934-35); Ford Motor Company Factory, Yokohama, (1934-37); and the Golconde Dormitory for the Sri Aurobindo Ashram, Pondicherry (1935-45). Similarly, his close colleague in the office, Kunio Maekawa, had lived in Paris and worked for Le Corbuiser. His "international" experience and orientation drew him assignments for the French Embassy in Tokyo (1929-33), a pair of houses for the Hatoyama brothers in Tokyo (1932-33), and the Morinaga Candy Store (1935). Whereas, the projects that brought the staff most closely in contact with Japanese craftsman, tended to be assigned to Masonori Sugiyama or Junzō Yoshimura. Sugiyama and Yoshimura likely benefited from their classical education where architecture was taught in the company of painters, sculptors, composers and musicians. Their

[18] Mira Nakashima, Nature, Form & Spirit: The Life and Legacy of George Nakashima (New York: Abrams, 2003), p.21

education was conscious of European developments, but much of the teaching centered on Japan's classical art traditions.

"For the Raymonds," scholar Kurt Helfrich observed, "Japan and its culture provided a means of circumventing the excesses of industrialization and materialism through its innate refinement – a continual source from which to distill fundamentals necessary to achieve the goals of simplicity and naturalness, which they saw as a condition that primed Modernism."[19] Specific work assignments aside, the effect was clear: The incredible range of experiences and perspectives Nakashima gained in the Raymond office over five years left an indelible mark that shaped his future work.

As Nakashima summarized the context more broadly:

> *"Japan was in a state of flux when I was there, and this was particularly visible in architecture, which strove to merge tradition with the requirements of a modern nation. There was a tendency to throw out the old for the new, while attempting to retain the core of the past. The discipline, the creativity, the innate sprit of Zen were to be kept; the forms could change. The concentrated intensity of skills, the drive for perfection and truth, were all disciplines of the past but could be used as steps into the future."*[20]

Three projects demonstrate how, at this time, Nakashima took definitive steps into the future. The first was completed by the Raymonds prior to Nakashima's arrival in Japan. The second is one of two known independent works – residential commissions – that Nakashima received in 1936 and completed in 1937, and a third, again for the Raymonds, was a large project in south Asia that – through his participation – would profoundly reshape the young architect's life work.

The Raymonds' Summer Studio

At the Raymonds' Summer Studio (1933), located in the mountainous landscape of Karuizawa, Antonin Raymond adapted contemporary western models to the regional context of Japan, finding a common ground between Le Corbusier's neo-vernacular work of the early 1930s and Japanese vernacular houses.[21] Local materials, and vernacular Japanese carpenter traditions, were central features of the house -- a design / build work brought to life through the close collaboration of Raymond and the Nikkō-based master craftsman Akasaka Tokichi, with whom he had previously collaborated on the Italian Embassy Villa.

As an adaptation of the *Minka* tradition, the Summer Studio complex included a residence and studio, as well as a caretaker's house. The residence and studio – a model live-work environment – was laid out in an asymmetrical floor plan of interconnected spaces, built with a structure of hand-

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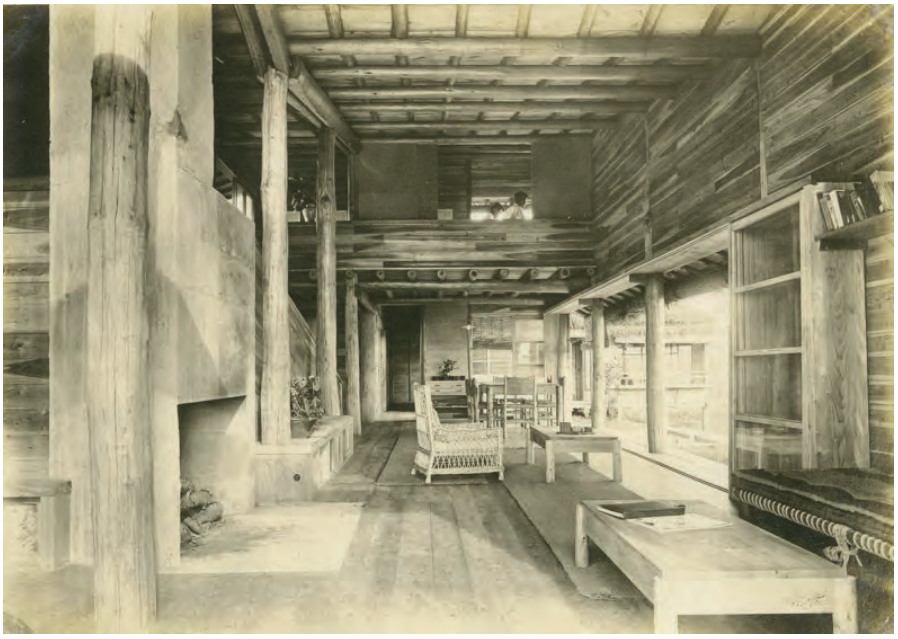
[19] see: Helfrich and Nakahara, "Rediscovering Antonin and Noémi Raymond," in *Crafting a Modern World: The Architecture and Design of Antonin and Noémi Raymond*. New York, NY; Princeton Architectural Press, 2006. pp. 15-21.
[20] *Soul of a Tree*, p. 58.
[21] For an insightful discussion of this house, see: Ken Tadashi Oshima, "Found in Translation," in Yokoyama and Whitaker, eds. *Uncrating the Japanese House*. New York; August Editions, 2022: 10-25.

hewn chestnut and cedar timbers erected upon a poured concrete plinth. The house's metal roof was covered with branches of Japanese larch, to protect the roof from the heat and to dampen the noise of the recurrent rains during summer. The main space was the living room, a double-height space organized around the fireplace and the ramp, which connected the studio in the upper floor. Overall, interior spaces flowed into the views of the surrounding landscape through a wide opening in each elevation.

Raymond Summer Studio, view with Mt. Asama in distance, 1933. Thatch roof and "sudare", or reed blinds, are traditional methods of heat control during summer. (AAUP, Raymond Col.)



Raymond Summer Studio, interior, 1933. Studio space is visible at the top of the ramp. (AAUP, Sugiyama Col.)

Revealing an interest in the raw qualities of the materials, the Summer Studio and the furniture within were of the simplest means. By retaining the prints of the wooden formwork, made of the same species as the walls, the imperfections of the crafted wood were harmonized with the plasticity of the concrete. In so doing, the concrete, as a new material, dialogued with the deep-rooted tradition of wood construction in Japan. The Raymonds' Summer Studio was thus a defining model for Nakashima, who experienced first-hand the possibilities of the vernacular traditions in crafting modern architecture.

In fact, Nakashima was among a select group of staff members who retreated to the cool mountain air of Karuizawa during the summer months, residing in the caretaker's cottage. These months mingled work alongside hikes thought the forests and nearby mountain ranges beyond.

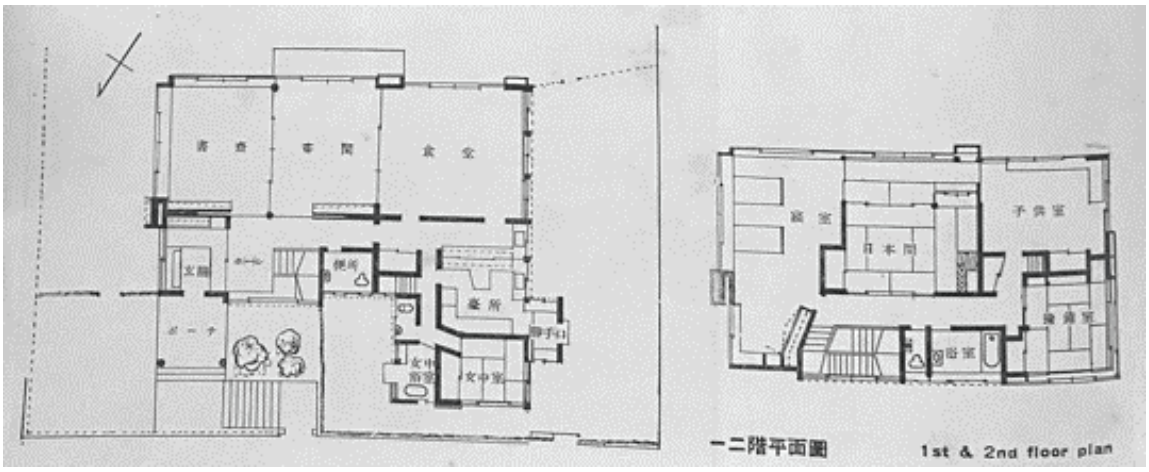
Okamoto's House

The intrinsic qualities of fine construction were also favored in the house Nakashima independently designed for diplomat Suemasa Okamoto (1892-1967).[22] Located in the Nakameguro area of Tokyo, the house was commissioned in 1936 and was completed by the fall of 1937. While more urban in character – and integrating the use of plywood and other contemporary materials – the Okamoto House allowed Nakashima the direct experience of working with a team of skilled Japanese carpenters and contractors. Nakashima took an apartment located a short distance from the building site so that he could inspect the works before heading to his day job at the Raymond office.[23]

Okamoto House (1936-37). (*Shinkenchiku*, Feb. 1938 issue)

[22] Okamoto served as the Japanese Consul in Seattle during the late 1920s and developed a friendship with the architect's father through his newspaper work. By 1935 he is back in Tokyo working in the Ministry of Foreign Affairs as Director of the American Bureau.
[23] Letter, GKN to Parents, dated Feb. 16, 1937. Nakashima Foundation Archives (folder: "George – travel correspondence 1928-1930s").

Parallelling residential works by the Raymonds – particularly houses for Daniel Henry Blake (1934-35), M. Nagaoka (1935-36), and A.O. Keller (1936-37), all of which were "on the boards" at the time – Nakashima's Okamoto House drew from his mentors' example to produce a design adapted to the specificities of the site and the needs of the individual client.[24] Flexible partitions – based on *fusuma* panels – were used to form an integrated living / dining area that faced an intimate garden space and a distant view from the house's hillside site. Access to the house from the street came via a small, paved court. Upstairs, sleeping spaces were provided to suit both Japanese and Western specifications, the former featuring *tatami* mat flooring and deep closets, the latter built-in desks and cabinetry. Bathing and toilet areas were adjacent, but in separated, spaces.



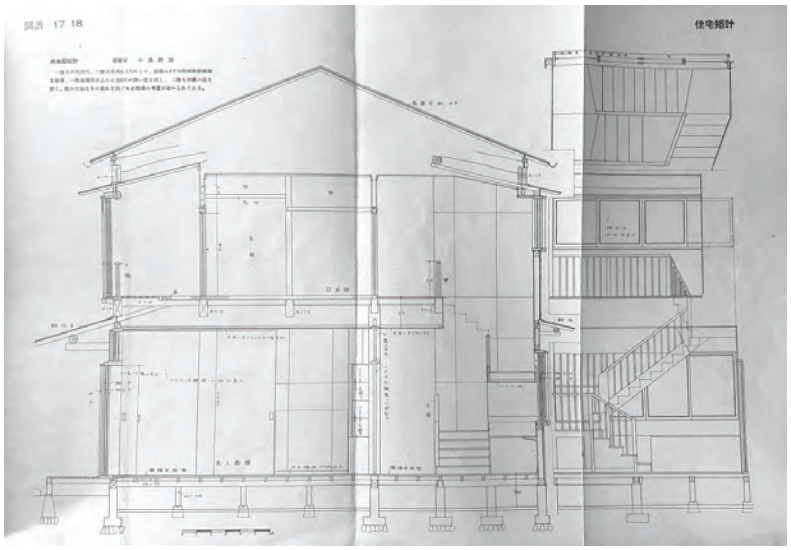
Okamoto House, plans. (*Shinkenchiku*, Feb. 1938 issue)

Okamoto House. Garden view (left) Japanese bed-room (right) (*Kokusai Kenchiku*, Oct. 1937 issue)

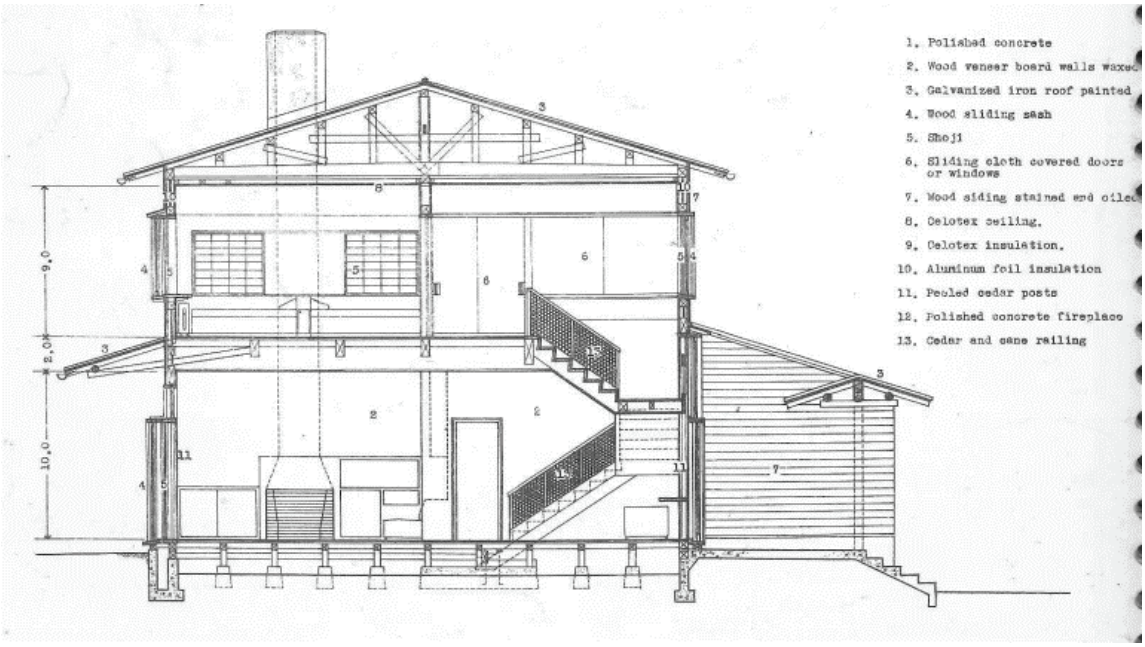
Infused within the Raymonds' approach, as well as in Nakashima's Okamoto House design, is a concern for and use of bioclimatic design principles. This is seen through the generous south-facing fenestration in the house. Roof eaves and overhangs, "eyebrows", provide shading to the large window areas during summer months. Service and circulation spaces are situated on the northern

[24] Details of the Raymonds' designs are featured their publication *Architectural Details* (1938). For more on the Okamoto house, see: *Kokusai Kenchiku* (Aug. 1937) and *Shinkenchiku* (Feb. 1938)

side of the house to provide buffers to the northern exposure. Cross-ventilation is provided through window placement and via the use of sliding doors and screens. Based on the Raymonds' practice, it is expected that Nakashima produced a full set of construction drawings and details for the Okamoto House, including large-scale sections and full-scale details. The structural and wall framing, typical for Japanese residential construction of the time, would inform his later work at the Nakashima Family House.



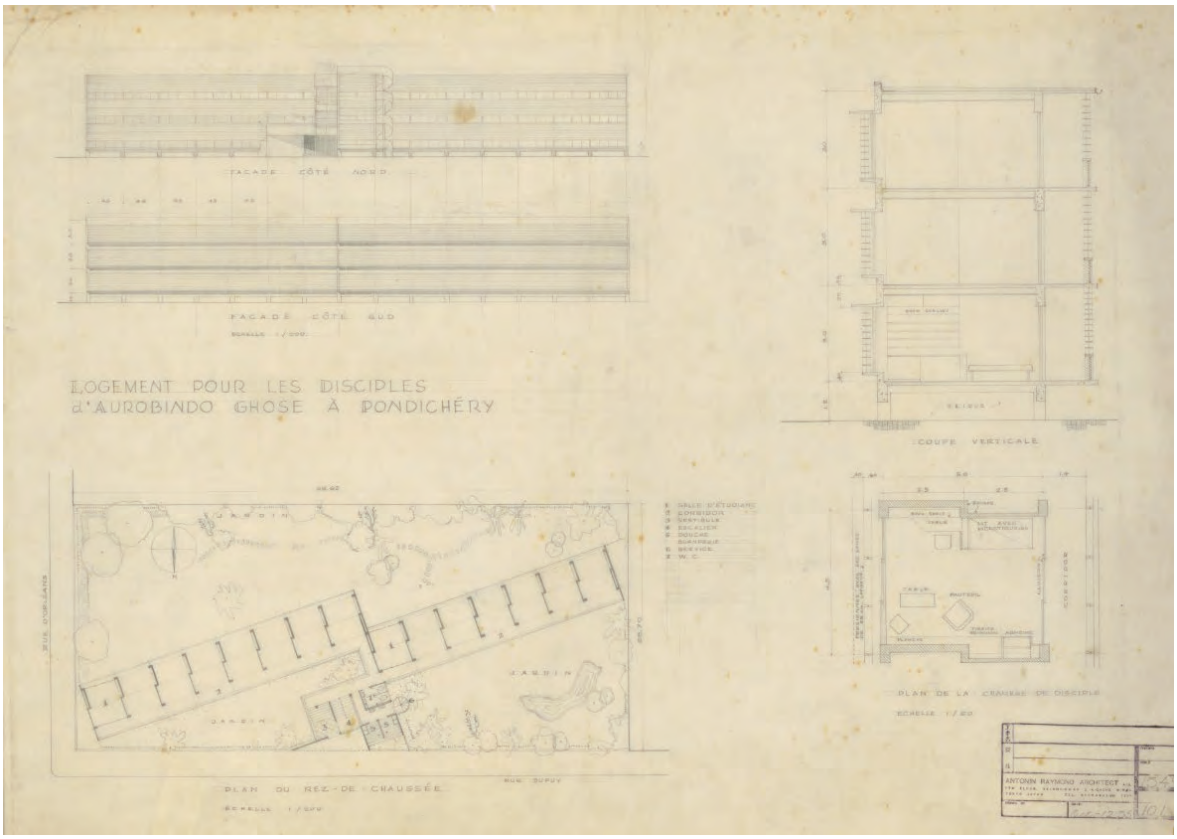
Nakashima's Okamoto House (1936-37), section and stair detail. (*Shinkenchiku*, Feb. 1938 issue)



The Raymonds' Blake House (1934-35), section. (*Architectural Details*, 1938)

Golconde

In August 1935, Sri Aurobindo Gosh (1872-1950), the leader of an ashram, a spiritual community, commissioned Antonin Raymond to design a new residential dormitory for his disciples in Pondicherry, a French protectorate in the southeastern state of Tamil Nadu, India. Previously, the Raymonds had become acquainted with Aurobindo's disciple Philippe B. St. Hilaire (Pavitra), who was trained as an engineer in his native France. The ashram was established by Aurobindo in 1926 with the close collaboration of his principal disciple Mirra Alfassa Richard (1878-1973), a French woman of Egyptian-Turkish lineage who assumed the moniker, "The Mother." Richard, St. Hilaire, and the Raymonds shared an interest in Theosophy, which made the latter sensitive to the spiritual needs of the ashram and led them to propose a modernist form as a peace retreat opposed to prejudices embedded in the colonial fabric.[25]



Dormitory for Sri Aurobindo, initial design, dated Oct. 12, 1935, George Nakashima, delineator (RKSJ, Tokyo)

[25] Christine M.E. Guth, "Crafting Community: George Nakashima and Modern Design in India" in Journal of Design History 29 (2016), 366-384.

In this project, Nakashima drew up the initial proposal (September – November 1935) and made a three-week advance trip to the site during the summer of 1937 to confirm conditions therein once approval was given to prepare construction drawings. From late December 1937 to October 1939, he served as the foreman supervising construction alongside the most recent addition to the Raymonds' office, Czech born architect František Sammer.[26]

The Golconde Dormitory (1935-45) was projected as a concrete structure facing north and south. Essentially, it was comprised of two rectangular volumes, offset to each other, joined and served by a central functional tower containing the stairs and the hygienic facilities. Modest rooms dedicated to sleep and study were placed on the upper levels, whereas the dining and common rooms were located at the ground level. The building was engineered to adapt to tropical and humid climatic characteristics. A roof of precast concrete barrel shells (for Nakashima – a precursor to the precast roof system that he deployed for the Family House), louvered walls, and cantilevered overhangs provided shielding from the sun and heat control.

As a project architect, Nakashima explored and refined the construction materials and details during the construction process through his own labor and close observation and invention. The work provided a hands-on experience that was not offered to Nakashima through his schooling and would not have been typically part of the work of architectural practice. Moreso, the physical act of working, of making, for Nakashima, became a way of knowing, or being in the world and in being at peace with oneself. The constant driving beat of the work, the problem solving, the value of knowing through doing, energized Nakashima in a way that work had never done before.

It is within this context – and maybe because of it – that Nakashima became himself a disciple of Sri Aurobindo. On his birthday in 1938 was given the name of *Sunderananda*; "one who takes delight in the beautiful" is how he translated it for his parents.[27] As a member of the ashram, Nakashima evolved a deeper understanding of life and a transcendent sense that profoundly influenced his position on craft and design. The Sadhana, a "spiritual training to attain deep concentration resulting in union with the ultimate reality,"[28] would be ultimately nurtured in New Hope. In fact, Nakashima aspired to create "a center for the evolution of life moved by higher consciousness, a life of the spirit."[29] These ideas would be summed up in his book *The Soul of a Tree*, published in 1981, where Nakashima revealed a spiritual interpretation of woodworking interwoven with a utilitarian dimension.

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[26] Sammer contributed with his previous experiences in the Centrosoyuz, the Palace of the Soviets competition (1931), and the Pavilion Suisse (1931-32), and undertook the Golconde project until its completion. Martina Hrabova, "Between Ideal and Ideology: The Parallel Worlds of Frantisek Sammer," *Umeni Art* 2 LXIV (2016): 137-166.
[27] Ltr., GKN to Parents, dated May 26, 1938. Nakashima Foundation Archives (folder: "George – Pondicherry letters (1938) photocopies").
[28] *Soul of a Tree*, p. 138
[29] *Nature, Form and Spirit*, p. 18

To Build for the Future

In October 1939, following the outbreak of war in Europe, and having completed of about half of the concrete work in Golconde's structure, George Nakashima left India on his way back to the United States. He stopped in Japan and worked for six months in Tokyo with his old friend Kunio Maekawa (1905-1986), a former colleague of Raymond's office, before returning to the United States in late May 1940. During this time, Nakashima met his future wife, Marion Sumire Okajima (1912-2004) and the two became engaged. She was an American born graduate of the University of California, Los Angeles, on an extended journey through to Australia and Japan. It turned out that she was born in Seattle, and that the two had grown up in the same city.

Marion Okajima and George Nakashima in Tokyo, April 28, 1940
[Nakashima Foundation Archives]

Like Nakashima's father, Marion's father, Kinya Okajima (1868-1948), worked as an interpreter for *Issei* laborers. He had come to the United States in 1892 as a "minister," having converted to Christianity as a child, and was responsible for establishing the Japanese Christian Home in Brooklyn – thought to be the first Christian Japanese mission in New York City.[30] The *Jersey City News* reported that he was, "one of the most eloquent Japanese speakers in this country."[31] His marriage to Marianne "Marian" Noordhoek Hegt (1874-1926), of mixed Japanese and Dutch ancestry, likely furthered his status as an "outsider" in Japan, and drove his migration to the United States.

Okajima was well educated, having first attended the Meiji university in Japan and, between 1902 and 1905, the University of Denver. He, his wife and their first child (Thelma) traveled with a large contingent of Japanese laborers from the Colorado and Wyoming areas to Omaha, Nebraska, who had found work in the meat packing industry on the City's south side. Acting as a community organizer, Okajima was seen as the representative of "all the Japanese living in South Omaha."[32] While not large (reported as 160), the community came east to fill the positions of striking American workers at the Cudahy company's packing plants.[33] The anti-Japanese sentiment ran high:

> *"The Japanese are no good to the merchants of South Omaha. They buy nothing here and they are driving good men [and] families out of town. Many of our best laborers have been idle ever since the strike, because of the importation of the Japs."*

By 1908 the family had relocated to Seattle where Okajima secured a position with the United States Immigration Services as an interpreter. Despite being an "alien", he served in this position into the 1930s. By 1912, when Marion was born, the family was successful enough to own their own house, a property located a 1217 Terrace Court in Seattle, less than four miles from the Nakashima's home. By 1922 they were living in a bungalow located at 523 16th Avenue. After his wife's death in 1926, he moved the family south to Los Angeles, California, where Marion attended college.

It is important to note that both of the couple's fathers served in positions at the Japanese Association of North America in Seattle.[34] Katsuharu in the late teens as an "assistant secretary," while Kinya, was the organization's President in the early-1920s. It was a time that coincided with increasing anti-Japanese sentiment, and ultimately saw the passage of the Immigration Act of 1924, legislation which barred further Japanese immigration. Kinya lobbied against the immigration bill at events in the United States and Japan.[35] For the *Issei*, passage of the Immigration act represented a great indignity. Any dream of truly belonging to the United States now rest with their American-born children who had the rights of citizenship.

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[30] "Aged Japanese Humanitarian Visits Denver," *Denver Post* (Feb. 28, 1939) – copy in family album KHPA-037. Nakashima Foundation Archives. This article provides extensive biographical information about his life.
[31] *Jersey City News* (May 5, 1900).
[32] "The Jap Immigrant as Strike Breaker," in *Cincinnati Post* (May 23, 1905).
[33] Ibid.
[34] The organizations archives are held at the University of Washington Libraries, Special Collections. Col. #1235.
[35] "With the Clubs" [calendar], *Seattle Union Record* (May 12, 1924) and "Benefits are cited in study of Lincoln," unknown source, clipping found in family album KHPA-037. Nakashima Foundation Archives.

Okajima Family at their home, 1217 Terrace Court, Seattle. Left: Photo of house taken Dec. 30, 1916. Right: family posed in front of their home: Dorothy, Thelma, "Violet" (Marion), Kinya, Victor and Marianne (Nakashima Foundation Archives. KHPA_037).

Okajima Family at their home, 523 16th Avenue, Seattle, c. 1922. Left: Photo of house. Right: family posed in their parlor: Kinya, Victor, "Violet" (Marion), Thelma, Marianne, and Dorothy (Nakashima Foundation Archives. KHPA_037).

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After George Nakashima's return to the States, Marion – who remained in Japan until October 1940 – made arrangements for photography of the Okamoto House, as well as the second of George's independent projects, the Sakurauchi House (1936-37)[36], to be made and sent to George so that he could establish himself as an architect. While that was his initial goal, George quickly became disillusioned with the level of building he saw in the United States and, along with the strong desire to work with his hands that had been catalyzed through the work in Pondicherry, he chose to take a different course.

As he described it to Marion in a September letter:

[36] The house was located in the Ichigaya neighborhood of Shinjuku, Tokyo.

> "I am trying to find a studio where I can work and make a little furniture. There is very little that is decent here in the way of furniture so I want to try my hand at it. Also I am anxious to be doing something with my hands – something tangible."[37]

By October 1940, Nakashima had met Father Leopold Tibesar, a Maryknoll priest responsible for a congregation in the Japanese section of Seattle. There, Nakashima set up shop and began making furniture. He started making his first chair at the end of the month.[38] His vision for the future expressed in a nascent form:

> "To go back to … what I was doing ten years ago is not very stimulating after doing creative work in Japan and India. I believe the chance to do something productive and eventually progressive is much better the way I want to do although it is the hard way. I want eventually to build up a little industry, a craft industry…"[39]

After getting a flush of initial orders, some fabrications were to the designs of others, while some were to his own designs, he was able to express to Marion his vision in a more developed form:

> "Rather than taking orders however I am interested in developing and designing new things in my own way such as unit chests-of-drawers similar to a *tansu*, chairs, tables, lamp stands, screens, using natural wood and techniques I have learned during my experiences in the East. Of course, too, I want to study joining so when I can do houses which I shall more or less detail in the shop and erected later on the job. I want to adapt Japanese construction to this country and with the feeling that this is impossible with the type of workmen in the building trades here … I want to do the work myself. These things I want to do in the shop in the way of experimentation."[40]

Nakashima expressed to Marion his enjoyment of the physicality of the work, while acknowledging his limited experience as a wood worker. When Marion confronted George about the practicality of such a venture he replied:

> "The reason I want to start this shop is that it seems to be the only way I can do the type of architecture I want to do. I have gone up and down the coast and have seen what is supposedly the 'best' work being done and realize it is not so much that … with that sort of workmanship [I saw]. The only solution is to do it myself. I am hoping that this shop can be the nucleus of an organization which designs and builds. There will be vast changes in the life of the next few years and the successes of today do not necessarily mean the successes of tomorrow. Although it means hardships, I feel it is better to build for the future."[41]

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[37] Ltr., GKN to Marion Okajima, dated Sep. 11, 1940. Nakashima Foundation Archives [GKN to MN, 1940-41]
[38] Ltr., GKN to Marion Okajima, dated October 18, 1940. Ibid.
[39] Ltr., GKN to Marion Okajima, dated October 29, 1940. Ibid.
[40] Ltr., GKN to Marion Okajima, dated Nov. 9, 1940. Ibid.
[41] Ltr., GKN to Marion Okajima, dated Nov. 26, 1940. Ibid. By this time, Marion has returned to the United States and is staying with her father in Los Angeles.

For Nakashima, there would be no going back to the practice of architecture has he knew it. But in imagining the "vast changes" ahead, Nakashima was expressing his thinking about changes in culture and technology. And While he was surely was aware of the darkening clouds of war on the horizon, he could not have anticipated that within the next eighteen months – while basking in the joy of marriage (to Marion in Los Angeles on February 14, 1941) and with the birth of their child, Mira (born in Seattle on February 11, 1942) – that his entire extended family would be required by the United States Government to turn themselves in as "enemy aliens," and be subjected to what was euphemistically termed, "relocation."[42]

An "Inside Room in the Badlands"

When the forces of Japan attacked Pearl Harbor and the United States entered World War II, that tension that existed between American ideals and American practices reached a breaking point. Now Japanese Americans were not just different. They looked like the enemy.[43]

Of the 127,000 Japanese Americans living on the U.S. mainland, most were living in Washington, Oregon and California. The government moved fast and under the guise of "military necessity," it began preparations to forcibly remove all West Cost Japanese Americans to concentration camps away from the coast. As Henry McLemore put it in the *San Francisco Examiner*:

> *"I am for the immediate removal of every Japanese on the West Coast to a point deep in the interior. I don't mean a nice part of the interior either. Herd 'em up, pack 'em up and give 'em the inside room in the badlands …. Personally, I hate the Japanese and that goes for all of them … "*

With anti-Japanese hysteria sweeping the nation, the wheels of mass incarceration were set in motion. By early 1942, Japanese Americans living on the West Coast knew that they would be forced to leave their homes, businesses and friends. These actions by the government were intended to deliberately destroy Japanese American communities on the West Coast. All told, more than 120,000 people would be incarcerated – two-thirds of them were American citizens who would be referred to, euphemistically, as "non-aliens." The rest, born in Japan, were referred to as "aliens ineligible to citizenship."

The words chose by government officials to describe the camps that Japanese Americans would be moved to were "relocation centers". This was a euphemism used to downplay the significance of its actions. These places were, by definition, "concentration camps." This term was used by government officials at the time, and it is crucial to note that "concentration camp" is defined broadly as a place

[42] This included George's parents, Marion's Father and sister, Thelma Hecht, and their daughter Mira who was not quite three months old.
[43] This section of the report draws from didactic texts presented in the exhibition, "Common Ground: The Heart of Community," viewed by the author on November 23, 2024 at the Japanese American National Museum in Los Angeles.

where people are imprisoned not because they are guilty of any crimes, but simply because of who they are.[44]

Despite some differences, all concentration camps have one thing in common: People in power remove a minority group from the general population, and the rest of society lets it happen.

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For the Nakashima and Okajima families, the process of incarceration played out as follows:

George, Marion, and their newly-born daughter, Mira (who was less than three months old), packed up their rental house in Seattle and placed all non-essential belongings in storage at the cabin of an artist friend, Morris Graves. Marion's father, Kinya Okajima and her eldest sister, Thelma Hecht, who were living in Los Angeles, did the same. The two family groups, in turn, gathered at the home of George's parents at 4111 SE Madison St., Portland, Oregon, to await "evacuation orders."

Marion and Mira on the day they left Seattle for Portland. Incarceration lay ahead. Photograph by George Nakashima, dated "March 29, 1942" (Nakashima Foundation Archives, KHPA_049).

[44] America's concentration camps are clearly distinguishable from Nazi Germany's torture and death camps. Six million Jews and many others were slaughtered in the Holocaust.

"Evacuees" – as the government euphemistically called them – were only allowed to take a limited amount of clothing and equipment into the camps. For George, that meant that he left his woodworking tools behind.[45]

In Portland, "Evacuation Orders" were posted on Tuesday, April 28th, giving notice to "all of Japanese ancestry in the Portland area that they will be evacuated by 12 noon May 5."[46]

THE OREGONIAN, WEDNESDAY, APRIL 29, 1942

Japs Get Their Evacuation Orders

NOTICE

Headquarters
Western Defense Command
and Fourth Army

Civilian Exclusion Order No. 34

Bert Newgard (left), captain of the 19th company, veterans' guard and patrol, and Police Captain Jack Keegan, a colonel in the veterans' guard and patrol, shown here Wednesday as they posted among the first notices to all of Japanese ancestry in the Portland area that they will be evacuated by 12 noon May 5.

"Japs Get Their Evacuation Orders." *Oregonian* (Apr. 29, 1942)

[45] The Nakashima's took six bags to the camp. Two suitcases of clothing, a typewriter, a duffel bag, and two boxes for Mira. One for "food" and the other for "essentials." The record of what the left behind and put into storage is recorded in a 1941-42 account book. See: "Incarceration Packing. 1940-41 Furniture orders". Nakashima Foundation Archives. From this record, it appears that George suspended is furniture making operations around April 1, 1942.

[46] "Japs Get Their Evacuation Orders," *Oregonian* (Apr. 29, 1942): 6.

Before their surrender, Nakashima's parents paused for a photograph in front of their home. It is unclear what provisions that they made to secure their property for the future. Another photograph captured George packing family belongings into a friend's car on the morning of May 5th. (these photos are included in a family album; the handwritten annotations on the bottom are by Marion).

Nakashima's parents and their house. Photograph dated, "May 1942" (Nakashima Foundation Archives, KHPA_049). The house remined the family's home after the war.

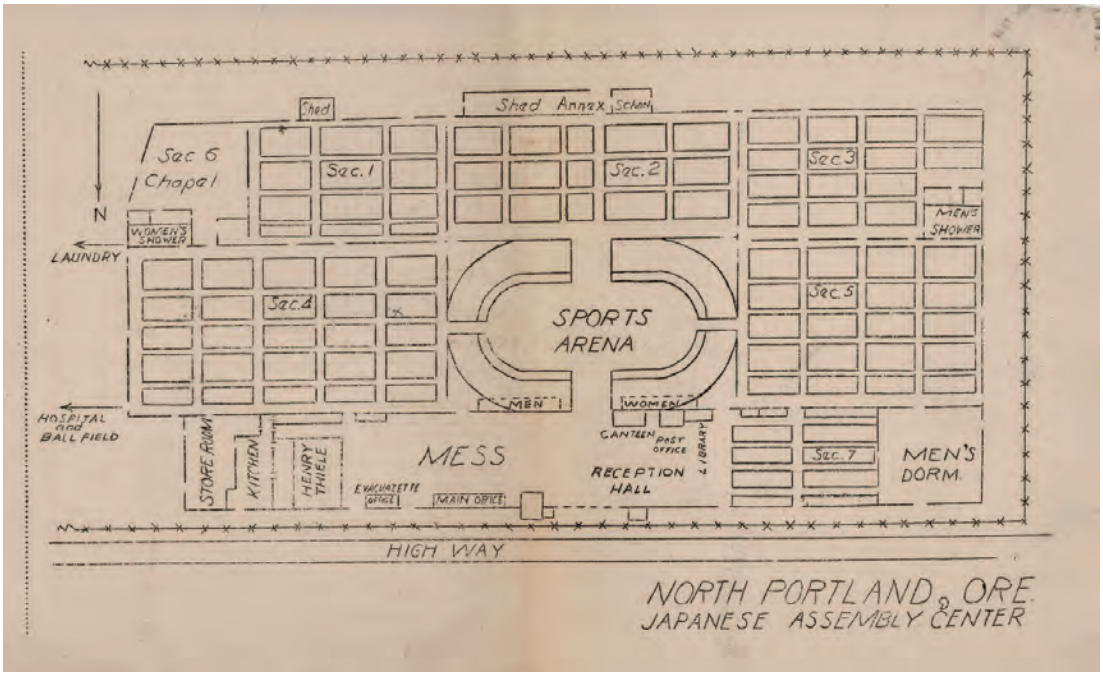
Nakashima packing their belongings into a friend's car on the morning of their surrender. Photograph dated, "May 5, 1942" (Nakashima Foundation Archives, KHPA_049).

For the next four months the family lived under the roof of a massive structure, the Pacific International Livestock Exposition Pavilion in North Portland, a structure that was designed as a livestock exhibition center and rodeo venue. While the Army removed the original pens and stalls of the animals, the stench of the site's former inhabitants remained. Each family was allocated a living area built of plywood panels eight feet high. With the roof of the pavilion some-30 feet above, sounds and smells carried. It was a difficult task to get Mira to sleep. The site was surrounded by barbed wire and controlled by machine gun equipped sentry towers at the corners.

Marion's sister Thelma, provides a first-hand account of the day of their arrival in her journal entry for May 5, 1942:

> *"Pacific International Stockyard Exhibit. All personal pain lost in suffering that little Mira must be here. Exposed to unsanitary conditions. The whole outrageous situation maddens me. Yet, I am helpless."*[47]

Aerial view of the Portland Assembly Center, c. 1942 (Densho Encyclopedia).



The Nakashimas' copy of the center plan, note the "X" in the rectangle at the right most column of Section 4. The building covered 11 acres and housed 3,676 individuals at its peak population (Nakashima Foundation Archives).

[47] Thelma Hecht. Journal entry for May 5, 1942. Nakashima Foundation Archives (folder: "Thelma – journal entries, 1930s – 1950s").

Minidoka "Concentration Camp"

The family was transferred to the Minidoka Relocation Center in Hunt, Idaho in September, arriving on the 9th, a "God-forsaken land of barrenness," as Marion recalled it.[48] In total, the Nakashimas would spend 230 days living in the high, windswept-desert of Idaho – their address, "34-3F" (building 3 in the residential block 34). "The dust and high altitude…makes it difficult to breathe."[49] But what really disturbed Marion was the fact that, "there are no provisions for bathing babies or caring for them. Washing clothes, particularly in cold water, and hanging them to dry in the dust seems rather a thankless job." "There are about three hundred people in each so-called block," she noted, "with one Mess Hall, one laundry, one shower room. The dust laden air irritates our noses, our throats and our lungs. What a place to have to bring babies and old people. It is a mess."[50]

Barrack buildings were identically built and measured 120 by 16 feet. Interiors were divided into four or six tiny "apartments," with a 20 by 16-foot room housing a family of two or more (or three or more single people).

View from the Nakashima's photo album, presumably this shows "Building 34-3F" (Nakashima Foundation Archives, KHPA_049).

Nakashima was employed at the camp with the duty of "design and planning of rooms and housing for social betterment of the project." For this he was paid $19.00 per month. While this may seem a pittance – and it was -- this work afforded him the opportunity of a second "education" in leaning the woodworking practice and skills directly from a well-trained Japanese carpenter, Gentaro "Kenneth" Hikogawa (1902-63).

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[48] Marion's account of the journey from Portland to Minindoka was written on Sep. 11, 1942. Nakashima Foundation Archives (folder: "tk").
[49] Ibid.
[50] Ibid.

Two photos taken outside the Nakashima's quarters, the pile of scrap wood is likely George's woodpile. Photo on left is undated. The photo on the right is dated, Nov. 16, 1942 (the significance of the date is unknown) (Nakashima Foundation Archives, KHPA_049).

While Hikogawa was only a few years older than Nakashima, the carpenter had a defining impact on the architect in his development as a woodworker. Hikogawa had been apprenticed to a traditional Japanese carpenter, or *daiku*, at age 15.[51] By 1924, driven by economic need, he stowed away on a steamer bound for Seattle. In the United States, the objective of making a new start meant that he worked a range of jobs from "waiter, dishwasher and fish grinder," before he was able to return to carpentry work in 1935, when he resumed doing "house repairs and building furniture." Hikogawa was incarcerated along with his family, arriving first at the Puyuallup Assembly Center on May 14, 1942, and at Minidoka on August 21st.

[51] This brief biography draws from the entry for Gentaro Kenneth Hikogawa on the Densho Encyclopedia: Gentaro Kenneth Hikogawa | Densho Encyclopedia Accessed, Dec. 14, 2024.

From v Hikogawa, Nakashima learned not only the use of Japanese hand tools and the traditional methods of joinery, but he also absorbed Hikogawa's reverence for trees. As author David Lane noted in Densho Encyclopedia:

> *For a traditionally trained Japanese carpenter, trees had deeply spiritual, even sacred value demanding lifelong devotion. There was no distinction between work of the spirit and that of the hand; the spiritual life of the tree remained vital from harvesting to finishing. Hikogawa's training grew out of this ancient reverence for wood and spoke deeply to Nakashima who deplored the twentieth century's obsession with mass production and synthetic materials. Reinforced by his previous visits to Japan during which he gained an appreciation for Japan's spiritual traditions, Nakashima was well primed to benefit from Gentaro's spiritual connection to wood.*
>
> *Nakshima also credits Hikogawa with teaching him the proper use and care of dogu, the tools of the carpenter. Dogu literally means the "way of the tool" and demanded rigorous and respectful training. It was not uncommon to spend four hours of sharpening to every six hours of sawing or hand planing a board. As an apprentice, Hikogawa would have spent a year or more just learning to sharpen before his master would allow him to touch metal to wood. He imparted this standard to Nakashima who later expected an equivalent skill from both himself and his employees.*
>
> *Hikogawa's greatest influence on Nakashima may have been his mastery of Japanese joinery, an art form rooted in the nature of his native Japan. Japan's earthquake-prone geology required the use of a staggering variety of ingenious joinery patterns designed to provide flexibility and shock-absorption in an earthquake. Driven by the beauty and abundance of wood in their land and the need for sturdy, flexible construction, Japanese carpenters set the standard for precise and creative joinery. Nakashima wrote appreciatively about Hikogawa teaching him the tenets of fine Japanese joinery. His Conoid Chair exemplifies his mastery of joinery in the tradition of beauty, precision and strength. It is a credit to Hikogawa's early influence.*[52]

Nakashima worked alongside Hikogawa on almost a daily basis. There were practical projects that allowed for the fabrication of flower boxes, tools boxes, and practical items like sawhorses, to be made for the general benefit of the community. One of the activities that Hikogawa and Nakashima engaged in was the collection of the wood from native scrub brush trees, locally known as greasewood or "Bitterbrush," for use in making improvements to barrack interiors. Photographer Francis Leroy Stewart (1909-1992), working for War Relocation Authority, documented examples of this work in December 1942, capturing views of both Nakashima and Hikogawa at work.[53]

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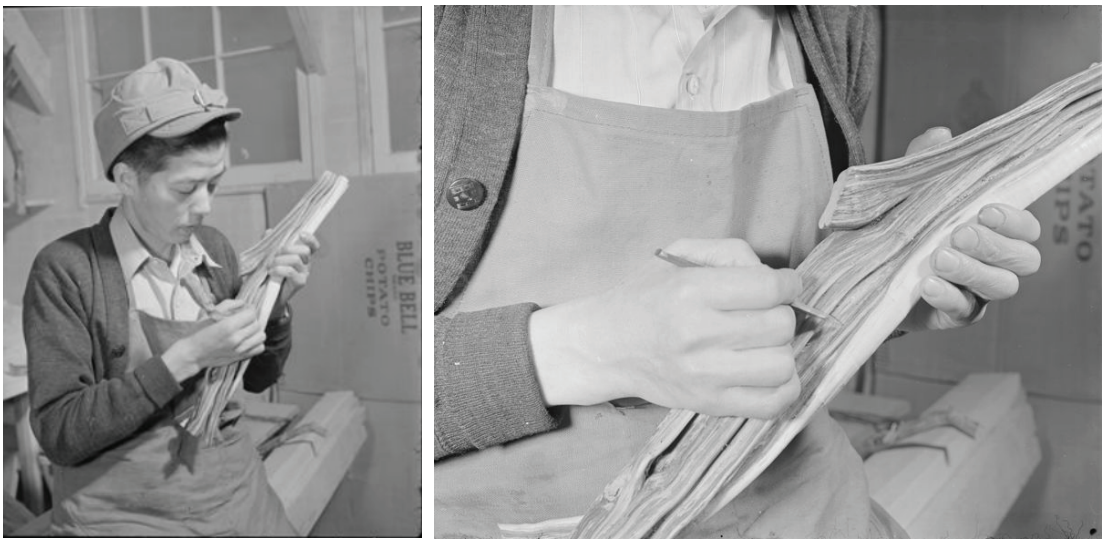
[52] Ibid.

[53] Nine views housed with the National Archives and Records Administration document Nakashima and Hikogawa's work at Minidoka. See: Central Photographic File of the War Relocation Authority (NARA)

Nakashima in his, “Model Room.” Photos dated December 9, 1942 (NARA).



Gintaro “Kenneth” Hikogawa polishing “grease-wood” to make furniture. Photos dated December 9, 1942 (NARA).

Finding "Hope" in New Hope

Leaving the Camp

As soon as was possible the Nakashimas petitioned for clearance to leave the camps. They, "filled out all kinds of papers, wrote letters, had friends write letters and sent telegrams. After about six months, they said that" the Nakashimas could leave the camp.[54] William Emerson, a professor of Nakashima's from MIT's School of Architecture, was among those who came to the family's aid. He successfully reached Nakashima's former employers, Antonin and Noemi Raymond, who agreed, in turn, to sponsor their release.

The Raymonds had last seen Nakashima in July 1938 in Pondicherry and since that time had relocated to New Hope, Pennsylvania – an idyllic corner of Southeastern Pennsylvania that was a haven for artists. The Raymonds did not initially realize the range of artists working in the area, as it was a desire to escape New York City (where they had an apartment and office) and the opportunity to settle their son Claude into a good school that drove their decision making. Soon enough, however, they befriended the sculptor Jo Davidson, and later designed houses for artists, including the modernist painter, Louis Stone.[55]

In New Hope, the Raymonds hoped to find a "saner tempo, a clearer vision, [and the opportunity to] do better work and live more healthful simple lives."[56] Their vehicle for this was a 150-acre farm, complete with a large, 18th century, three-story stone house and large barn that they sensitively renovated and restored in 1939-40.[57] Their driving vision was the creation of a combined living and working environment, with the potential to work closely on the land through farm work and professionally as architects and designers in proximity to the landscape.[58] For several years the scene at the Raymond Farm was a flourish of activities. Pearl Harbor changed that and the circle of young apprentices that had gathered to work for the Raymonds instead put on uniforms and went to war. Raymond, for his part, established a large office based in New York focused on large-scale military efforts.

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[54] Untitled typescript by Marion Nakashima, dated Sept. 11, 1942, the third page of which is a disassociated sheet relating to a story Marion's sister, Thema Hecht writes entitled, "Little Mira." This quote is from the Hecht portion of the manuscript. Nakashima Foundation Archives (folder: "Incarceration 1942-43").
[55] For a details on the Raymond's transition to New Hope and connection to Nakashima, see: *Antonin Raymond: An Autobiography*. Rutland, Vermont; Charles E. Tuttle Company, 1973: pp. 158-195.
[56] Raymond quoted in "A Portfolio of Recent Work by Antonin Raymond, Architect," *Architectural Forum* 75 (Nov. 1941): 343.
[57] Work between April 1939 and February 1940.
[58] For more on the Raymonds and their time in New Hope, see: Kurt G.F. Helfrich, "Antonin Raymond in America, 1939-49" in Helfrich and Whitaker, eds., *Crafting a Modern World: The Architecture and Design of Antonin and Noemi Raymond.* New York, NY; Princeton Architectural Press, 2006: 45-64.

Raymond Farm, c. 1943 (AAUP, Raymond Col.)

Rigid conditions dictated the terms of the Nakashimas' release, chiefly that "Nakashima was not to do any work whatsoever or have access to any military work," within the Raymond office.[59] The Raymonds were required to obtain the consent of their neighbors to having a Japanese-American family staying at the Farm (which they "readily" received) and to provide the family with "living quarters and subsistence."[60] Subsistence included a modest income of $50 per month to support their day-to-day expenses (roughly 1/5 what Nakashima was earning before incarceration).[61] George was tasked with general farm work (including tending to the chickens and house repairs) and Marion was likely responsible for household duties like cooking or cleaning.[62] Their intent was to make a new start and to stay with the Raymonds until more suitable employment opportunities were found.

George, Marion and Mira Nakashima transited from Hunt, Idaho, via Chicago, and were picked up at the Trenton, New Jersey station by Noemi and her sister, Jeanette Allison for the drive to the

[59] Antonin Raymond quoted in a letter to the Editor, Smithsonian Magazine, dated December 7, 1972. The Architectural Archives, University of Pennsylvania (folder: "Corr. RE Nakashima's Claims. AR / Kimura / Sugiyama, Oct. 1972").
[60] Ibid.
[61] Facsimile copy of George Nakashima's, "application for Employment and Personal History Statement", dated September 11, 1943. Michener Archives (Box 9, folder 19).
[62] George reported that he was cooking meals for Mrs. Raymond and Mrs. Allison while Marion was away in Cleveland, Ohio, visiting her father and sister. See letters: GKN to MN, Jan. 20-27, 1944. Nakashima Foundation Archives (folder, GKN to MN, letters, 1944).

Raymond's farm.[63] Their departure from the camp was reported as April 27th, 1943, with an arrival in New Hope likely having occurred on May 1, 1943.[64] As Nakashima described it, "we had nothing, only $100. I had no tools."

Life on the Raymond Farm

At the Raymond Farm, the Nakashima Family took up residence in a large room on the third floor with windows down to the floor. There was a full bath on that floor that was shared with two other bedrooms, although it appears that those may not have been occupied during this period. All told, the Nakashimas would live on the Raymond Farm for just under nine months.[65]

Initial impressions of the Nakashimas' life on the farm were captured by Marion's sister Thelma Hecht, in a narrative she entitled, "Little Mira."[66]

> *"…The farm was very big. There was green grass all over, trees, flowers, and little brooks. There were cows, chickens, pigs, birds, dogs and a cat. There was lots of rich milk to drink and many eggs. Little Mira was kept busy looking at all of the new things…she liked to ride on Daddy's shoulders when he went to feed the chickens. Every time that she would see a dandelion, she wanted to stop and pick it. One day, Mrs. Raymond, Mummy and Little Mira went down to the brook. The dogs went too. They splashed and made the brook muddy. Mummy took off Little Mira's shoes and socks. The water was very cold at first, but soon Little Mira loved to wade. It was fun."*[67]

Removed from the indignities of life at the camp, the Nakashimas could begin to consider the future. George had made a start at furniture making in Seattle and among the individuals whom he reached out to for guidance were the Raymonds.[68] At the camp, he had expanded his carpentry skills working alongside Hikogawa. George was, no doubt, eager to get his hands busy again. As the Raymond's son Claude recalled, Nakashima "remodeled…[the old] milk house and shop" and "started building

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[63] Undated typescript with a text by Thelma Hecht. Nakashima Foundation (folder "Incarceration 1942-1943").
[64] In a letter dated May 5th, 1943, Marion's sister Thema Hecht reports that the Nakashima's left on April 17th while U.S. government records (U.S., Final Accountability Rosters for Evacuees at Relocation Centers, 1942-1946 – accessed via Ancestry.com on December 2, 2024) indicate that the family's "final departure" occurred on April 27th. Perhaps Thelma's dating is simply a typo. Regardless the trip, as she recounts it, took 4 days. See: Letter, Thelma Hecht to family, dated May 5, 1943. Nakashima Foundation (folder "Incarceration 1942-1943").
[65] May 1, 1943 to February 14, 1944.
[66] The "Little Mira" story comprises two parts: the first section – produced in multiple, mimeographed copies -- records the experiences of the Nakashima family (who were incarcerated along with Marion's father and sister) during the traumatic months after Pearl Harbor when Japanese Americans living in Western states were ordered into government detention centers. The story, told from Mira's point of view, captures their time at the Portland Assembly Center, transfer to Hunt, Idaho, and initial reactions to life at the Minidoka Relocation Center. The second section – surviving in letter form – provides an update to the story at the time the Nakashimas were released from the Camp. Letter, Thelma Hecht to Family, dated May 5, 1943. Nakashima Foundation (folder "Incarceration 1942-1943").
[67] Ibid.
[68] See: Letters., Noemi Raymond to GKN, dated Nov. 8, 1940 and Feb. 5, 1942. Michener Museum Archives. (Folder "ltrs to GKN in Seattle and Portland, 1932-44, box. 2, folder 16).

furniture."[69] Presumably the tools that the Raymonds had on hand were used by Nakashima to make his start.

By December 1943, Nakashima had developed designs for "about 25 basic pieces."[70] Roughly half of that number were in prototype form by January 1944.[71] The earliest-known piece of furniture built by Nakashima at the Raymond Farm was the so-called "Milk House Table", completed during the fall of 1943.[72] He had assembled and put into use a "steam box" which was used to fabricate prototypes for what would become his "Straight-Backed Chair."[73] That equipment would also have made fabrication of a prototype for his "Grass-Seated Chair" possible, photographs of which were taken in the living area of the Raymond Farm on February 4, 1944.[74]

Ultimately, Nakashima became disillusioned with life on farm, citing his realization that, "chickens and I were not compatible."[75] The Raymond's had been helpful, but the daily grind of farm work left little time for his creative efforts. In January 1944, he ventured out into the New Hope community to check on prospects for a place of their own. In letters to Marion – who was visiting her father and sister in Cleveland, Ohio at the time – he reports his first real experience of the town of New Hope and of meeting individuals in the local community. From these letters, it becomes clear that the couple had been keeping a low profile. The war was still raging, and recent reports of Japanese atrocities raised concern: Would there be retribution or discrimination against them from the local community? This, happily, didn't occur. In fact, the Nakashimas found a warm welcome among the community. Writing to Marion, Nakashima noted that, "the people in New Hope certainly seem kind and I think we would find it pleasant to live there.[76] After exploring options for living in the town

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[69] Claude Raymond, in an interview with Mira Nakashima, April 8, 2000. See: "Claude Raymond Interview." Michener Museum Archives. George Nakashima Collection ARC2010.10 ("Early Days and Knoll Era (1944-47)", Box 11, Folder 1). In 1972, Antonin Raymond described that, "a shed, a former milk house was put at Nakashima's disposition to serve as a wood working shop and he was free to use any materials at the Farm gratis. This he enjoyed until he move to his own place." See: Letter, Antonin Raymond to editor, Smithsonian Magazine, dated December 7, 1972. The Architectural Archives, University of Pennsylvania (folder: "Corr. RE Nakashima's Claims. AR / Kimura / Sugiyama, Oct. 1972").
[70] Ltr., GKN to Serge Chermayeff, dated Dec. 9, [1943] (copy of original in the Museum of Modern Art Archives). Michener Museum Archives. George Nakashima Collection ARC2010.10 ("Early Days and Knoll Era (1944-47)", Box 11, Folder 1)
[71] Ltr., GKN to Serge Chermayeff, dated Jan. 22, 1944 (copy of original in the Museum of Modern Art Archives). Michener Museum Archives. George Nakashima Collection ARC2010.10 (Folder: "Early Days and Knoll Era (1944-47)", Box 11, Folder 1)
[72] A photograph of this table is date stamped on its verso, "Hayes Photo Service, New Hope, PA, on December 14, 1943." Nakashima Foundation Archives (Series II, Box 2, Folder 2, "Stan-nu Furniture Photos, Milkhouse Table, 1943-44").
[73] A photograph of this chair – taken in the living area of the Raymond Farm, is date stamped on its verso, "Hayes Photo Service, New Hope, PA, on February 17, 1944." Nakashima Foundation Archives (Series II, Box 2, Folder 13, "Stan-nu Furniture Photos, Straightback Arm Chair, 1944").
[74] The photograph is date stamped on its verso, "Hayes Photo Service, New Hope, PA, on February 4, 1944." Nakashima Foundation Archives (Series II, Box 2, Folder 1, "Stan-nu Furniture Photos, Grass-seated Chair, 1944-48").
[75] Nakashima, *Soul of a Tree*, p. 70.
[76] Letter, GKN to Marion Nakashima, dated January 20, 1944. Nakashima Foundation Archives (folder, "Letters George to Marion, 1941, 1944").

center, Nakashima learns of a "lovely" stone house located three miles out on the road to Buckingham.[77] They'd need a car to make it work, but it had the advantage of having a garage that George could use as a shop and, perhaps most importantly, a yard for Mira to play in. By Feb. 5th, all had been confirmed with the rental and through the kindness of artist Lloyd R. "Bill" Ney (1893-1965), they had a car – traded on the promise of George making him something in the future.[78]

Nakashima's, "Milkhouse Table", photographed on in the family's third-floor living quarters at the Raymond Farm, December 13, 1943. Nakashima Foundation Archives [Series 2, Box 2, Folder 2]

Just before leaving Raymond Farm, Nakashima used the Raymond's Ford Woodie Station Wagon to deliver his first commissioned work to a client in New York (Ney's car was more of a fixer-upper than George had realized).[79] On their final night at the farm – February 14, 1944 – the couple celebrated their third wedding anniversary.

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[77] For George's description of the house and its setting see: Letter, GKN to Marion Nakashima, dated January 27, 1944. Nakashima Foundation Archives (folder, "Letters George to Marion, 1941, 1944").
[78] See letters, GKN to Marion Nakashima, dated January 24 and Feb. 5, 1944. Nakashima Foundation Archives (folder, "Letters George to Marion, 1941, 1944").
[79] Comprising a "poplar dining table" and "Walnut bench," commissioned by Juliane A. Smetana of 32 Jones St., New York, NY. See: "Ledger Book, 1944-46", Nakashima Foundation Archives (Series 1, Box 1, Folder 1.). On

A New Beginning

Located five miles north of the Raymond Farm, the Nakashimas' home for the next 32 months was the two-story stone farmhouse (dating to the late 18th century) at 2827 Aquetong Rd., New Hope.[80] Nakashima could now focus on his building his business and he used contacts facilitated by the Raymonds to make a new beginning. Marion begins the task of keeping track of household and work-related expenses – soon calling herself the "business department of the Nakashima enterprises."[81]

The family fixed up the farmhouse and "white-washed interior walls…sand papering any cracks to make a shading from white to gray to yellow."[82] In lieu of curtains "the glass in the windows [was] covered with transparent white paper" – presumably Japanese rice paper shoji.[83] George upgraded the former garage space into a workshop. Scenes of the family at home and work before war's end were captured by the photographers of the War Relocation Board who also prepared a narrative text describing their visit and pointing to the Nakashimas' successful transition.

Nakashimas gathered for a meal at the "Milkhouse Table", Aquetong House. Photo dated May 1945 (WRA photo, UC Berkeley)

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delivery of the pieces see: letters, GKN to Marion Nakashima, dated January 24-Feb. 7, 1944. Nakashima Foundation Archives (Folder: "Letters George to Marion, 1941, 1944").

[80] The house remains standing, but in a much-altered state. The Nakashimas' landlords were Maude and Daniel Bonade. Bonade was a top-level clarinetist who had played with the Philadelphia Orchestra. Daniel Bonade's papers are housed at the Michelle Smith Performing Arts Library, University of Maryland, College Park, MD (Two informal portraits of him that are thought to have been taken in New Hope, are in Box 5, Folder 9; his day diaries for 1944 and 1946 are Box 3, Folder 1.)

[81] Marion as quoted in an untitled article by Gertrude Benson. *The Evening Bulletin* (Philadelphia, PA; June 24, 1950). See also: notebook of household [and business] expenses, April 15, 1944 to August 31, 1945. Michener Museum Archives (Box 7; in basket).

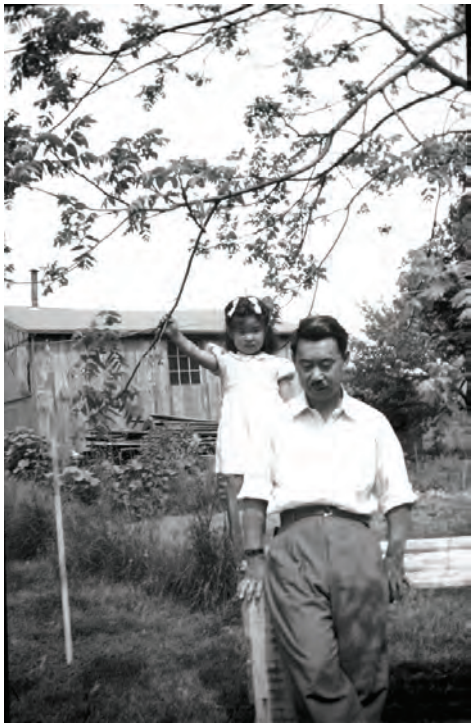
[82] "Relocated Japanese likes Bucks Co." *Bristol Courier* (Jul. 21, 1945 – via Newspapers.com).

[83] "Relocated Japanese likes Bucks Co." *Bristol Courier* (Jul. 21, 1945 – via Newspapers.com).

Marion's father visited in February 1944 and described the situation to Thelma:

> *"This house, of which Marion wrote you, is a very nice one….It is about four miles from New Hope and you can imagine how quiet the surroundings are…no soot no dirty dust and Mira has plenty of room to run around both inside and out. I think this is an ideal place for a child to grow up. The more I think of such matters, I feel that it is almost a crime to raise children in soot and dirty dust in a city."*[84]

The rental house that the Nakashimas occupied from February 1944 to December 1947, as they found during the winter of 1944. Note that the garage has not been altered yet. It will be the location of Nakashima's workshop (Nakashima Foundation Archives)



Family photos taken during the spring of 1944. Note the pile of wood under the window of the garage. Nakashima has started working. (Nakashima Foundation Archives)

[84] Ltr., Kinya Okajima to Thelma Hecht, dated Feb. 21, 1944. Nakashima Foundation Archives (folder: "Thelma-Kinya Correspondence, c. 1910s – 40s").

A circle of friends began to develop, artists mostly, many of whom had been living and working in New Hope since the 1920s. Those individuals were drawn to the inclusive, open-minded attitude among the area community, a community steeped in the Quaker tradition of tolerance. Closely connected by train to the urban centers of New York and Philadelphia – along with the region's inherent natural beauty and its strong regional architecture traditions – were essential ingredients that cultivated an artistic community where music, literature, and art flourished.[85] The Raymonds, along with Nakashima and others, extended the range of that artistic community into architecture and design.

"Bill" Ney – who was on-hand and helpful to the Nakashimas during this transition – had, himself, settled in New Hope in 1925 "for the same reasons artists go anywhere – beauty of the country side, cheap living and a sympathetic atmosphere."[86] Ney was a frequent contributor to exhibitions at the Guggenheim Museum in New York during this period which brought him national attention as a leading non-objective artist. Ney's "circle" of artist friends coalesced in 1930 to form "The New Group" – a collective of modernists pressing against the region's well-known Impressionist school. By 1932, then gathering as "Independents", Charles Evans, Robert A. Hogue, R.A.D. Miller, Ney, B.J.O. Norfeldt, Charles Ramsey and Louis Stone.[87] For a time in 1935, Isamu Noguchi worked in New Hope and exhibited with the Independents.[88]

The sympathetic support of the New Hope community sustained the activities of these artists. By the time of the Nakashimas' arrival in 1943, artists John Charry, Charles Child, Jessie H. Drew-Bear, and Harry Rosin (1897-1973) had established themselves in the area. While many individuals contributed to the overall scene, Sally and Tyson Nimick played an especially important role in making it possible for the Nakashimas, in particular, and for that matter, the Raymonds as well, to put down roots in New Hope and to build their lives there.

As Nakashima recalled:

> *"Through a great act of generosity, a landowner who we hardly knew offered us three acres of land to be worked off on barter, exchanging construction work for the deed. This was true American goodness of heart. With no collateral whatsoever, he offered us the title to our property. His construction plans changed, so we finished paying for the land in money."*[89]

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[85] For the classic – if dated study of this period – see: George S. Bush, ed., *The Genius Belt: The Story of the Arts in Bucks County, Pennsylvania*. Doylestown, PA; James A. Michener Art Museum, 1996.
[86] Artist File, "Lloyd R. Ney". Michener Museum Archives.
[87] For artist Peter Keenan's account of the scene, see: "Close-ups of Life in an Art Colony." *Public Ledger* (Philadelphia, PA; Jun 11, 1933) copy in "Artist File: Robert Hogue." Michener Museum Archives.
[88] For details of Noguchi's time in New Hope, see: Roy Pederson, "The New Hope Modernists," in: Robin Larson, *The New Hope Modernists: 1917-1950.* New Hope, PA; The New Hope Modernist Project, Inc., 1991: 11.
[89] *Soul of a Tree,* p. 70. For the deed records, see: Bucks County (PA) Deed Records (Book 772, p. 328), dated April 17, 1946 and registered April 20, 1946.

The landowners they "hardly knew" were the Nimicks. It is most likely that the Nakashimas became acquainted with the Nimicks through Bill Ney.[90] Ney's wife, Jean Roland Keating, was a childhood friend of Sally Nimick from their days growing up in Pittsburgh together. Sally Todd Nimick (1908-1990), in turn, first came to Bucks County to attend what is now the Solebury School (Holmquist School, class of 1927). She studied art with R. Sloan Bredin (from 1923-27) and Hugh Breckinridge (in Gloucester, Mass during the summer of 1928). In 1929 she was included in the first show at the Phillips Mill in New Hope. That same year she met and married Tyson Nimick – heir to a banking fortune – and the couple settled in Bucks County at "Sycamore Farm."[91] At that time she stopped painting and devoted her energies to raising a family.[92] However, this did not mean that the Nimick's stepped away from art altogether. They were strong supporters of "Independents," and in the years that followed, continued to find ways to support artists and their work.[93]

One way that they did so was to sell, barter or traded pieces of their "Sycamore Farm" estate – both in large and small parcels – to these artists. This included, first and foremost, the Raymonds, who purchased the former Van Sant Farm from the Nimicks in 1939.[94] Six years prior to that, Bill Ney, Jesse Drew-Bear, and Robert Hogue acquired land from the Nimicks (the latter building a house and studio on Old Windy Bush Road).[95] Painter Harry Rosin, after "…a little horse swapping," acquired "a lovely little acre of land, where he set up to build himself a little house and studio" that was located on Old Covered Bridge Road. [96]

As they had done with Rosin, the Nimicks' offered land to the Nakashimas' in exchange for work. In the end, however, given that they changed their minds about a building project, the land would be sold for a cost of $750.00.

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[90] Although it is tempting to speculate that the Nimicks, as neighbors of the Raymonds, came to know of the Nakashimas and their plight as their release from the camps was pending.

[91] Tyson Nimick (1902-1960), youngest child of W. Howard Nimick and Letitia Tyson, was born in Pittsburgh. His father served as president and chairman of the board of the Keystone National Bank. His marriage and the purchase of "Sycamore Farm" occurred within two years of his father's death, allowing him what can be assumed to be a generous nest egg upon which to begin married life. His mother Letitia Poultney Tyson (1863-1949) was a descendant of Ryner Tyson who was one of the 13 families that settled Germantown in 1863.

[92] For details about Sally Nimick see: "Nimick is November's artist" *New Hope Gazette* (Oct. 29, 1987) and "Nimick exhibits at Bank," *New Hope Gazette* (Oct. 29, 1991). She also has an important role in land conservation – a history relevant to the Nakashma and Raymond properties which are contiguous with her "Sycamore Farm". See: "Nimick honored with award from Nature Conservancy," *New Hope Gazette* (Jan. 8, 1987) and "Donation allows purchase of Raymond easement," *Bucks County Herald* (Feb. 10, 2005).

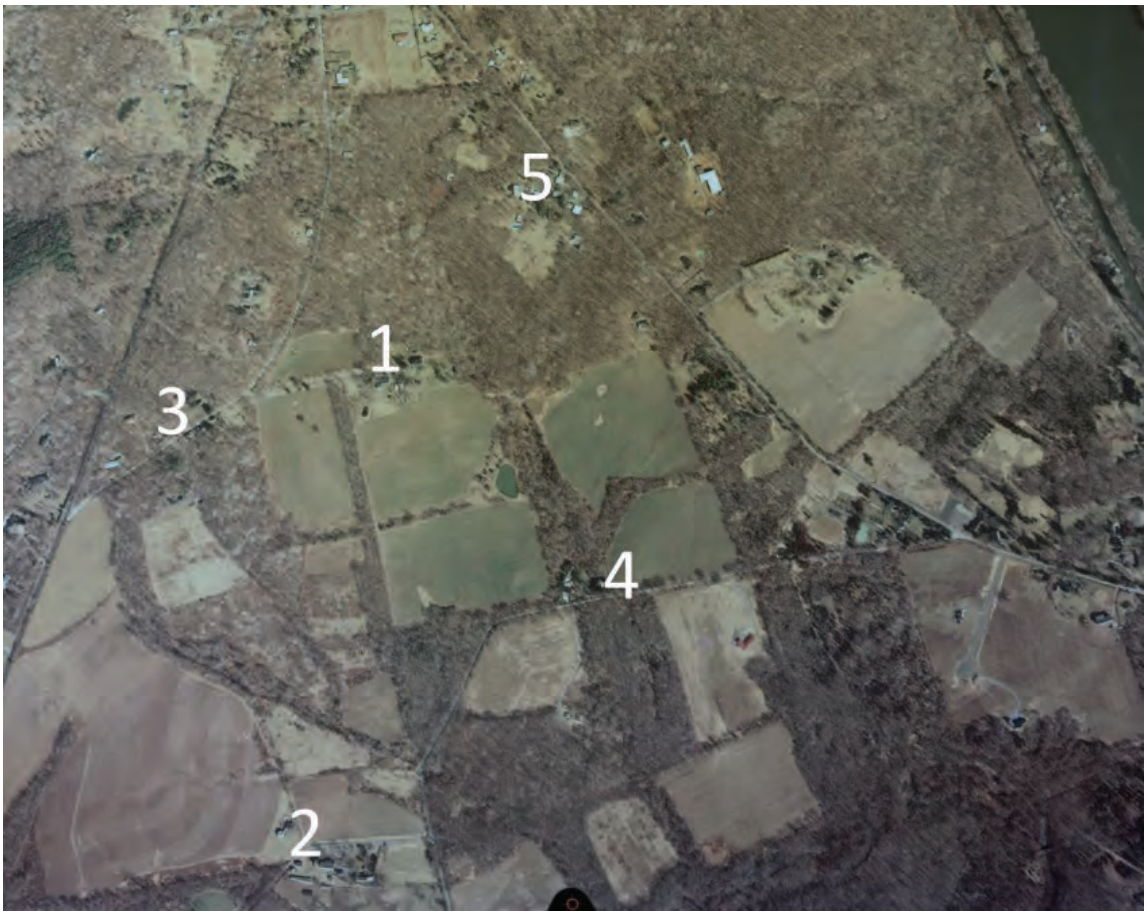
[93] Tyson served as the "business manager" for the group's magazine *The New Hope.* See: "About Bucks Co." *New Herald* (Perkasie, PA; Aug. 16, 1933).

[94] Antonin's records indicate that the Raymonds paid $15,000 for the property in an agreement of sale dated March 28, 1939, with the deed recording occurring six weeks later. Bucks County (PA) Deed Records, Book 677, p. 628, dated May 16, 1939.

[95] Bucks County (PA) Deed Records: Jean K. Ney (Book 615, p. 320, dated Apr 18, 1933); Robert M. Hogue (Book 620, p. 378, dated Sep. 13, 1933); Robert G. Drew-Bear (Book 689, p. 352, dated, Jun. 25, 1940).

[96] Bucks County (PA) Deed Records (Book 689, p. 266, dated Jun 4, 1940, and also, Book 889, p. 519, dated Dec. 13, 1948). For period reporting on the Nimick – Rosin relationship, see: Wayne Robinson. "The House That Art Built," *Evening Bulletin* (Philadelphia PA; Mar. 12, 1941).

Like these other artists, the Nakashima and his family committed to saying; there was something about living in a community called "New Hope" that appealed to Nakashima.[97]



Aerial view, taken in 1979, showing the vicinity of "Sycamore Farm" (labeled #1) and the relative locations to the Nimicks' property of the parcels transferred to: Antonin and Noémi Raymond (labeled #2, property located on Pidcock Creek Rd.); Robert Hogue (labeled #3, property located on Old Windy Bush Rd.); Harry Rosin (labeled #4; property located on Covered Bridge Rd.), and George and Marion Nakashima (labeled #5, on Aquetong Rd.). (Nakashima Foundation Archives)

Bucks County (PA) Deed Records: Jean K. Ney (Book 615, p. 320, dated Apr 18, 1933); Robert M. Hogue (Book 620, p. 378, dated Sep. 13, 1933); Robert G. Drew-Bear (Book 689, p. 352, dated, Jun. 25, 1940).

[97] Paraphrasing Mira Nakashima in conversation with the Author (2016).

PART TWO: CHRONOLOGY OF SITE DEVELOPMENT AND USE (1945-2020)

Site Planning and Design Development: c. April 1945 to c. March 1947

With the property acquisition finalized on April 17, 1945, Nakashima turned his attention to site planning and the erection of a workshop. His goal was to provide first for the needs of his expanding business, and the planning and construction of the family house would have been of a secondary concern. Afterall, wartime building restrictions (particularly for residential building) remained in place at the time and the family's housing needs were accommodated at the rental house at Aquetong.

In making his initial decisions about the site planning, Nakashima established a key characteristic of the site: that it was to be a place of living and working. Family living and recreation spaces were to be entwined with the necessary workspaces, storage buildings and "yard" areas required for the making and marketing of furniture. This mixing of life and work contained a spiritual dimension and was a core value of Nakashima's approach (and the fact that this arrangement should continue is an important, "intangible value").

Taking advantage of the relatively flat, upper half of the 2.736-acre site, Nakashima laid out these principal functions along a roughly east to west orientation, with a gravel driveway aligned to form a loop in front of the house. The workshop's position – in close proximity to the site entrance – facilitated ease of access for shipping, receiving, and customer meetings; its principal entrance faced west with an ample open area for a staging area on the south. The house site, situated about 100 feet to the Southwest of the workshop, was aligned along the crest of a south-facing slope that rose approximately 25 feet above the then-property line. This distance afforded some privacy from the day-to-day work activities, along with a good southern exposure and a view which overlooked a valley to the Jericho mountains. The principal entrance to the house would be from the north (and defined by wall constructed of local stone). The lumber storage "yard" was situated toward the more secluded western corner of the site, presumably to be out of sight from visiting clients. Access was provided via a spur road connected to the cul-de-sac at the house.

Within days of the war's end on August 15th, Nakashima reports having started construction of the "walls" of the Workshop.[98] Building activities continued into February 1946, with February 14, 1946, being recorded as the date that on-site furniture making began.[99] Nakashima expressed a desire to

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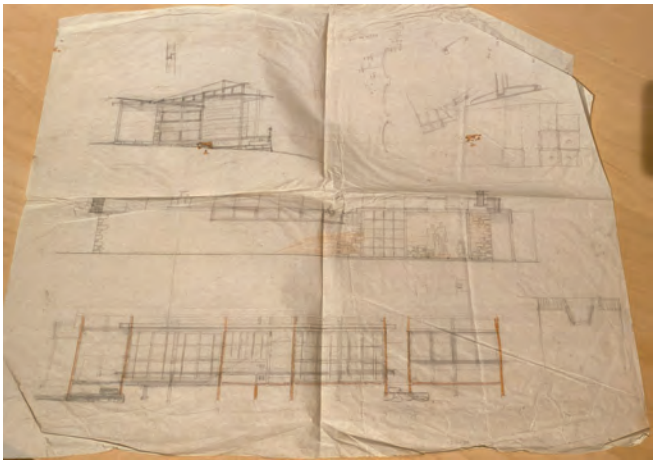
[98] Letters, Parents to GKN, dated Aug. 15 and Aug. 21, 1945. Nakashima Foundation Archives (folder: "Mother & Dad (1947-48) Corr."). Expenses for the construction of the Workshop are documented in the Ledger Book, 1944-46. Nakashima Foundation Archives (Series 1, box 1, folder 1).

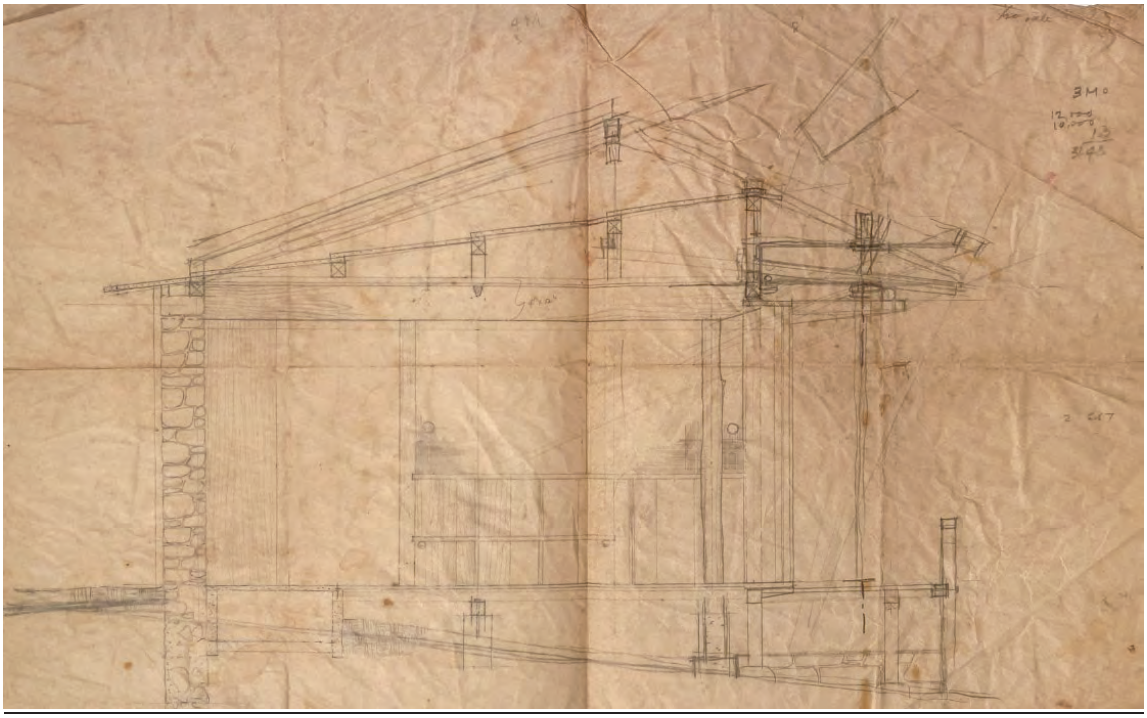
[99] Marion Nakashima began accounting for a portion of their monthly rent ($10 in total) as a business expense due. The last entry for rent (pro-rated at $3.00) appears on Feb. 15, 1946. See: Nakashima Foundation Archives ("Ledger Book," Series 1, box 1, folder 1); GKN reported that he had, "finally finished my new shop and am operating" out of it in a letter sent to Rene D'Haroncourt. See: Letter, GKN to Rene d'Harnoncourt, dated Feb. 14, 1946 (copy of original in the Museum of Modern Art Archives). Michener Museum Archives. George Nakashima Collection ARC2010.10 ("Early Days and Knoll Era (1944-47)", Box 11, Folder 1)

start construction on the house that spring.[100] It can be assumed that the development of the final design for the house occurred at this time.

Two undated drawings – a sheet of preliminary elevations and a detailed cross section – document the house design prior to construction.[101]



Elevations [Michener Museum]



Section study, c. 1946. Note: Nakashima sketched early ideas for 1982 alterations on top of the earlier drawing. [Michener Museum Archives]

[100] Ibid.
[101] Michener Museum Archives (box 3, folder 9, Aquetong Property / Buildings")

House Construction, Phase One (prior to habitation): April 1946 to December 1947

Work in 1946

Work on the house began on, or about, April 8, 1946 with the purchase of lumber (and possibly concrete) along with a supply of "oak" from a local farmer, William Henze. In the months to come, this stockpile of oak was milled by Nakashima into the structural members for the house.[102]

Purchase of a wheelbarrow on April 16th indicates the beginning of the foundation work – most of it "hand dug"; the first delivery of "stone" arriving from the Delaware Quarries on September 3, 1946.[103] Nakashima purchases a "stone hammer" and the constituent parts of mortar (sand, lime, and cement) by month's end.[104] The random rubble north wall of the house is partially completed by the time work is paused for the winter months. Nakashima's wife, Marion, recalled that the whole family assisted in the building of this wall, Mira included.[105] Roof tiles made of cast concrete 42 inches square, 1 inch thick, were prefabricated on-site using a form Nakashima made.

While accounts report that the house was, "90 per cent owner-built," Nakashima was in fact regularly assisted by two individuals starting in October 1946.[106] Roger G. (Gove) Hight (1918-1983), a Marine veteran and neighbor living across from the property, was working in the area as a forester.[107] The other individual was a high-school student, Norman E. Naylor (b. Pennsylvania abt. 1932), whose grandmother, Esther, ran a nearby grocery store frequented by the Nakashimas.[108] The names of several unidentified individuals – "Pinto," "Pifferger," and "Russ" (the latter possibly being Russ Naylor, Norman's father) – are recorded in expense records, although only in mid-May 1947. The name "Francis", possibly Francis Lovett, appears once in April 1947.

Spring and Summer 1947

Construction of the rubble masonry wall resumes in March with a second delivery (roughly equal in cost to the first). Nakashima purchases a "machete", presumably to clear the site of overgrowth.[109] A second purchase of lumber, presumably Oak, from Henze (double the cost of the first), as well as sand and gravel suggest that the work on the stone wall is nearly done and that the roof framing was

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[102] The key source for dating the construction activities at the house through 1947 are found in the "Household Account Book", Nakashima Foundation Archives [Series 1, box 1, folder 2].
[103] Ibid. For Marion Nakashima's recollections see: "Original House", written by Marion Nakashima, c. 1990. Nakashima Foundation Archives (folder: "Kevin's House History").
[104] "Household Account Book". Ibid.
[105] See: "Original House", written by Marion Nakashima, c. 1990. Nakashima Foundation Archives (folder: "Kevin's House History").
[106] As asserted by Nakashima, see: "The house of George Nakashima, woodworker," in *Arts and Architecture* (January 1950): 22-25 and "Designed for Living: George Nakashima handcrafts a house in Pennsylvania." *Scene* (May 1950): 30-
[107] Hight appears to have worked full-time on the house for a period of 10 weeks between early September and the week ending November 22, 1947. See: "Household Account Book". Ibid.
[108] The Nakashimas' monthly expense records show purchases for groceries at "Naylors' on a weekly basis. See: "Household Account Book". Ibid.
[109] Ibid.

underway in May.[110] The work was "difficult," Nakashima recounted, as they were, "trying to build a house and earn a living at the same time."[111]

The pressure to make progress on the house had been dramatically intensified after the Nakashimas learned that their rented house had been, "sold out from under" them.[112] On May 1st, the family took up residency on site in a ten-foot by ten-foot, army surplus tent which already stood on the site. had been erected by Hight – with the Nakashimas' permission – for his personal use.[113]

Expense records for July and August show the purchase of plumbing and sink fittings, along with an expense of $78.10 paid to "Flemington Block" – presumably for 8 x 8 x 16-inch concrete cinder blocks. These blocks were laid to form a crawl space under the house, providing an insulated area for plumbing supply and waste lines (Flemington Block & Supply Inc., established in 1937), as well as structural support for floor beams and under the fireplace.[114] Spruce lath is purchased at this time, confirming preparations for interior plaster work. Poignantly, the expense ledger includes an undated entry for a "mail box" costing $4.39 accounted for in late August.

A set of photos – probably taken by Marion Nakashima – show the tent and capture the scene on the construction site at this time. Mira and her father would go swimming at "the Falls" of Ingram Creek with bars of soap to bathe.[115]

Compound in c. August 1947 [as published in *Jubilee* (July 1953); Nakashima Foundation Archives [Series 12, box 1, folder xx]

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[110] Ibid. See entries for April 14, 1946 for "Oak (Bill Henzy) $49.00" and March 19, 1947 for "lumber (Henze) $100.00".
[111] Letter, GKN to Rene d'Harnoncourt, dated Feb. 14, 1946 (copy of original in the Museum of Modern Art Archives). Michener Museum Archives. George Nakashima Collection ARC2010.10 ("Early Days and Knoll Era (1944-47)", Box 11, Folder 1)
[112] *House and Home* (Mar. 1952), p. 84.
[113] The last entry for "Rent" appears in the April 1947 expenses. "Household Account Book", Nakashima Foundation Archives [Series 1, box 1, folder 2]. Marion Nakashima recounted that the tent was lent to the Nakashimas by Hight who, in turn, had their permission to erect it on site following a marital spat. See: "Original House", written by Marion Nakashima, c. 1990. Nakashima Foundation Archives (folder: "Kevin's House History"). Mira Nakashima recalls that the tent was located near the lumber storage area (conversation with the Author, 2024). Counter to Mira's recollections, a May 1950 article reported that the tent was still standing, "in the yard near the shop." See: "Designed for Living: George Nakashima handcrafts a house in Pennsylvania." *Scene* (May 1950): 37.
[114] Presumably, Flemington Block and Supply Company of Flemington, NJ (established in 1937).
[115] Mira Nakashima, email to author, dated Dec. 11, 2024.

Fall 1947

With winter fast approaching – and the need for the family to move out of the tent and into a heated space – Nakashima, with the full-time assistance of Hight (and 1-2 days per week from Naylor), focused his "entire time" to completing the enclosure of the house, along with the kitchen and bathing facilities.[116] Navy surplus "3/8 inch pressured pure asbestos" panels were used to sheath the house. Roofing materials shifted from his pre-cast system to mass-produced corrugated Transite panels, most likely in an effort to expedite protection of that portion of the house's framing before the onset of winter; a temporary solution that, more or less, became a "permanent" condition.

Nakashima House, construction in fall 1947 (Nakashima Foundation Archives]

By late October, Marian traveled west to Los Angeles (with Mira) for an extended stay with her father (who was suffering from terminal cancer). The expectation was that– upon their return – the house would be ready for occupancy – if even in a primitive form. Elements of the kitchen and end windows were installed by the end of October. When Nakashima reported on his progress a month later, Marion was "glad to hear that the house will be under control when we [return]."[117]

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[116] Letter, Kinya Okajima to Marion Nakashima, dated Sept. 29, 1947. Nakashima Foundation Archives [folder: "Grand-Dad"

[117] Letter, Marion Nakashima to GKN, dated Nov. 25, 1947. Nakashima Foundation Archives [Folder: "'California 1947 (Oct-Nov.)".

Nakashima borrowed a kerosene stove for heating that was outfitted with a small tin oven on top.[118] The family spent their first night together in the house, bundled up on the unfinished floor of the living room, the evening of Sunday, Dec. 7th, 1947, exactly six years after the attack on Pearl Harbor.[119]

In January 1948, George took a moment to photograph the house after a snow fall.[120] These photos show the unfinished eastern portion of the house. Of this time living in an unfinished house during winter was remembered by George as, "bitterly cold," so much so that the faucet in the kitchen froze.[121]

House in January 1948 in a photo taken by George Nakashima (Nakashima Foundation Archives).

[118] Early histories of the house report that the fireplace provided the heating for the house. This was not the case initially (the fireplace was completed in December 1948). That the Nakashimas were making use of a temporary kerosene heater was noted in a letter from George's parents. See: Letter: Parents to GKN, dated Jan. 14, 1948. Nakashima Foundation Archives (folder: "Mother & Dad (1948-50) Corr.").
[119] For Marion and Mira's return itinerary see: Letter, Marion Nakashima to GKN, dated Nov. 18, 1947. Nakashima Foundation Archives [Folder: "'California 1947 (Oct-Nov.)".
[120] Letter, Kinya Okajima to Marion Nakashima, dated Jan. 24, 1948. Nakashima Foundation Archives [folder: "Grand-Dad"
[121] *Soul of a Tree*, p. 71.

Nakashima family with the view to Jericho Mountain. With the general decrease in active farming in the area during the twentieth century, a reforestation has occurred both on the property owned by the Nakashimas and in the property surrounding theirs. Reference to this area of Solebury Township, once regarded as the Jericho Valley, has faded from use with these changes. Photo dated c. April 1948. (Michener Museum Archives)

Photographer John Corcoran captured the Nakashimas in early spring and their still unfinished house for a July 1948 article in *Science Illustrated*; It would be another six months before they moved into their bedrooms. They used a sliding panel – intended for storing firewood next to the fireplace – as a temporary entry into the house while the entrance vestibule was completed.[122]

House Construction, Phase One (post-habitation): April 1948 through December 1950

April to December 1948

With the return of spring, work began again on the house.[123] Nakashima sought help and most likely continued work with the assistance of Roger Hight. Kitchen drawers were installed in May with work

[122] Mira Nakashima, email to author, dated Dec. 11, 2024.

[123] No expense records have been found to document the work on the house during 1948-1950. Developments during this period were frequently noted in letters to GKN by his mother. She fatefully echoed her sons news

on the ceiling in the living room extending into June (made of wide poplar boards that were nailed on one side and secured in place with clips on the other to allow for seasonal movements). Major work occurred in late summer during which time the south facing window wall was finished.

By October the family could move into the bedrooms and at Christmas time, they enjoyed eating baked potatoes and steaks cooked on the newly finished living room fireplace.[124] Nakashima's father sent a special shipment of Bitterbrush (that had been collected by George and Kenny Hikogawa in the Idaho desert) with the suggestion that, "…I think you could use them for your works."[125] At first, Nakashima simply staged pieces in important locations within the house (like the mantle above the fireplace or on top of the Milk House table), and later, used the wood for handles throughout the house, the most prominent of which is the cabinet adjacent to the fireplace.

View of the living room with Bitterbrush incorporated as table displays, above the fireplace and, as Nakashima had done in the "Model Apartment" at Minidoka, as a fixed shelf support (visible at the upper left of the photo). Photo by Hal Kelly, dated c. early 1949. (Nakashima Foundation Archives)

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back in her replies – a boon for historical research as no other sources are currently known to exist. Nakashima Foundation Archives (folder: "Mother & Dad (1947-48) Corr.").

[124]See: Letters, Mother to GKN, dated Oct. 17 to December 25, 1948. Nakashima Foundation Archives (folder: "Mother & Dad (1947-48) Corr.").

[125] Ltr., parents to GKN, dated Nov. 12, 1948. Nakashima Foundation Archives (folder: "Mother and Dad (1948-50) Corr.). Bitterbrush (Purshia tridentata), also known as "grease wood" or "antelope bitterbrush", is a deciduous bush in the Rosaceae or rose family. Native to the western United States, it grows in high desert areas common to the landscape around the Minidoka Relocation Camp, Hunt, Idaho.

The house could now be considered substantially complete, although the finishing touches would extend to February 1952.

Non-potable water was collected from the roof into in a cistern located next to the entrance. A hand pump circulated water from the cistern into the house. Mira Nakashima recalls carrying empty jugs when the family went to visit friends and neighbors and filing them with drinking water until a well was dug in 1952.[126]

The Bathroom had a flagstone floor, and the bathtub was a rectangular box, made of cedar, thought to have been brought with the Nakashimas from the Aquetong House. It was heated by a small wood-coal stove and convection pipes. As Mira Nakashima recalled:

> *"We only had a bath once a week on Saturdays, a special occasion! As we were open to the public only on Saturday afternoons, the other special Saturday treat was frozen chicken pot pies from the corner store, as Mom didn't have time to cook. I don't know exactly when it was converted to a "real" bathtub (perhaps when we got a well?) but there was a low porcelain bathtub when my father faithfully soaked my mother daily in Japanese herbs for her arthritis before she had her hips replaced in 1972 or so."*[127]

September 1949-February 1952

By the fall of 1949, Nakashima focused his attention on wrapping up the final details for the primary bedroom, with work completed by the end of November.[128] Nakashima erected a carport in early 1950 (which stood until 1967); added some shelving in the kitchen by summer – particularly a sliding screen to subtly separate the kitchen from the living area; and in time for the winter of 1950-51, installed an oil-burning stove in the closet space between the two bedrooms for heating (electrical heating panels were installed in the ceiling above the kitchen – although these, apparently, were never made active).[129] It was reported that the house was "finally finished" in February 1952. [130] Ezra Stoller documented this milestone in over 100 views of the house and its interiors, the Workshop, piles of lumber, and even Mira's playground.[131]

The house was published in: *Science Illustrated* (July 1948); *Craft Horizons* (Autum 1949); *Arts and Architecture* (January 1950); *Scene,* (May 1950); Interiors (August 1950); *House and Home* (March 1952); *Jubilee* (July 1953); and *Life* (December 17, 1953).

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[126] Mira Nakashima, email to author, dated Dec. 11, 2024.
[127] Ibid.
[128] Letter, Mother to GKN, dated Nov. 27, 1949. Nakashima Foundation Archives (folder: "Mother & Dad (1949-50) Corr.").
[129] "George Nakashima, his furniture, his home, his way of life." *House and Home*, Vol. 2, no. [?] (March 1952); 80-89. See p. 88
[130] Ibid. p. 86
[131] Ezra Stoller photoshoot #8M, dated Feb. 1, 1952. See also: photoshoot 54k, dated June 1, 1949.

Mira's "mural". Photo dated 2024 (Elizabeth Felicella)

Mira's Murals

Beginning in 1952, Mira Nakashima started painting a mural on the sliding closet doors in her bedroom. The scenes capture an idyllic rural landscape of trees and animals in springtime, with a deer leaping across a flowing river. The barn, particularly the silo, is reminiscent of a pair of metal silos that the Raymonds added to the barn at Raymond Farm which Mira would lived a played around. The "house" depicted I the scene bears a striking resemblance to a "doll house" that her father made for her.

Mira's "doll house" in 1948 (Michener Museum Archives)

The House as a "Showroom" (1948-54)

When completed, the Nakashima House served not only as a house but as a space for visitors and clients to experience his furniture designs in a "harmonized unity" with an architectural setting.[132] Expense records itemize costs for entertaining – including food and alcohol, while family letters capture the reality that Marion – in addition to her role as a business manager – also must have spent a lot of time in kitchen. Privacy was an issue, and while the Nakashimas, characterized as "amiable extroverts" by a contemporary author, they expressed a real strain in hosting "the parades of prospective customers who stalk in stocking feet to look longingly at the family furniture."[133] To provide some relief, a substantial portion of an extension to the shop – completed in November 1951 – was dedicated to hosting customers.[134] That space was soon thereafter (September 1954) supplanted by a dedicated Showroom (which also could occasionally serve as a guest house).[135] With this structure, sales activities were consolidated into a single location.

At this point in time, the family house could now simply be a family house.

Site Expansion, 1954-60

The Nakashimas expand their landholdings in the 1950s to provide for the growth of the business.[136] They returned to Tyson and Sally Nimick (who sold their original parcel to the Nakashima's in 1945) in 1954 and 1960 to acquire an additional 5 ½ acres. In 1957 – to provide for a dedicated road suitable for large vehicles – the Nakashimas acquire a strip of land approximately 50 feet by 817 feet from Valentine and Elizabeth Chamberlain, their neighbors to the north. (This constitutes the site in its current form).

On this property a series of buildings are erected, including: Warehouse (now Finishing Building; 1954-55); Conoid Studio (1956-58); Lumber Storage, or "Kura" (1958-59; expanded in 1961); and the Arts Building & Cloister (1964-67).

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[132] Mira Nakashima singled out this quality as essential to their success. See: *Nature, Form and Spirit: The Life and Legacy of George Nakashima*. New York, NY; Harry N. Abrams, Inc., 2003, p. 76-77.
[133] *House and Home* (March 1952), p. 88.
[134] Marion Nakashima's narrative description the "Showroom" notes that the house and a part of the Workshop were used for display. Nakashima Foundation Archives (folder: "Kevin's House History").
[135] The Showroom was widely published. See: "Romantic Realism," in *Architectural Forum* (May 1955): 150-153.
[136] See Bucks County (PA) Deed Records, including: Tyson and Sally T. Nimick to George K. and Marion S. Nakashima, dated October 4, 1954 for 1.642 acres at a cost of $1,642.00 (book 1194, p. 487). Valentine B. and Elizabeth C. Chamberlain to George K. and Marion S. Nakashima, dated January 3, 1957 for 0.970 acres at a cost of $966.00 (book 1350, p. 280); Tyson and Sally T. Nimick to George K. and Marion S. Nakashima, dated March 18, 1960 for 3.818 acres at a cost of $9545.00 (book 1534 p. 157).

House Construction, Phase Two: 1955-1956

c. May 1955-November 1956

The first substantial modification to the house occurred in 1955-56 following the birth of the Nakashima's son, Kevin on December 18, 1954. This addition, which comprised a 193.5 square foot room, measuring 13'-10 5/8" by 13'-8 7/16", was built on the south side of the house at a level two-steps lower than the floor level of the original structure and covered with a simple shed roof (the angle of which matches the timber awning over the primary bedroom window). Known initially as Mira's room, the space was, in fact, far more extensively used by Kevin. As Mira recalls it:

> *"When I went to college in 1959, the lower bedroom was still mine, even though I wasn't home much. I think Kevin must have stayed in the middle bedroom. I remember when I came back with my oldest baby in 1966, [the baby] slept in one of the cabinet drawers until Dad drove me to our new home in Pittsburgh in the old T-bird….it was after 1966 that Keven moved into the lower bedroom where he remained until our father and mother both died. When he moved into my parents' bedroom after our mother died in 2004, it appeared that he just removed some of Dad's clothes from the closes and drawers and left everything else pretty much as it was when they were alive, including my mother's teddy bear collection. He did pass along to me some of my mother's dresses and jewelry in her jewelry box."*[137]

There are no known drawings for the addition and the only evidence associated with the construction process is an invoice submitted by Francis L. Lovett, general contractor, to the Nakashima's, dated December 5, 1955, that covers work completed between October 27th and December 7th.[138] This invoice is marked up in red pencil to itemize work categorized for accounting purposes as personal expenses (labeled "Mira") from those expenses incurred on behalf of the Nakashima's business interests. From family correspondence, it appears that work on the addition may have started as early as May, but that the majority of the work was done in the fall.[139] Nakashima reported to his mother that the floor had been installed and that the addition would "almost" be finished in time for Christmas.[140] Central heating for the addition was installed in November of 1956.[141] Ezra Stoller photographed the completed interior on September 11, 1962.[142]

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[137] Mira Nakashima, email to author, dated Dec. 11, 2024.
[138] Billing, dated December 5, 1955, Francis I. Lovett to GKN. Nakashima Foundation Archives (folder, "Contractor Records – for construction dates 1952-1957: Francis Lovett").
[139] Ltr., Mother to GKN, dated May 23, 1955. Nakashima Foundation Archives (folder: "Mother & Dad (1954-56) Corr.")
[140] Ltr., GKN to Mother, dated Dec. 22, 1955. Ibid.
[141] Billing, dated December 1, 1956, Francis I. Lovett to GKN, covering work done on Nov. 14 and 28th, including repairs to roof and installation of a flue liner. Ibid.
[142] Ezra Stoller photoshoot #139x, frame 17.

Extending the Amenities for and Extended Family

The Nakashimas made a series of building additions to the site to serve the family's needs. These include a pool and a pool house (1960-61) sited at the southern corner of the original plot – the latter featuring a dramatic conoidal plywood shell roof structure (the prototype of which is sited directly to its east and was erected with Mira's assistance), as well as an "outdoor room" design commissioned in 1958 by the Simpson Lumber Company as a marketing scheme for redwood. The "lanai" element, built of concrete and redwood, provided shelter for working and seating area. Nakashima integrated a "Chinese Barbeque" into the retaining wall for smoking meats.

These spaces were readily usable for the entertainment of clients. In fact, in the 1960s and beyond, the Nakashimas held annual [flower festivals] every May hosting their customers in a celebration of the Cherry blossoms.

In the fall of 1967, the original carport was demolished and replaced with a one-car garage building with an ample workspace and laundry facility.[143]

Mira's Family and Return

In the fall of 1959, Mira Nakashima left home to attend Harvard University. She majored in General Studies with a focus on architecture. After graduation in 1963, she decided to enroll in a Master of Architecture program at Waseda University in Tokyo, affording her the opportunity of living in Japan (and learning to speak the language fluently) for a period of two and a half years (Oct. 1964 to May 1966). While in Tokyo, she met and married Tetsu Amagasu, attending her graduation with a "baby in her arms."[144] The couple has four children, including: Satoru "Ru" (b. Tokyo, 1965); Maria (b. Trenton, Oct. 1966); Shanti (b. Pittsburgh, Nov. 1968); and Misha (b. Doylestown, 1972). The family moved to the United States in 1966, taking up residence in Pittsburgh (where Tetsu worked as an architect), before settling in New Hope in 1970 (Husband and wife separated in 1975 and finalized a divorce in 1980).

To accommodate his daughter and her growing family, Nakashima had purchased a plot of land across Aquetong Road from the Woodworker complex, designed and built them a house. The house was completed in early 1971.[145] A guest house was built adjacent to Mira's House which was used by her grandmother during her yearly visits. Neither of the two family houses could accommodate the growing clan during holiday times and the desire to do so was – at least in part – the impetus for the building of the Reception House, or "Sanso Villa." It was completed in 1977.[146]

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[143] Nakashima Foundation Archives (Deprecation Ledger book, "Residence").
[144] Mira Nakashima (conversation with author, 2024)
[145] Nakashima's design drawings are dated April 7 to October 21, 1969. 35mm color slides showing house framing and completed interiors are dated January 1970 and April 1971 respectively. As he had done at the time of the completion of the House, Ezra Stoller captured not only the house, but also the family at home (photoshoot #13JJ, dated May 17, 1973).
[146] The house built between 1974 and 1977. Ezra Stoller photographed it in December 1977 (see photoshoot #18NN).

With her return to New Hope, Mira began working for the family business. At first, she learned the ropes of the company management alongside her mother (and would continue to work in this way until her father's death in 1990). As a mother of four, there was little time at first for Mira to gain experience in the shop. But when she could, she worked with Adam Martini in finishing and later with Jimmy, Mario and Jerry in the shop. Her brother Kevin worked most closely with their mother in the office.

In welcoming his daughter into the family business, Nakashima laid the groundwork for its continued success as a "living tradition."

Nakashima family gathered in Reception House, 1977 [Ezra Stoller]

House Construction, Phase Three: 1982

c. April to August 1982

At age 77, Nakashima undertook alterations to the family house. Leaks in the original roofing – as well as a desire to make the house more energy efficient – led him to reconfigure the roof (providing ample room for insulation), and to extend the interior by about three feet by incorporating the deck into the interior of the house. [147] New windows and a large Pella patio door were installed; a "moon-viewing platform" provided for outdoor seating.[148] Modifications were also made in the living room where the built-in seating was removed and replaced with cabinetry. The original paneling was relocated and incorporated into the kitchen cabinetry and the door to the bed rooms. Drive-it was applied to the house exteriors.

Nakashima House, summer 2020 (Elizabeth Felicella)

For Mira Nakashima, the modifications to the experience of the interiors were striking:

> *"I remember the nice sunny porch which ran almost the entire length of the old house before the roof expansion….Mother must have requested more storage space, but I missed all those glass sliding doors letting the sunshine in in wintertime, and the openness to the hillside view of the forest below."*[149]

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[147] Michener Museum Archives (box 3, folder 9, Aquetong Property / Buildings")
[148] For general contractor Lucien Peebles billing records (dated April to August 1982), see: "House Renovations" Nakashima Foundation Archives.
[149] Mira Nakashima, email to author, dated Dec. 11, 2024.

Kevin's House, 2004-2020

Marion Nakashima's death in 2004 resulted in the transfer of the house property to her son. Kevin, who had been born in Doylestown Hospital in 1954 and – excepting for a semester of study abroad in Japan – lived the entirety of his life in the house. In 2008, alterations were made to the bathroom to provide him with the ease of a walk-in bathtub.[150] Kevin Nakashima died on November 7, 2020 at Doylestown Hospital.

In the time of his ownership the house and its contents remained remarkably unchanged. His parents' clothing and possessions remained – more or less – where they had left them. Family photo albums, letters and other precious possessions tucked away for safe keeping. Tours of the house interiors were rare, and few, if any, photographs document the current configuration. The only items that struck a discordant note with his father's sense of integrated interior were a Barcalounger recliner, a wide-screen television, and a stack of video cassettes and dvd's.

The house and its contents were transferred to the ownership of the Nakashima Foundation by bequest of Kevin's estate.[151]

[150] Records documenting this work – which included installation of a new sink, removal of a step and partition in the toilet area, modification to the linen closet, replacement of the tub, relocation of the wall light, and installation of the wall -- can be found in: Nakashima Foundation Archives (folder: "Kevin's House History").
[151] Inventories of the contents of the house were prepared by Marion Nakashima in 1990 following her husbands death. See: "House Inventory and Description," dated August 7, 1991 and "House Furnishings", dated January 1992. Nakashima Foundation Archives (folder: "Kevin's House History"). Following Kevin Nakashima's death, Zoriana Siokalo completed an inventory of furniture, fine art and decorative arts (2022-23) and, later, an inventory of books, copies of which are kept by the Nakashima Foundation Archives.

George Nakashima and his “world”, c. April 1948. (photo by John Corcoran for *Science Illustrated*, Michener Art Museum Archives)

The Family House (at right), while inhabited at this time, remains in an incomplete state. Nakashima, seated on a Plank Stool, is flanked by two chairs of his design. In the foreground is his “Milk House Table” and upon that is a piece of “Bitterbrush” that he gathered during his incarceration during World War II. This composition of woodworker and his work occurs atop of a pile of wood planks, left out in a yard space to dry. Visible behind Nakashima is the Workshop (the first building erected on site), and his car, a connection with the outside world.

EVALUATION OF SIGNIFICANCE

As an integrated environment by George Nakashima

George Nakashima (1905-1990) began his professional career as an architect before committing to a life as a woodworker. Nakashima's earlier work connects with his time at Antonin and Noémi Raymond's office in Tokyo. There, Nakashima absorbed the Raymonds' synthetic approach and practice through projects like the Raymond's Summer Studio (1933) and the St. Paul's Catholic Church (1934-1935), both in Karuizawa. In 1937, on behalf of Raymond's office, Nakashima traveled to India to supervise the construction of a dormitory of disciples of Sri Aurobindo. His work at the ashram became a pivotal moment in Nakashima's life both outwardly and inwardly that shaped his spiritual and philosophical approach to woodworking and architecture.

All the above experiences proved influential to the creation of his singular approach to design. Economic struggle in the US and racial upheaval caused by the war affected Nakashima, as other of his contemporaries. It was in his 40s when Nakashima made a seminal contribution to woodworking in the United States, the free-edge furniture, which brought him both national and international recognition.

His shift to furniture making didn't preclude Nakashima from architecture. Perhaps, it enhanced his conviction on the integration of architecture, furnishing and landscape. His career resulted in a handful of designs, which were mostly concentrated in New Hope, Pennsylvania. The Nakashima Family House is one of over a dozen designs built on the family property built there between 1945 and his death in 1990, and it served as the primary family dwelling for 73 years.[152]

The Nakashima Family House is of national significance through its association with George Nakashima "one of America's most eminent designer-craftsmen and a significant force within the American Craft movement of the mid-twentieth century." Nakashima himself, designed and was largely responsible for the construction of the building, furnishings, and larger setting.

In the context of his buildings at New Hope, the Family House is of paramount significance in that it embodies the emergent moment where Nakashima's independent (or, perhaps, singular) search for enlightenment and understanding come alive through a nexus of physical action (through the work of the hands) and a striving for spiritual transcendence (through the engagement of the mind). He sought this not just as an expression of beauty conceived and built in piece of furniture, but through the creation of integrated environments.

[152] The family first inhabited the house on December 7, 1947 – absolutely and by coincidence – exactly six years after the Japanese attack on Pearl Harbor. Both George and Marion Nakashima lived in the house for the rest of their lives. Their son, Kevin, lived – except for a period of a few months when he studied abroad – the entirety of his life there. Upon the death of his parents, Kevin become the sole-owner of the house and it was, in turn, bequeathed to the Nakashima Foundation for Peace upon his death on November 7, 2020. Mira Nakashima lived in the house until the fall of 1959 when she left home to attend college.

Of particular value is the fact that Nakashima largely built the house with his own hands and that his wife, Marion, and daughter, Mira, both contributed their efforts in the erection of the stone wall that defines the structures northern flank. The hand-painted mural created by Mira for the middle bedroom is of additional value, especially given the fact that she carried on the work of her father following his death in 1990.

As a site associated with Japanese American experience during the twentieth century

The Family House is of national significance for its connections to the Nakashima family's experience of incarceration as Japanese Americans during World War II. The Nakashimas' decision to settle in New Hope and to build their lives here is directly predicated upon the American government's policy to destroy Japanese American communities and to disaggregate the population away from the West Coast under the guise of "military necessity." That the Nakashimas' were welcomed in New Hope and found a supportive community there is important, and significant in and of itself, but that is beside the point: it was very much the anti-Japanese racism of that period that put them on the path to New Hope in the first place.

Social and racial injustice runs deep within the contours of American experience, and accounting for the degradation of life the Nakashima family experienced during their detention at the Portland Assembly Center in Portland Oregon and the Minidoka Relocation Camp in Hunt, Idaho is a narrative best explored through the interpretation of the Family House. Further, Marion and George Nakashima's fathers, Kinya Okajima and Katauharu Nakashima, extend the family's experience of anti-Japanese sentiment and racism back to the turn of the twentieth century through their designation as "aliens not eligible for citizenship" at the time of their arrival in the U.S. Both men were involved in lobbying and advocating played roles in the passage of the Immigration Act of 1924 which represented a great indignity to the Japanese American population. Both had deep and complex experiences working as educated interpreters for their countrymen working as laborers and brought their wives to this country as "picture brides."

That the Nakashima and Okajima families found success in providing for the college education of their children and that George and Marion Nakashima were able to provide for the success of their family is a testament to the resilience of the Japanese American people. The very fact that the Family House exists and that is signaled the beginnings of Nakashima's professional success, and that he reached the very highest levels of art in his time, extend this theme.

A key element in interpreting this experience in the tangible materials that make up the Family House is Nakashima's use of Bitterbrush for handles and free-standing decorative elements within the structure. This wood, native to the Idaho high desert, was collected by Nakashima and his mentor Gentaro Hikogawa during their captivity at Minidoka. They first incorporated this material into their work at the camp, as "improvements" to barrack interiors, for themselves and follow prisoners. In the Family House, the wood is used in a variety of locations. It is recommended that a inventory be made of the instances where the wood is used in the house in fixed locations. It is also recommended that a survey of historical photography and other records be made to inventory and physically account for the present whereabouts of free standing pieces that have been displayed in

the context of the house. This is not to discount the historical value and significance of other objects associated with the house (such as the suitcases they brought with them to the camp), or family objects, works of art, or Nakashima's furniture for that matter.

It is recommended that the Foundation engage a photographer to document the house and its interiors in its current configuration for submission to the Historic American Buildings Survey and in digital formats for its own use. The house was last documented photographically in 1962. Extensive changes occurred in 1982 that warrant documentation.

A rare interpretation of modernist ideas with vernacular traditions in the Eastern United States

The house is demonstrative of Nakashima's interpretation and combination of modernist structural and environmental design theory with traditional Japanese and local vernacular building and landscape techniques, which stem from his apprenticeship and earlier experiences.
This is an architecture that blends traditional materials such as wood and stone, with modern manufactured materials such as plywood, structural concrete block, and poured concrete. George Nakashima's consideration on integration of interior space, architecture, and landscape, shaped the distinctive character of the House, along with a consideration for orientation, bioclimatic principles, setting and views.
There is a clear connection between furniture and architecture through aesthetic and functional principles as well as the use of fine manual skills.
Nakashima's works in America, particularly the Family House, along with a body of work completed in the Northeastern United States by his mentors the Raymonds, and other of their key followers (such as Junzō Yoshimura and David Leavitt), constitutes a significant example of the adaptation (or translation) Japanese principles into the creation of a humane, regionally responsive modernism. By extension, this body of work is central to understanding and assessing the impact that Japan and its craft traditions had on postwar America. The larger context for this is a reassessment of the sources that inform the making of American architecture and that there is much to be discovered in looking not just to European examples, but also to the spatial sensibilities and craft traditions found in Asia and the cultures of the global south.
As a Historic Artist's Home and Studio located in an Intact Landscape
It was in New Hope that the Nakashima's found a welcoming, tolerant community, and more specifically, integrated themselves with a circle of artists, many of whom had been living and working in New Hope since the 1920s. Those individuals were drawn to the inclusive, open-minded attitude among the area community, a community steeped in the Quaker tradition of tolerance. Closely connected by train to the urban centers of New York and Philadelphia – along with the region's inherent natural beauty and its strong regional architecture traditions – these were essential ingredients that cultivated an artistic community where music, literature, and art flourished. The Raymonds, along with Nakashima and others, extended the range of that artistic community into architecture and design.

The quality of the larger landscape setting for the Family House, at one time identified as the "Jericho Valley," is of significant value to the interpretation of the site and historically important for its place in attracting artists to the area in the first place. The area maintains a strong rural feeling

connected with the cultural heritage of Quaker settlement dating back to the 18th century. That quality has been protected, in part, through land easements and open space preservation initiatives at the township level. The property of both the Raymond Farm and the Nimick's "Sycamore Farm," are protected through significant contributions made by their descendants, and there is value to considering how the properties in both the Foundation's and the Family's ownership may contribute to the preservation of this larger setting. .

Degree of wholeness and intactness

It is important to remark that the Nakashima House possesses high integrity in design, setting, materials, craftsmanship, and feeling. The building served as the primary family dwelling for 73 years, and as such, embodies the life history and stories of the family – this is the nexus where the living side of a living working environment occurred. The changes to the house over time respond to changes in the way Nakashima related to family and the outside world.

The house continues to house a specific collection, from cookbooks to furnishings and artwork, and may be an ideal place with which to present the life of Kevin Nakashima through maintaining the interior furnishings as he left them.

Period of Significance

The period of significance of the Family House as articulated in the National Historic Landmark Nomination is 1946 to 1982. This study recommends that the period of significance be amended to reflect the on-going inhabitation through the lifespan of their son Kevin who passed away in 2020. There is an intangible value in recognizing that the house was rarely, if ever, opened up for visitation and interpretation after the 1950s. This reflected choices made by Nakashima, his wife, and later his son, to keep the Family House as a place apart from the areas of the campus dedicated to the making and marketing of furniture. To make this structure a "showroom" again would run against Nakashima's intent.

APPENDIX – A

KNOWN HOME ADDRESSES OF GEORGE NAKASHIMA

June 1905 to c. 1906	S 214 Washington Street, Spokane, Washington *noted as the location of his birthplace*
c.1906 to c.1908	324 Third Avenue, Spokane, Washington
1912 to c. 1930	3808 South Genesee Street, Seattle, Washington
Dec. 1931 to Jan. 1933	76 Columbia Street, Albany, New York
March to June 1933	Rue des Plantanes, Paris 14e, France
Jun. 1933 to Feb. 1934	99 Rue Mademoselle, Paris 11e, France
Mar. 1934 to Dec. 1937	11-3 Chome, Higashikamata, Kamata-Ku, Tokyo, Japan *mother's ancestral home; grandmother's house (historical address)*
Dec. 1937 to Oct. 1939	6 Rue de Marine, Pondicherry, India *Sri Aurobindo Ashram*
May 1940 to Jan. 1941	4111 S.E. Madison Street, Portland, Oregon (parent's home)
Feb. 1941 to Mar. 1942	2413 10th Ave., North, Seattle, Washington *first residence of George and Marion Nakshima Family*
Apr. 1942 to May 5, 1942	4111 S.E. Madison Street, Portland, Oregon (parent's home)
May 1942 to Sep. 1942	Wartime Civil Control Administration (W.C.C.A.) Assembly Center, North Portland, Oregon *Pacific International Livestock Exposition Pavilion (section 4)*
Sep. 1942 to May 1943	Minidoka War Relocation Authority (W.R.A.) Camp, Hunt, Idaho *Concentration Camp (Building 34-3F)*
May 1943 to Feb. 1944	6370 Pidcock Creek Road, New Hope, Pennsylvania *Antonin and Noémi Raymond Farm*
Feb. 1944 to Dec. 1947	2827 Aquetong Road, New Hope, Pennsylvania
Dec. 1947 to Jun. 1990	1847 Aquetong Road, New Hope, Pennsylvania

GEORGE NAKASHIMA FAMILY HOUSE

George Nakashima Foundation for Peace

1847 Aquetong Road, New Hope, Pennsylvania 18938

CENTER FOR ARCHITECTURAL CONSERVATION

GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
John Hinchman - Project Supervisor, University of Pennsylvania
Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

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JUNE 2024 (SOURCE: CAC)

DRAWING SHEET LIST

ARCHITECTURAL DRAWINGS
SHEET 1 DISTRICT SITE PLAN
SHEET 2 SITE PLAN
SHEET 3 FOUNDATION PLAN
SHEET 4 MEASUREMENT GROUND FLOOR PLAN
SHEET 5 GROUND FLOOR FURNITURE AND REFLECTED CEILING PLANS
SHEET 6 ROOF PLAN
SHEET 7 NORTH & WEST & SOUTH & EAST ELEVATIONS
SHEET 8 SECTIONS A & B
SHEET 9 SECTIONS C & D
SHEET 10 SECTIONS E & F

PRESERVATION DRAWINGS
SHEET 11 BUILDING EVOLUTION OF NAKASHIMA HOUSE
SHEET 12 PHASE ONE MODIFICATION PRE & POST HABITATION
SHEET 13 PHASE ONE STONE WALL AND CRAWL SPACE
SHEET 14 PHASE ONE FOUNDATION & FLOORING SYSTEM
SHEET 15 PHASE ONE POST & BEAM FRAMEWORK
SHEET 16 PHASE ONE SOUTH VERANDA
SHEET 17 PHASE ONE ROOF ASSEMBLING SYSTEM
SHEET 18 PHASE TWO CONSTRUCTION OF KEVIN'S BEDROOM
SHEET 19 PHASE THREE HOUSE MODIFICATION
SHEET 20 PHASE THREE GABLE ROOF CONSTRUCTION

SURFACE HATCH LEGEND

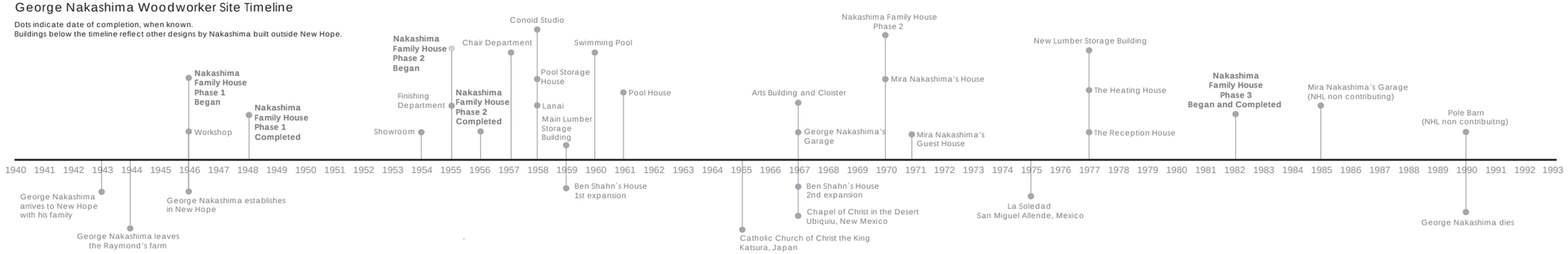
- Rubble Stone Wall/Floor
- Concrete Unit Masonry
- Concrete Footings/Slap
- Cementitious Topping
- Wooden Roof Shakes
- Gypsum/Plaster Surface
- Asbestos Concrete Panel
- Exterior Roof Insulation and Finish
- Exterior Roof Copper Finish
- Wall/Floor Wooden Panel
- Ceiling/Cabinet/Partition Wooden Panel
- Wallpaper

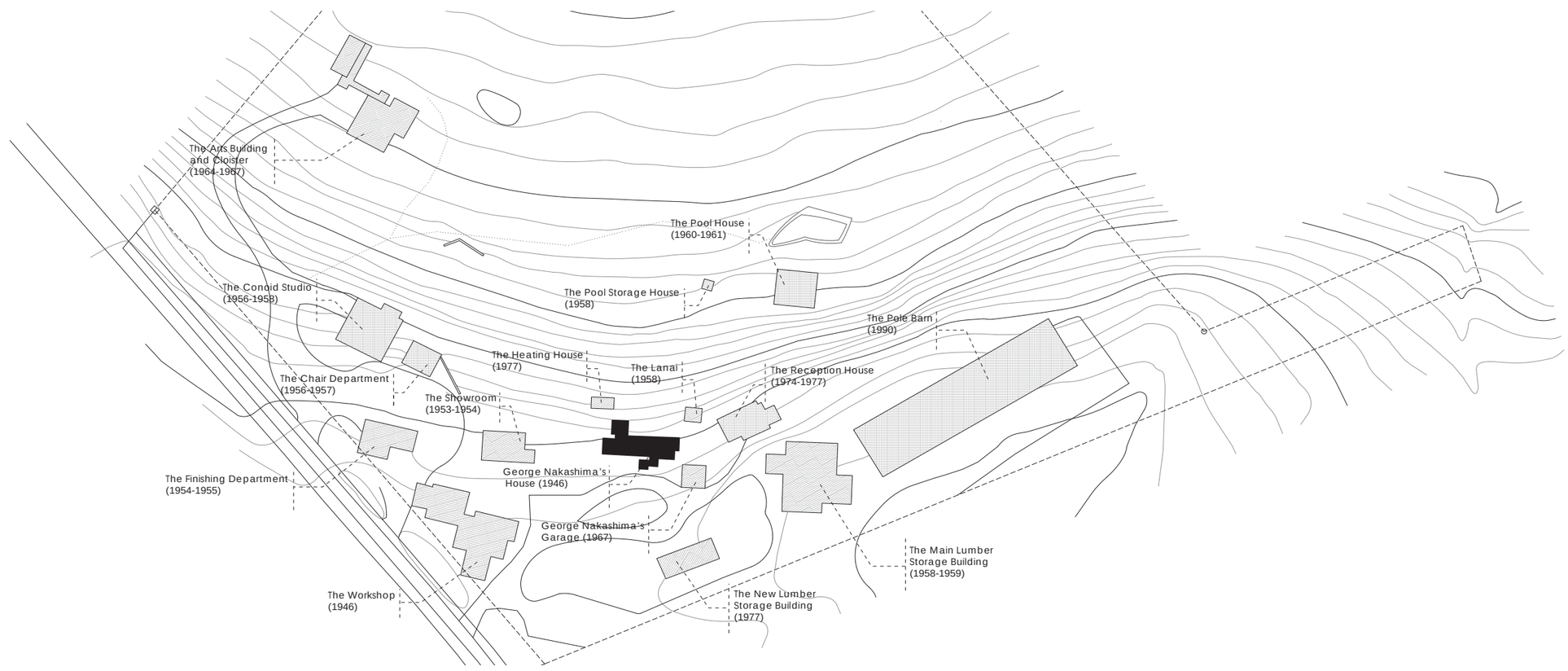
CUT HATCH LEGEND

- Rubble Stone Wall
- Concrete Unit Masonry
- Foam Insulation
- Batt Insulation

George Nakashima Woodworker Site Timeline

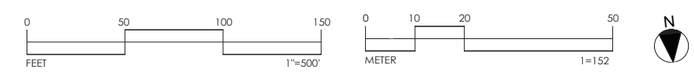
Dots indicate date of completion, when known.
Buildings below the timeline reflect other designs by Nakashima built outside New Hope.





1 DISTRICT SITE PLAN

1"=500' METRIC 1:152



THE GEORGE NAKASHIMA FAMILY HOUSE

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SHEET NUMBER: 1

CENTER FOR ARCHITECTURAL CONSERVATION
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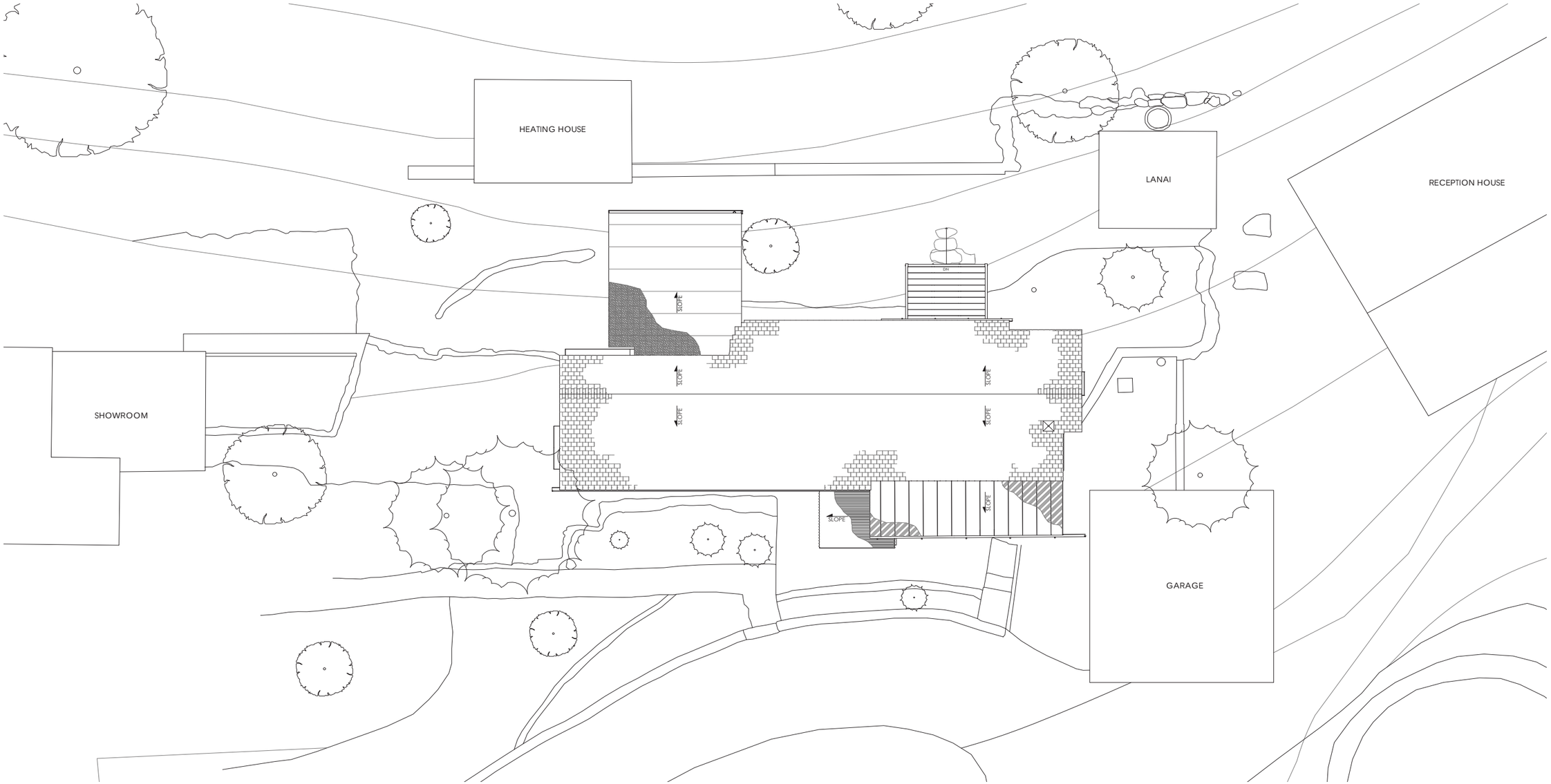
Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET DESCRIPTION: DISTRICT SITE PLAN



1 SITE PLAN
3/16"=1'-0" METRIC 1:64

Legend

Coniferous Tree

Deciduous Tree

0 5 10 15 FEET 3/16"=1'-0"

0 5 METER 1:64

N

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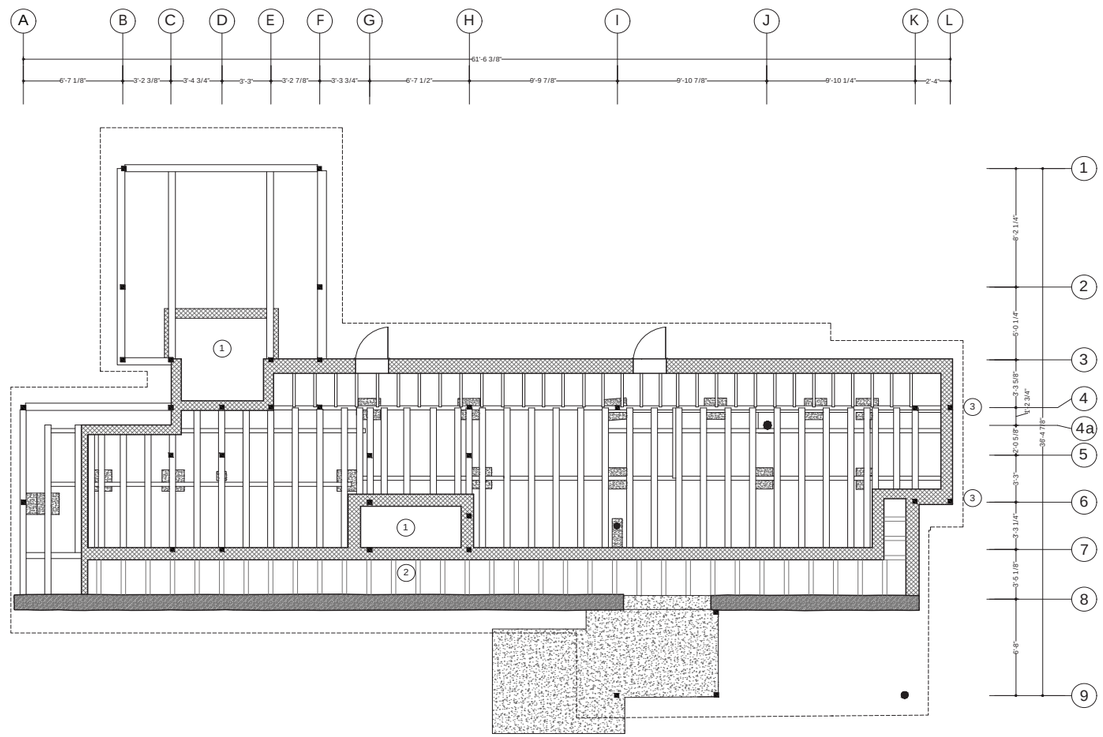
DELINEATORS:
Mojtaba Saffarian
Paridhee Goel

SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET NUMBER: 2

SHEET DESCRIPTION: SITE PLAN



1 FOUNDATION PLAN
1/4"=1'-0" METRIC 1:48

Keynotes

1. Concrete Block Chamber: Two C.B.C.s are present, one located beneath the bathroom and the other under Kevin's bedroom. These chambers serve multiple purposes, including providing a foundation for the structures and bracing above, as well as housing utilities such as plumbing and pipes.
2. Crawl Space: An elongated space adjacent to the northern stone wall, constructed with concrete blocks. It is designed to house utilities such as plumbing and pipes while keeping them above 32°F during the cold seasons. Due to limited access, the presence and spacing of the joists above the crawl space cannot be definitively confirmed.
3. The gray color of the two posts on the west end indicates that their exact location could not be confirmed through current or historic resources.

0 5 10 15 FEET 1/4"=1'-0"
0 5 METER 1:48
N

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DELINEATORS:
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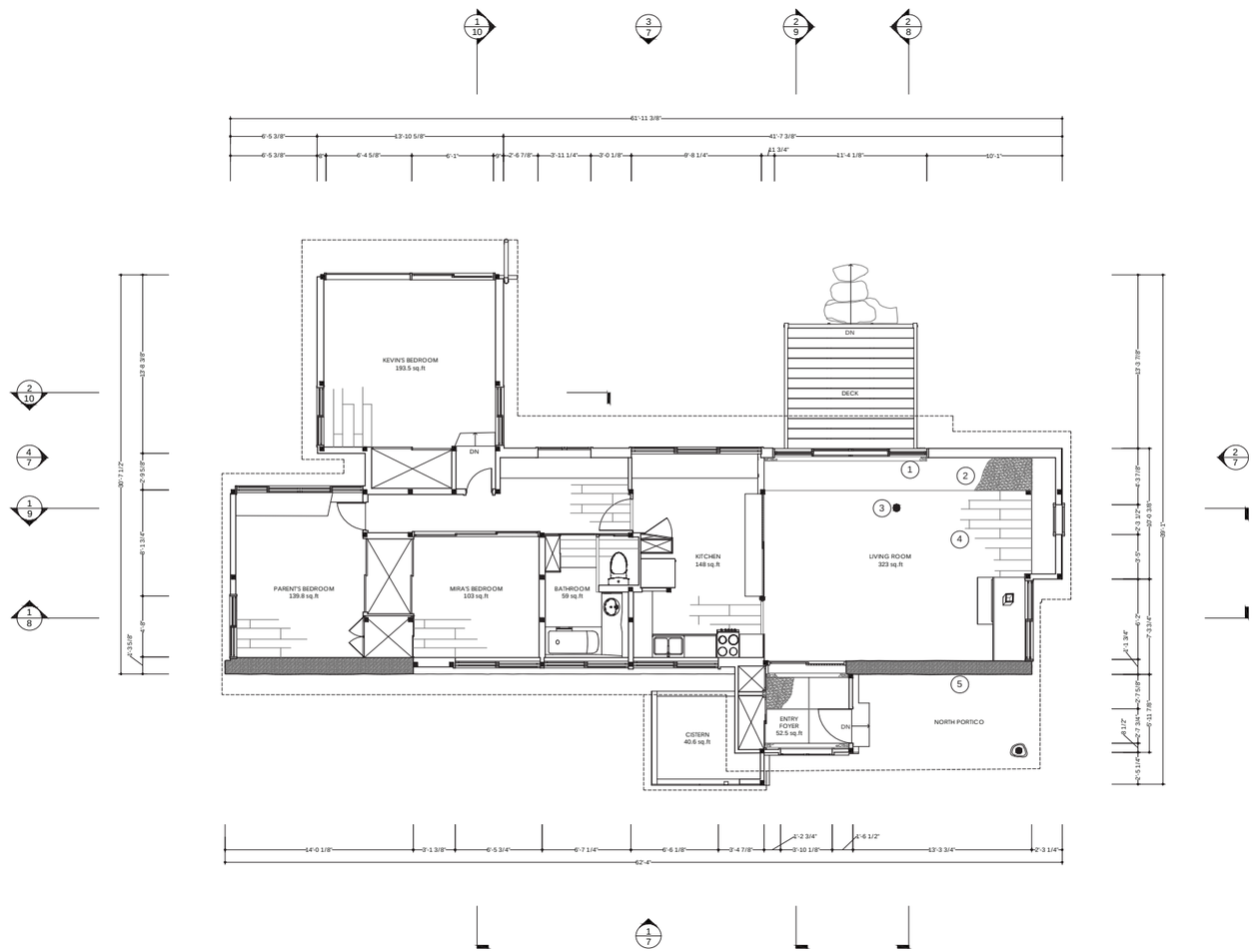
Paridhee Goel

SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET NUMBER: 3

SHEET DESCRIPTION: FLOOR FRAMING AND FOUNDATION PLAN



1 GROUND FLOOR MEASUREMENT PLAN
1/4"=1'-0" METRIC 1:48

Keynotes

1. Rubble Stone Strip: Decorative strips of rubble stones embedded in concrete are featured in the living room and entry space.
2. Concrete Floor Finish: Used as the finishing material for the entry space and the area adjacent to the southern sliding door in the living room. This concrete-floored area in the living room, along with the projection on the west side, was added to the house during the 1982 expansion.
3. Daikoku-Bashira: A single round post, located in the living room near the southern wall, stands outside the grid of posts. In traditional Japanese architecture, this is known as Daikoku-Bashira, which is the largest pillar of a home, symbolizing strength, stability, and spiritual protection.
4. Wooden Floor Finish: Composed of wooden tiles, serves as the primary flooring material throughout the house.
5. Rubble Stone Wall: Made in a random pattern, exposed both to the exterior and interior spaces.

0 5 10 15 FEET 1/4"=1'-0" 0 5 METER 1:48 N

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SHEET NUMBER: 4

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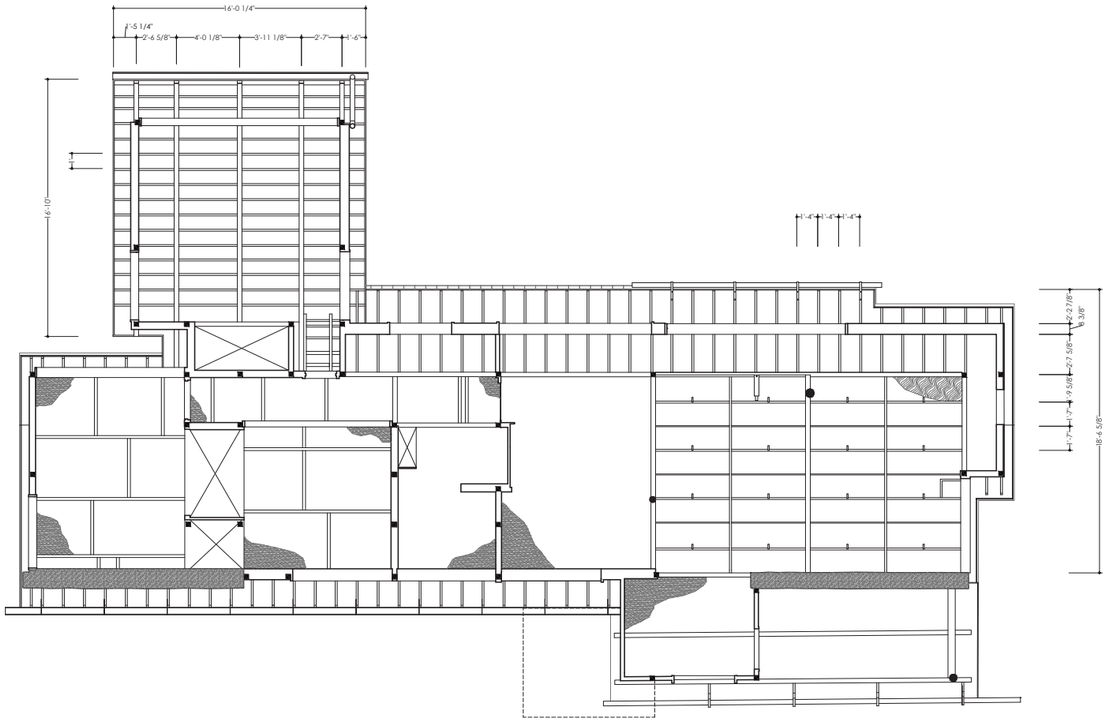
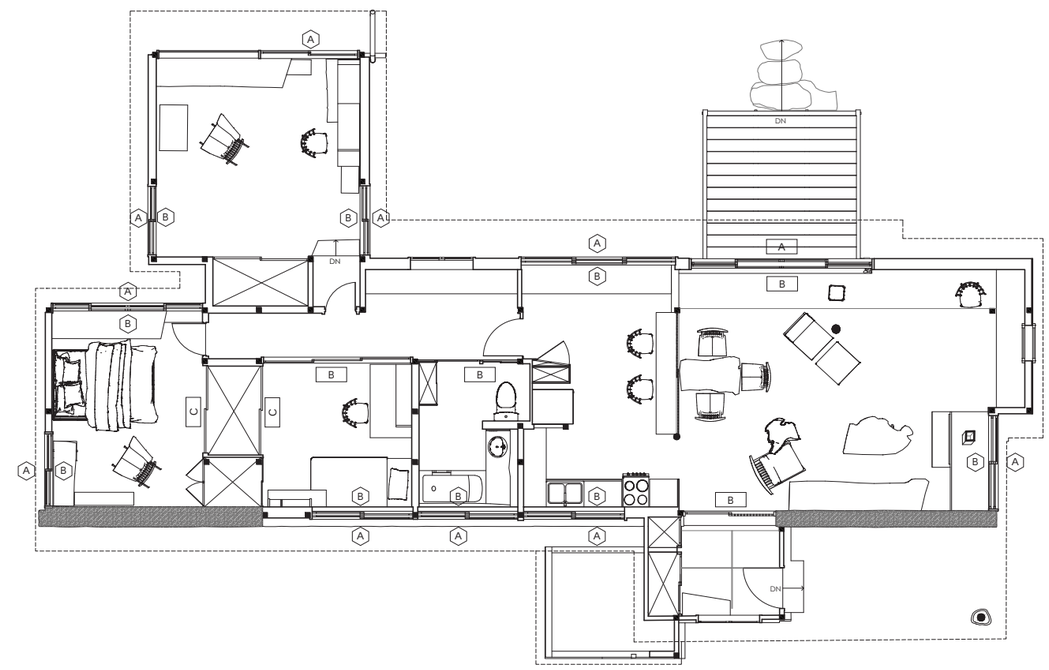
DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET DESCRIPTION: AS BUILT - GROUND FLOOR MEASUREMENT PLAN



2 REFLECTED CEILING PLAN
1/4"=1'-0" METRIC 1:48



1 GROUND FLOOR FURNITURE PLAN
1/4"=1'-0" METRIC 1:48

Legend

Sliding glass door or window — Sliding Shoji door or window — Sliding Fusuma door or window

Door A B C

Window A B

0 5 10 15 FEET 1/4"=1'-0"

0 5 METER 1:48

N

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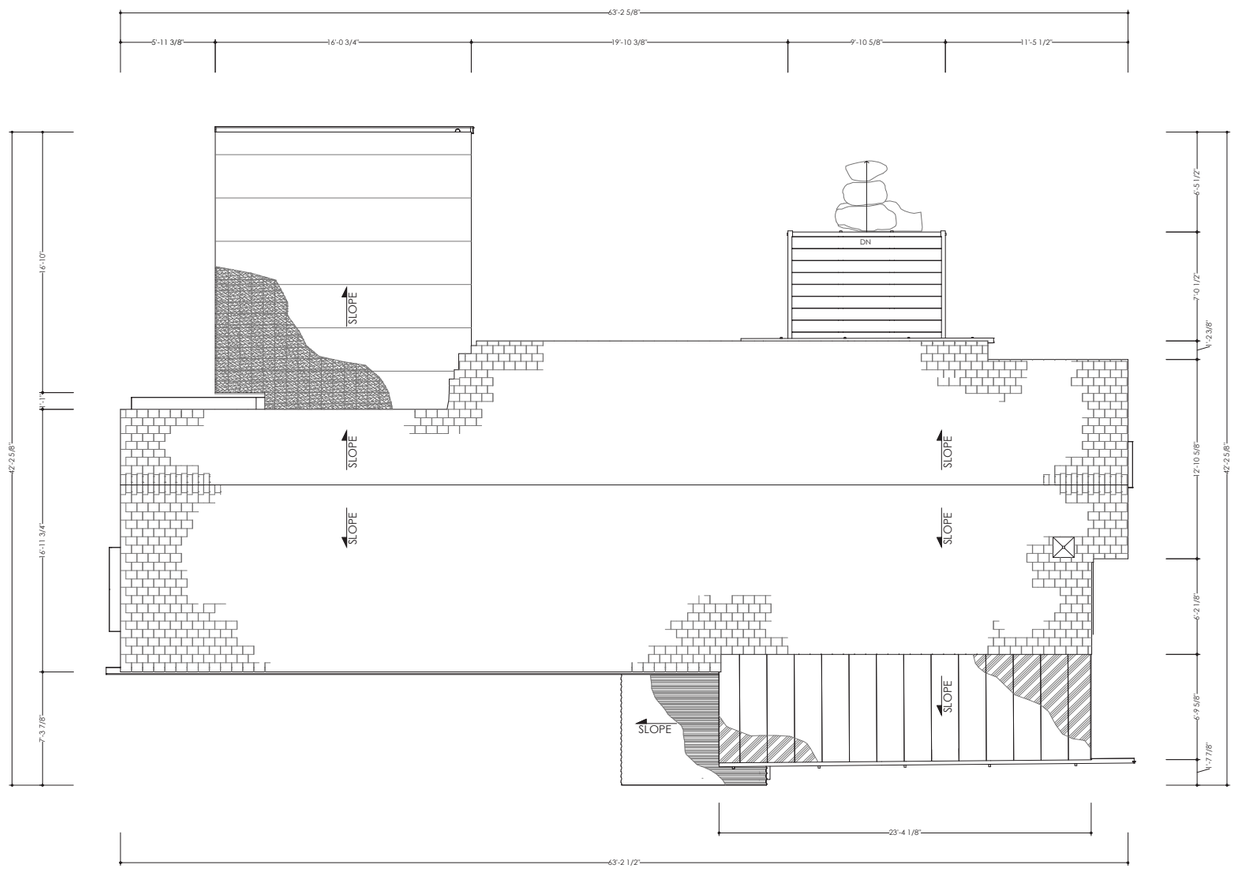
DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET NUMBER: 5

SHEET DESCRIPTION: AS BUILT - GROUND FLOOR FURNITURE & CEILING PLANS



1 ROOF PLAN

1/4"=1'-0" METRIC 1:48

0 5 10 15 FEET 1/4"=1'-0"

0 5 METER 1:48

N

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DELINEATORS:
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Paridhee Goel

SITE RECORDING:
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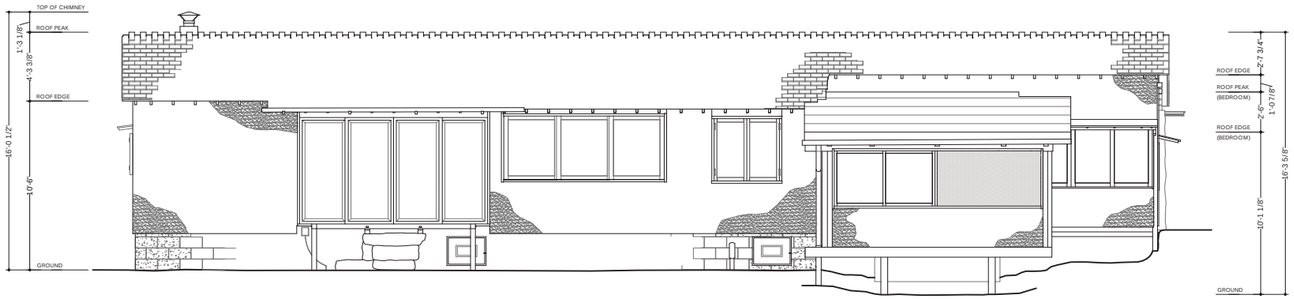
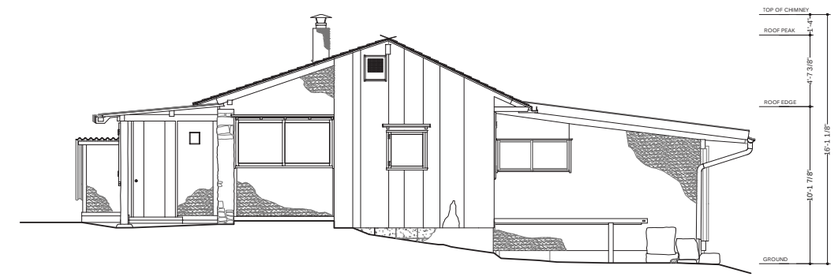
Mojtaba Saffarian

SHEET NUMBER: 6

SHEET DESCRIPTION: AS BUILT - ROOF PLAN



3 SOUTH ELEVATION
1/4"=1'-0" METRIC 1:48



2 WEST ELEVATION
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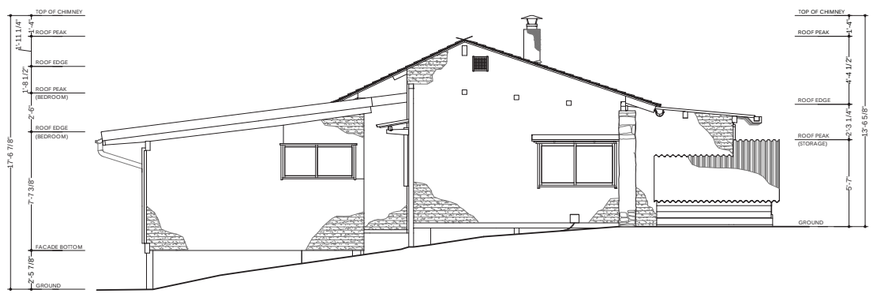
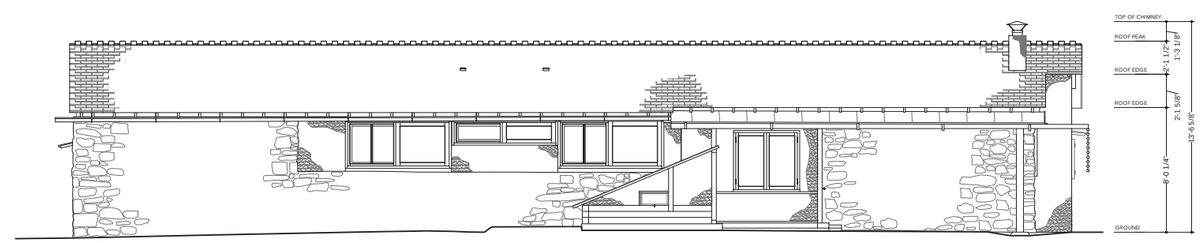


4 EAST ELEVATION
1/4"=1'-0" METRIC 1:48



1 NORTH ELEVATION
1/4"=1'-0" METRIC 1:48

0 5 10 15 FEET 1/4"=1'-0"
0 5 METER 1:48

THE GEORGE NAKASHIMA FAMILY HOUSE

1847 Aquetong Rd, New Hope, PA 18938

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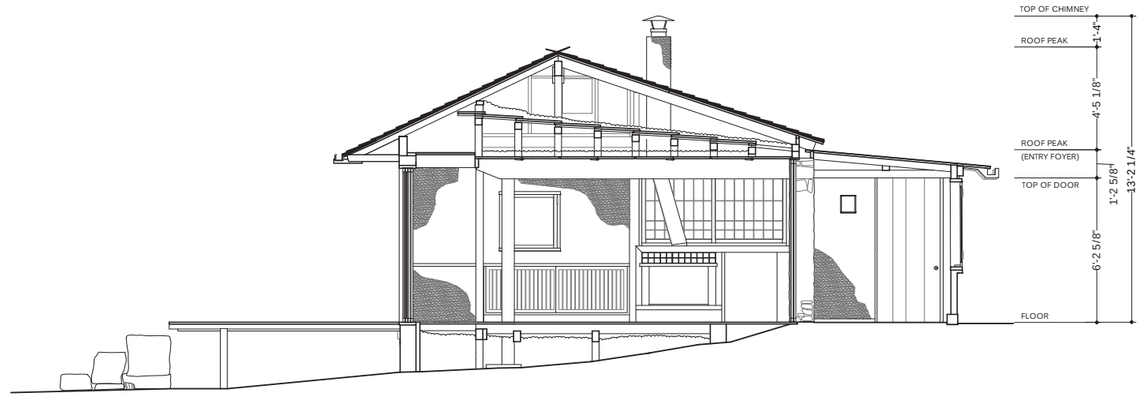
SHEET NUMBER: 7

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
John Hinchman - Project Supervisor, University of Pennsylvania
Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET DESCRIPTION: AS BUILT - ELEVATIONS NORTH & WEST & SOUTH & EAST



2 SECTION B
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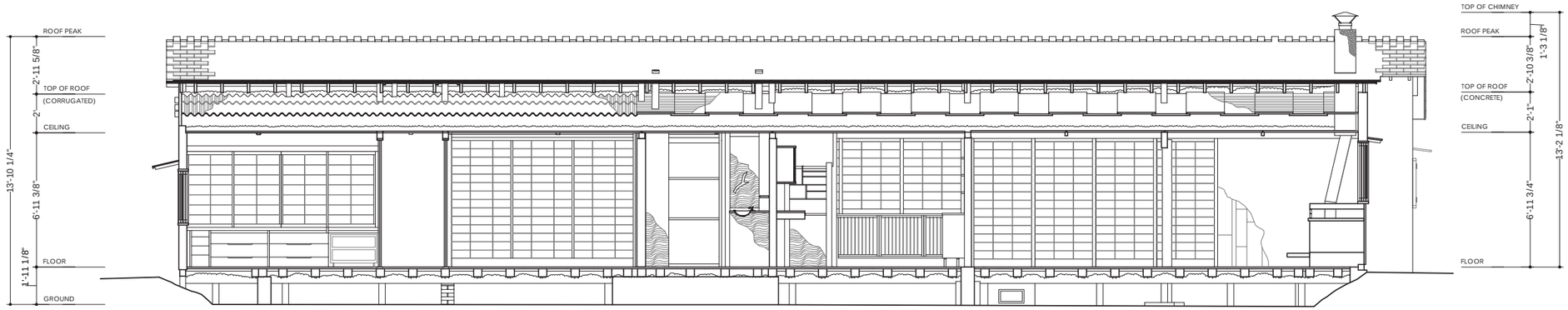

1 SECTION A
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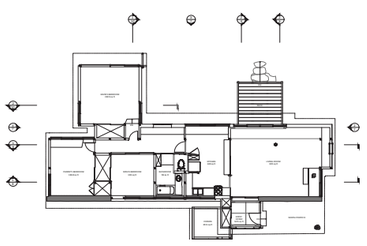
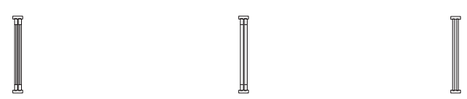


Legend



Sliding glass door or window | Sliding Shoji door or window | Sliding Fusuma door or window

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DELINEATORS:
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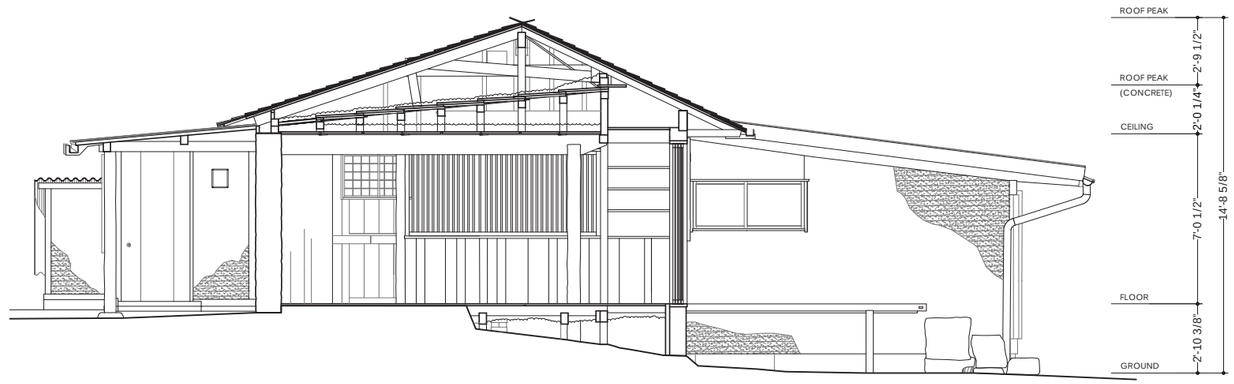
Paridhee Goel

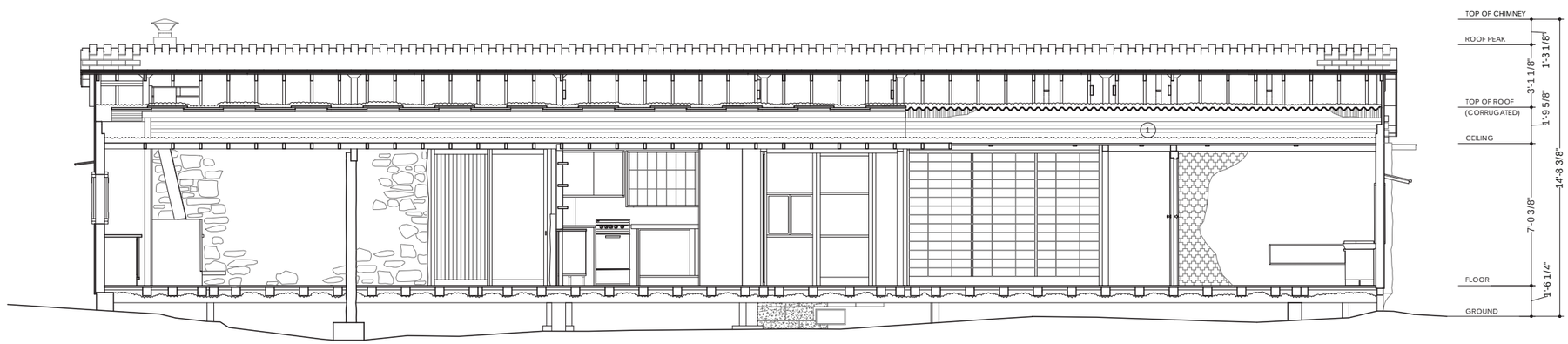
SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET NUMBER: 8

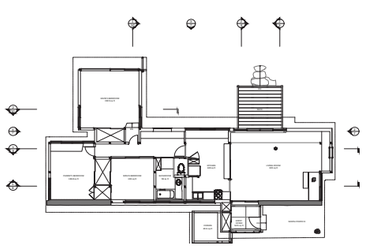
SHEET DESCRIPTION: AS BUILT - SECTIONS A & B



2 SECTION D
3/8"=1'-0" METRIC 1:32



1 SECTION C
3/8"=1'-0" METRIC 1:32



Keynotes

1. The presence of batt insulation above the ceiling can be confirmed through access to the ceiling in the hallway and a historic initial sketch indicating that a layer of insulation was proposed. However, its presence throughout the entire house cannot be definitively confirmed.

0 5 10 15
FEET 3/8"=1'-0"

0 5
METER 1:32

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DELINEATORS:
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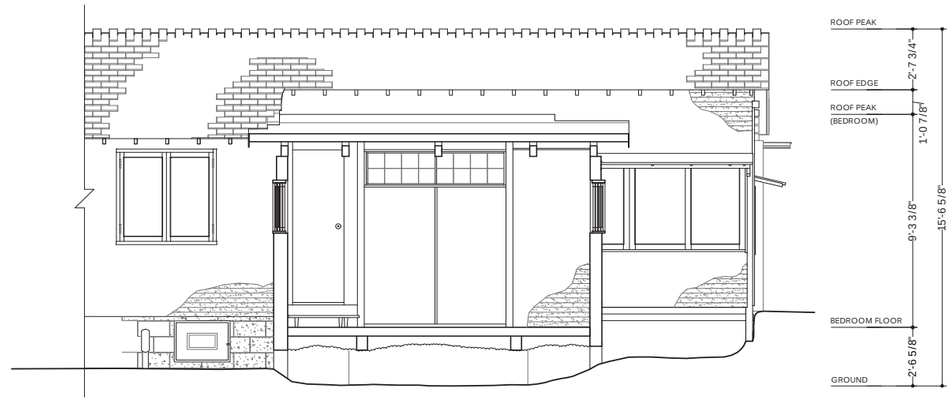
Paridhee Goel

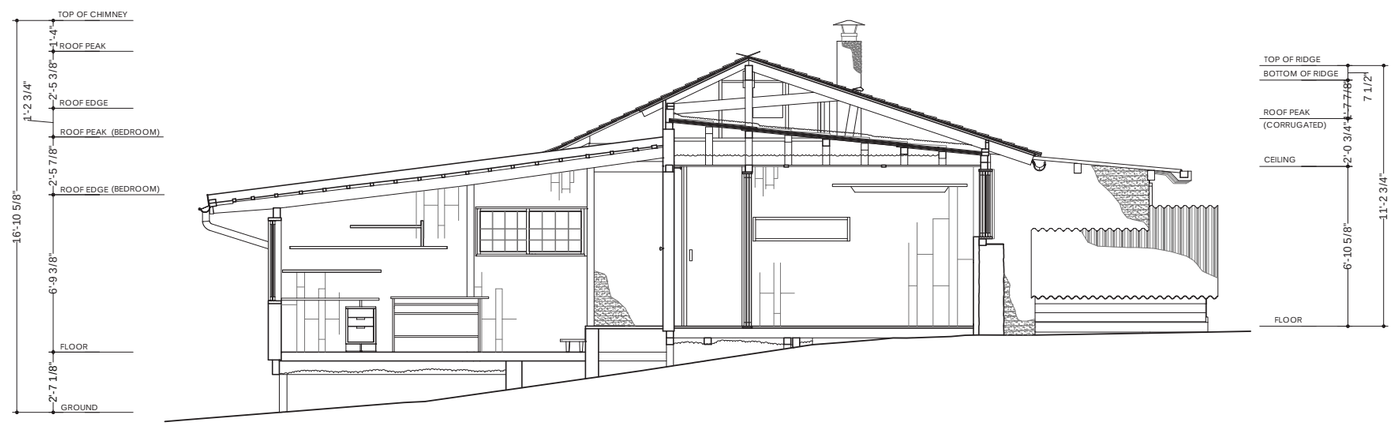
SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET NUMBER: 9

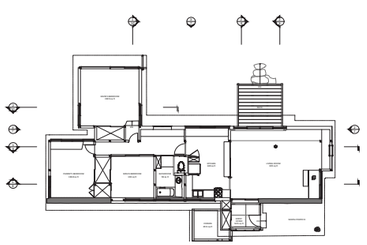
SHEET DESCRIPTION: AS BUILT - SECTIONS C & D

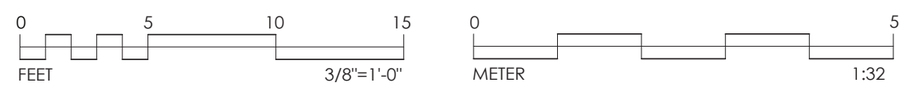


2 SECTION F
3/8"=1'-0" METRIC 1:32



1 SECTION E
3/8"=1'-0" METRIC 1:32





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SHEET NUMBER: 10

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
John Hinchman - Project Supervisor, University of Pennsylvania
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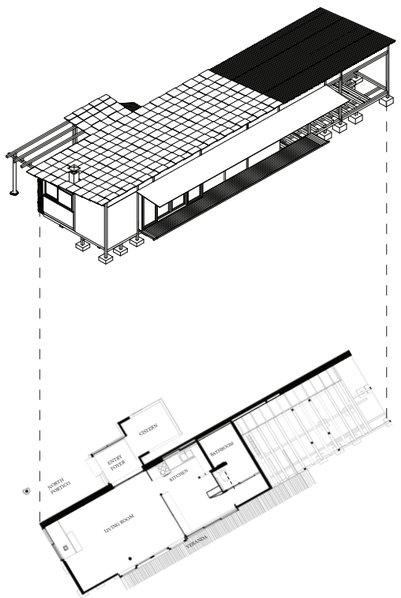
DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

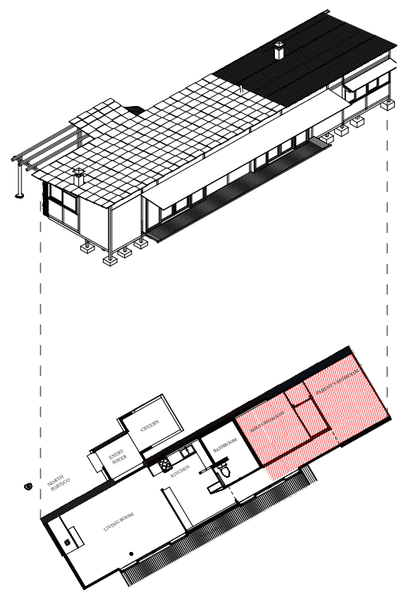
SHEET DESCRIPTION: AS BUILT - SECTIONS E & F

BUILDING EVOLUTION (1946 - 2024)

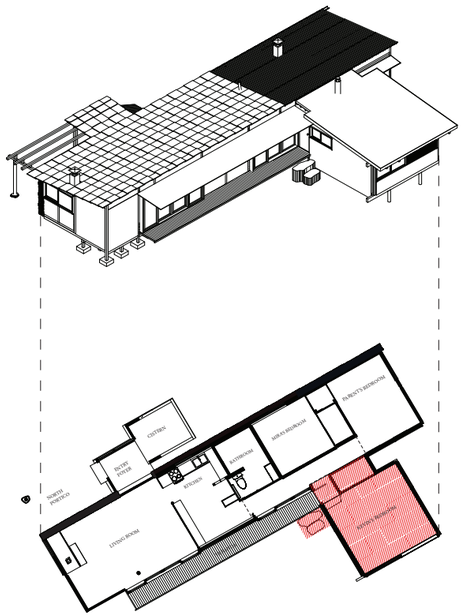
1946



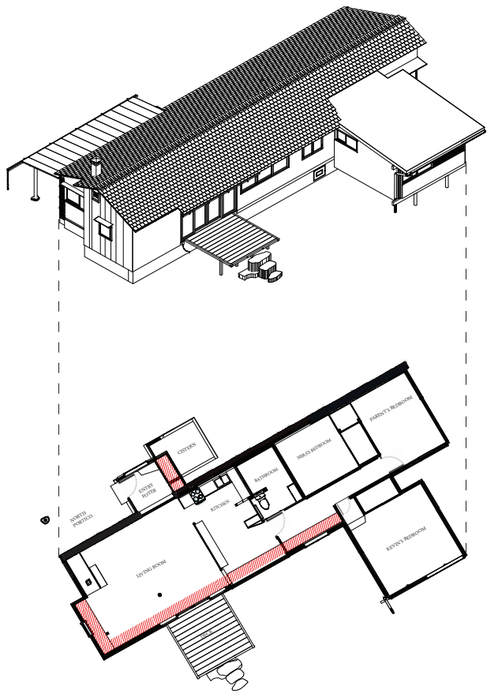
1948



1956



1982



Phase one

George Nakashima began construction of his family house in April,1946. Rooted in traditional Japanese building principles, phase one construction, executed over two years, began with the completion of primary living areas that included the entry foyer, the living room, the kitchen, the veranda, the bathroom, as well as a cistern. After moving into the house, two bedrooms, identified as Mira's room and the parent's room, along with a closet on the east end, were added (Sheet 12).

The original design featured a shed roof crafted from handmade concrete tiles and asbestos corrugated panels (Sheet 17). In keeping with Japanese tradition, many of the early elements of the house were common to Japanese housing, including sliding screens opening onto the veranda. In addition, he included a "daikoku-bashira" in the living room, the sacred central pillar linked to the kitchen deity "Daikoku"[1]. Japanese construction techniques were used, including complex wood joints for the post and beam framing. Additionally, the foundation post were treated with wood charring technique, enhancing their durability while imparting a distinctive and elegant aesthetic (Sheet 14).

Phase two

In December1954, with the arrival of George Nakashima's son Kevin, the New Hope house was expanded beginning construction in October 1955 until November 1956 (Sheet 18). A new bedroom was added to the southern side, designed a step lower than the original structure. This expansion included a remodeled bathroom and a more efficient heating system.

In keeping with Japanese tradition once again, at the northeastern end of the house, two large stepping stones were placed leading up to the veranda (Sheet 18). These stones hold symbolic significance while entering the house.

Phase three

In 1982, the New Hope house underwent its final modification. The most profound change was the addition of a new gable roof (Sheet 20), but the work included additions on both the west and south sides of the house and the original veranda was removed and replaced with a narrower, square deck (Sheet 19). The entry foyer was modified, making it a more enclosed, and extending it into the cistern. Additionally, the original concrete tile roof covering the north portico was replaced with a new standing seam metal roof.

1. "Minka: Traditional Japanese Houses and Their Enduring Charm." Meguri Japan, 27 June 2021

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SHEET NUMBER: 11

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
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DELINEATORS:
Mojtaba Saffarian
Paridhee Goel

SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET DESCRIPTION:
BUILDING EVOLUTION (1946 - 2024)

PHASE ONE: PRE-HABITATION (APRIL, 1946 - DECEMBER, 1947)

On Apr. 17, 1945, the Nakashima's purchased the 2.7 acres of land on which the current Nakashima complex would be built[1]. The shop would be built first, but in April of 1946 Nakashima began construction on his house. While the earliest phase of construction is defined as the period from when George Nakashima began building his house to when it was fully enclosed, due to how he built it and when he first lived in it, this substantial completion phase is divided into two periods of pre- and post-habitation.

The pre-habitation period began in April of 1946, during which time the living room, kitchen, and bathroom were fully enclosed and made functional. Nakashima's decision to focus on this section of the house was likely out of necessity, as his family had started living in a tent on the property in May of 1947. Winter conditions eventually forced them to occupy the house, so on December 7th, 1947 the family moved in before it was completed.

Historic photographs show that while the entire post and beam structure, along with both sections of the roof (Sheet 17), had been completed by this point, the eastern end, including Mira's and the parents' bedrooms, remained unfinished without walls (Figure 12.6- red arrows).

During the post-habitation period, the house featured a living room fireplace on the west end of the building serving as the primary source of heat. The only other source may have been a small coal burning water heater in the bathroom, which likely contributed to warming the house (Figure 12.5).

Exterior wall openings during this earliest period included a small window on the west elevation, (A) a large four panel sliding door, and a window on the south (B).

Although no photographs of the north elevation from this period are available, it can be inferred that the kitchen and bathroom were completed during this phase.

POST HABITATION (DECEMBER 1947 - OCTOBER 1948)

Consequently, the two double-sliding windows for these spaces were likely installed as well (C).

A 1952 article, House+Home, published in *The Magazine of Building*, mentions that Nakashima used flat asbestos cement sheets for the exterior wall cladding.

While this is difficult to confirm from historic photographs, the cladding's texture appears to resemble a cementitious material.

North Entry and Porch

It is common in traditional Japanese houses to have an entrance foyer, known as a "genkan". It serves as a transitional space between the outdoors and indoors, both practically and symbolically. It is deeply rooted in Japanese culture and etiquette and plays an important role in maintaining the cleanliness and harmony of the home.

Nakashima was likely embracing this tradition when he created his entrance foyer (D). It is unclear if it was constructed during the pre- or post-habitation period when the entire house was fully enclosed; however, a historic image shows that its earliest iteration was much more transitional than it is today (Figure12.9).

To the west of the entry foyer is a small covered area, similar to a portico. It was difficult to accurately date its completion; however, a historic image, likely taken in the winter of 1946-47 (no sliding door into the bedroom area), shows the post and beam framing for this feature in situ (Figure 12.2- red arrow), although none of the roofing files have been installed. The lack of files on this roof is also confirmed in a photograph of Mira taken around the same period with the portico in the background (Figure 12.3).

Similar to the original main house roof (Sheet 15), the portico and entry roof were designed with a stepped purlin configuration. In this case, though, the roof sloped in the opposite direction from the house. A reason for this may have had to do with the need for head room; however, the arrangement allowed rain and snow melt to collect in the valley, at the junction of both roofs, directing the water to a cistern located adjacent to the entry foyer (Figure 12.4).

The Cistern

The cistern took advantage of the entire roof for water collection with gutters collecting where there was no valley (E). Constructed of post and beam, it had a roof that sloped eastward that was covered in the same corrugated roofing sheets used for the eastern end of the house (Figure 12.7- red arrow). In addition, it had a small window on its north wall, likely for determining the water levels. This feature today remains almost identical to how it was originally constructed; however, it no longer actively collects water.

The Last Remaining Elements

By the end of 1948, a substantial portion of the house was complete, including building the new concrete fireplace, the bedrooms for both Mira and the parents (Figure 12.8). A four-panel sliding door was added to the south elevation of the house, (F) three of the panels occupying a portion of wall that had been completed in the first phase (G), with the eastern most panel being in a newly completed section.

Additionally, a four-panel sliding window was installed in the parents' bedroom on the same elevation (H), as was a double-sliding window on the east (I). The north elevation was completed with the addition of another double-sliding window (J) for Mira's bedroom. During this period, "shoji" panels were not yet installed, suggesting that these essential elements of Japanese craftsmanship were added later. Shoji are traditional Japanese sliding doors made from wooden frames and "washi"paper.

Traditional Japanese architecture focuses on flexibility and spatial fluidity. It allows living spaces to open seamlessly to the outside, dissolving barriers between inside and out. These windows, paired with shoji panels, were designed to filter natural light softly while maintaining privacy, evoking the minimalist elegance of Japanese interiors.

With the completion of the east end of the house, a new chimney was added to the roof (K). According to the 1952 House+Home article in *The Magazine of Building*, the house did not have a central heating system; however, after post-habitation completion, in addition to the fireplace in the living room, a small sub-floor, traditional Japanese kerosene space heater was installed between the two bedrooms in a space that is currently occupied by a closet. A tank located on the east elevation likely serving as storage for the fuel (Figure 12.7- green arrow).

Finally, awnings were added over both the south and east facing window of the parents' bedroom (Figure 12.7- blue arrow). Despite various modifications to the house over the years, these awnings have remained intact.

Figure 12.2 | The south west corner of the house, January 1948 (Source: Nakashima Foundation for Peace).

Figure 12.3 | This image of the north porch and entry shows that the entry space is already covered by concrete tiles, while the porch area remains incomplete, as its concrete tiles have not yet been installed. This illustrates a phased construction approach, with the entry being prioritized for completion before the porch, ca. 1946-1948 (Source: Nakashima Foundation for Peace).

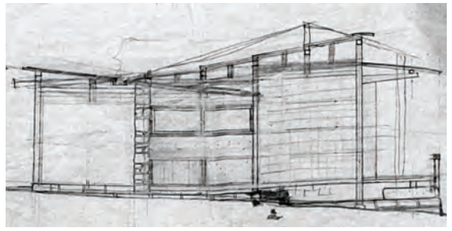

Figure 12.4 | A transverse section through the house shows that the roof of the house and the roof of the porch sloped in opposite directions, providing a way to collect water for the cistern, ca 1946, (Source: Nakashima Foundation for Peace).

Figure 12.5 | A fireplace in the living room was the original primary source of heat in the house; however, a small coal burning water heater in the bathroom that provided hot water for the soaking tubs, may have offered additional warmth, Left: ca. 1948-56, Right: February 1952 (Source: Nakashima Foundation for Peace).

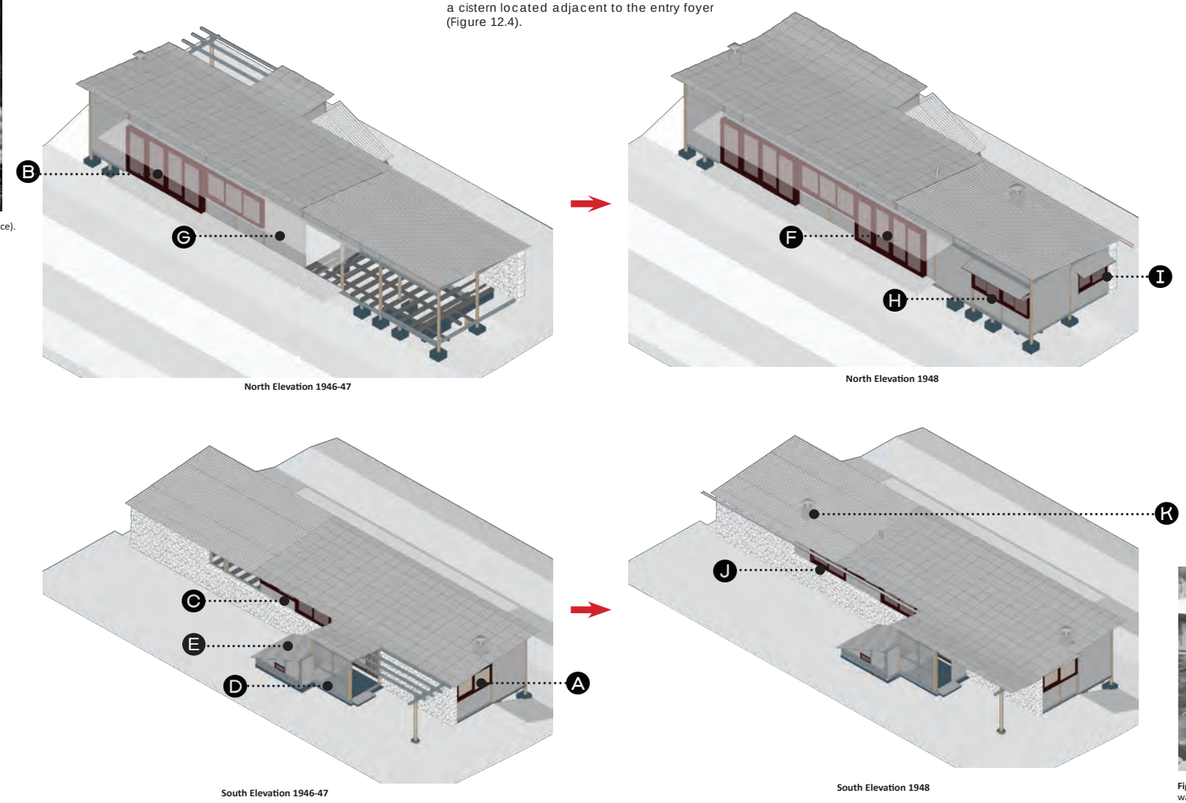

Figure 12.1 | Modification per-habitation and post-habitation at north and south elevation between 1946 to 1948 (Source: CAC, September 2024).

Figure 12.6 | The historic photo above it, taken sometime in the winter of 1946-47. It is used to emphasize that the west end of the building was fully enclosed, while the east side remained open, January 1948 (Source: Nakashima Foundation for Peace).

Figure 12.7 | A view looking west shows the presence of an additional chimney on the roof and a tank likely used for storing kerosene for new heating system, February 1952 (Source: Nakashima Foundation for Peace).

Figure 12.8 | The south elevation of the house, when the second phase of construction was completed and the sliding door as well as the other windows were added, June 1949 (Source: Nakashima Foundation for Peace).

Figure 12.9 | The entry way into the house on the north elevation shows that it was much less closed in than it is today, with the entire west wall open and the north wall large open glass panels (Source: Nakashima Foundation for Peace, June 1949, and CAC, June 2024).

1. Deed Book 772, p. 328; need the actual transaction date (TK, ca. July 1945); Ltr., Parents to GKN, dated Jul. 2, 1945. Sent from Cobert, WA

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DELINEATORS:
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Paridhee Goel

SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET NUMBER: 12

SHEET DESCRIPTION: PHASE ONE: PRE-HABITATION (APRIL, 1946 - DECEMBER, 1946) POST HABITATION (DECEMBER 1947 - OCTOBER 1948)

PHASE ONE: THE STONE WALL AND CRAWL SPACE

Stone Wall

Nakashima built using many traditional Japanese construction conventions; however, the north elevation of the New Hope house is almost entirely constructed of stone which breaks from that approach. Traditional Japanese houses, known as "minka", do not typically feature full stone walls. Instead, their construction emphasizes lightness, flexibility, and natural materials suited to Japan's climate and frequent seismic activity.

The stone wall on the northern elevation of the Family house (A) offers a sense of permanence and protection more appropriate to the Pennsylvania climate. It not only shields the house from cold winds but also serves as a primary load-bearing wall (Figure 13.1 & 13.2) supporting the mono-pitched roof structure (Sheet 17).

The use of both natural stone and wood was a hallmark of Nakashima's design ethos, reflecting his commitment to integrating natural materials in their raw form, but also reflecting his desire to draw those materials directly from his surroundings. As George Nakashima wrote "by scrounging materials, gathering stones off the property, digging foundation by hand, ... I was able to build a rough structure by Thanksgiving. There is a wonderful feeling to be had in erecting a stone wall. There is a sense of order and permanence. A good wall will last for generations and even millennia."[1]

The stone wall, approximately 12 inches thick, was constructed of random rubble masonry with two wythes of stone (Figures 13.4). The wall appears to have been built in its entirety as a single monolithic feature and did not grow organically as Nakashima progressed in his construction (Figure 13.3).

To construct the wall, form-work or bracing was erected on the interior and the stones were then laid in cement against it (Figure 13.5). Evidence suggests that the bracing was purely for stone wall construction and was eventually removed (Figure 13.6).

Crawl Space

Excavated and constructed using poured concrete and cinder blocks, a 2'-5" wide crawl space was built just to the south of the stone wall (B). This sub-floor enclosure served multiple functions, providing a stable platform for the placement of foundation beams and floor joists (Figure 13.7 & 13.8), but also accommodating utilities such as water supply pipes for both the kitchen and bath (Figure 13.9). A tank situated on the east end of the house was possibly storage for Kerosene oil. Evidence of a shutoff valve (Figure 13.10 - red arrow) and the location of a kerosene heater, suggests that the connection between this tank and the house was likely routed through the crawl space as well (Figure 13.10).

By enclosing the crawl space, it would have trapped stationary air. Functioning as an insulator and allowing the space to remain warmer in the winter, it would help keep temperatures above 32°F and thus protecting the pipes from freezing (Figure 13.11-red arrow). On the west end of the house, the crawl space turns 90 degrees southward, extending below the location of the living room fireplace, which was built later, in December 1948, as an ell (D). Since this crawl space ell is only partially visible in one historic photo and only its exterior boundary is visible in the point cloud collected in 2024, it remains unclear whether it was built as a solid mass, or if it was built hollow, allowing air to be heated and move freely.

The function of this extension may be two-fold, providing a strong non-combustible base for the fireplace, but also, potentially utilizing the heat generated by the warmed hearthstone to help increase the temperature in the crawl space, once again, protecting the pipes from freezing. This concept of using the house's source of heat to warm the crawl space may have been applied in a second iteration, where a sunken kerosene heater was placed against the north wall, between Mira's bedroom and the parents bedroom[2]. The heater was situated over the crawl space, and if it was sunken, as a magazine article suggests, it likely sat within the crawl space providing some additional warmth.

Concrete Block Chamber

An additional concrete block chamber extends from the crawl space southward, beneath the bathroom (C) and likely served more than one function. Positioned directly beneath the bathroom, where bracing walls are present, the north-south walls of this box likely helped provide strength to shear walls that were constructed above them (Sheet 15).

Additionally, due to the configuration of the bathroom, as well as the need for larger sized piping for waste lines, this extended chamber was also necessary as freeze protection for waste and supply piping that could not be contained within the crawl space. And finally, this chamber of stationary air would mean a better insulated floor above, providing a warmer bathroom during colder months.

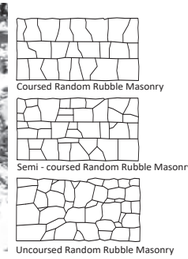


Figure 13.2 | A view looking southwest at the north stone elevation under construction. Constructed using irregular stones laid in anomalous pattern, this method is commonly known as uncoursed random rubble, ca. August 1947 (Source: Nakashima Foundation for Peace).

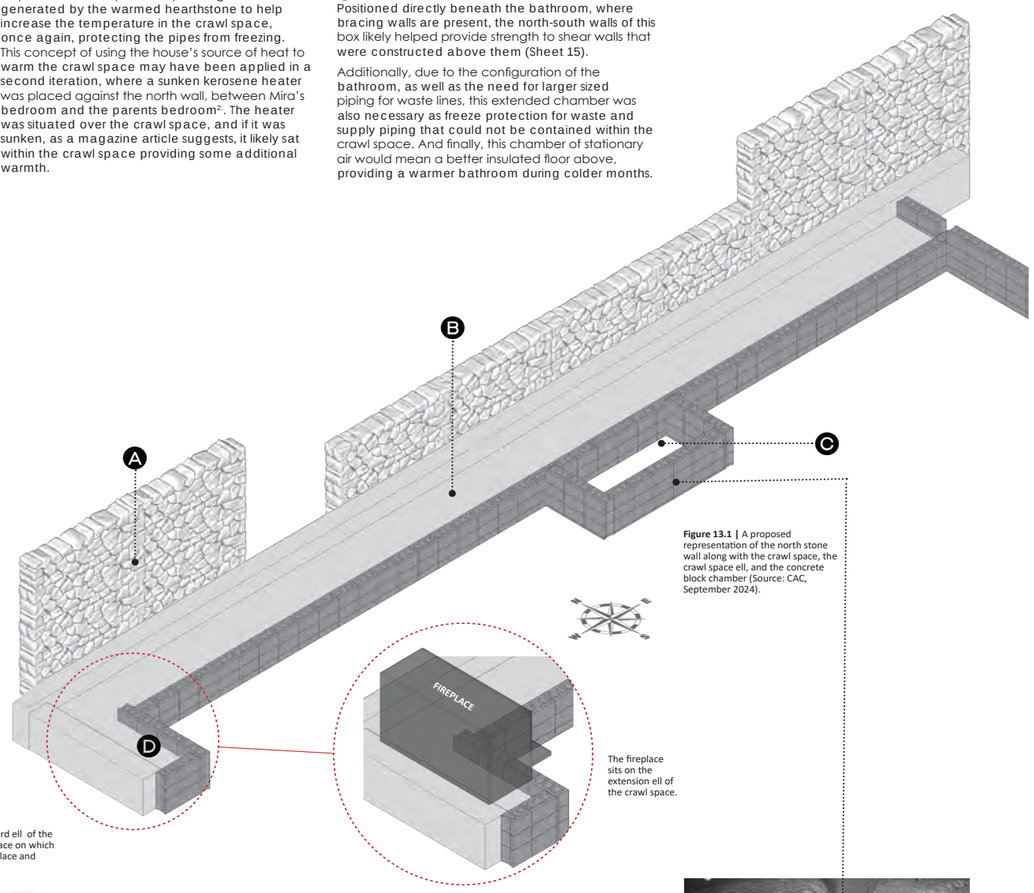


Figure 13.1 | A proposed representation of the north stone wall along with the crawl space, the crawl space ell, and the concrete block chamber (Source: CAC, September 2024).

The fireplace sits on the extension ell of the crawl space.

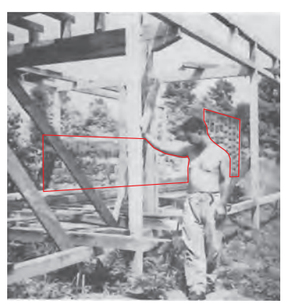
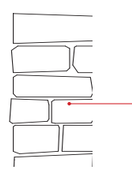


Figure 13.3 | A view looking northeast showing the stone wall fully completed in the background, ca. August 1947 (Source: Nakashima Foundation for Peace).



A stone wall, constructed with two widths is often referred to as a "double-wythe" wall. It consists of two parallel, vertical layers of stones, with intermittent bonding stones that cross between to help add stability (Source: CAC, September 2024).

Figure 13.4 | A view looking east shows the completed stone wall, as well as the concrete block crawl space, ca. August 1947 (Source: Nakashima Foundation for Peace).

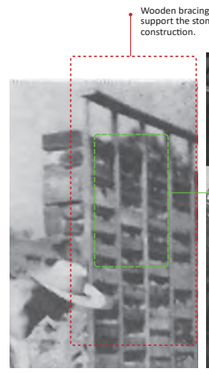


Figure 13.5 | A view looking northeast showing the stone wall, with form work which is- visibly attached to the wall, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 13.6 | A view looking north showing the stone wall without the bracing, captured after the house was completed, ca. September 1947 (Source: Nakashima Foundation for Peace).

Figure 13.7 | A view looking east showing the south concrete block wall of the crawl space, as well as the chamber below the bathroom, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 13.8 | A view looking east, showing the south block wall of the crawl space, ca. August 1947 (Source: Nakashima Foundation for Peace).

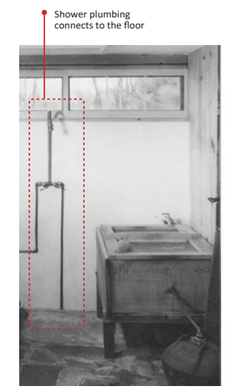


Figure 13.9 | A view of the bathroom interior showing the location of the Japanese tub and the small coal heater that provided hot water. The water lines highlighted in the red dashed box penetrate the floor into the crawl space below, February 1952 (Source: Nakashima Foundation for Peace).

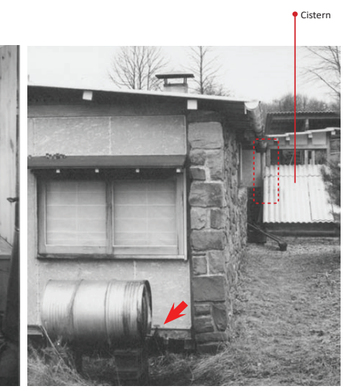
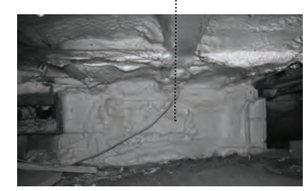


Figure 13.10 | A view looking west showing a kerosene tank which supplied a small sunken heater. The shut-off (red arrow) is connected to the supply line that runs through the crawl space below the parent's bedroom. The dashed box shows the location of the rain conductor used to fill the cistern, ca. 1948-1954 (Source: Nakashima Foundation for Peace).



The east-west wall of the concrete chamber below the bathroom contains an opening currently concealed by Styrofoam (or similar material). Originally, this opening likely held a screen for summer ventilation and was covered with a solid panel in winter months to retain heat (Source: CAC, June 2024).

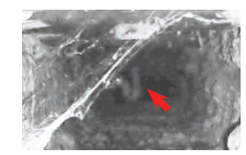


Figure 13.11 | A photograph taken within the crawl space, accessed through the floor of the parents' bedroom, reveals a drainage pipe and trap—likely associated with the current tub descends through the house floor and turns toward the CMU box (Source: CAC, June 2024).

1. Nakashima, George, The Soul of a Tree: A Woodworker's Reflections. First edition. Tokyo: Kodansha International, 1981. P. 70.
2. Ryūichi Hamaguchi, "George Nakashima: His Furniture, His House, His Way of Life," The Magazine of Building: House and Home Edition, March 1952.

THE GEORGE NAKASHIMA FAMILY HOUSE
1847 Aquetong Rd, New Hope, PA 18938

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SHEET NUMBER: 13

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

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SHEET DESCRIPTION: PHASE ONE: THE STONE WALL AND CRAWL SPACE

PHASE ONE: FOUNDATION SYSTEM and FLOOR STRUCTURE

The foundation system of the New Hope house employs concrete footings, typically known as a spread footings (A). Commonly used in residential construction to support walls, columns, or other structural elements, especially in areas with lower soil-bearing capacity, this approach spreads the load of the structure over a larger area of soil, reducing the pressure on the ground.

While the footing approach is common to posted structures in the United States, the foundation and lowest elements of the flooring system for the New Hope house also reflect Japanese tradition.

Takayuki

In traditional Japanese architecture, "takayuki" refers to elevated floors or raised-floor structures (Figure 14.3). This design is a hallmark of traditional Japanese houses, shrines, and storehouses, particularly in regions with high humidity, heavy rainfall, or risk of flooding.

Key features of the New Hope house flooring system is that it is raised above the ground, supported by pillars, posts, or stones. The height can vary depending on the purpose of the building and environmental conditions. The raised design allows for airflow beneath the floor, which helps to prevent moisture accumulation, reducing the risk of rot and mold in the wooden structure. This contributes to a cooler indoor environment during hot and humid summers. Historically, elevated floors were also used to protect against animals or pests.

Ishibatate

A traditional Japanese construction footing, similar to a spread footing, is known as "ishibatate" which directly translates to "stone base". The term typically refers to a formal solution where stones are carefully selected and sometimes shaped to fit the design of the house, contributing to the overall harmony of the building. Following a Japanese technique called "hikaritsuka" the ends of the wooden struts on those stones are carved to fit the stone's irregular surface and the carved surface of the wood is then protected using a burning method called "yakisugi". While many of the footings on the New Hope house use cast concrete, evidence shows that some of the footings were more in keeping with "ishibatate", where natural stones were employed (Figure 14.4). The discoloration seen at the base of the wooden post in the image is possibly the result of the burning technique just outlined (Figure 14.4). A drawing from an article on Nakashima and his house shows that these footings likely had sub-grade concrete bases to ensure stability (Figure 14.5).

Hashira

In traditional Japanese houses, full-height wooden primary struts are called "hashira" (B). These tall posts are a fundamental part of Japanese timber frame architecture, providing vertical support for the structure and connecting other architectural elements like beams and roof structures (Figure 14.9).

Yukazuka

In traditional Japanese houses, "yukazuka" refers to short wooden intermediate struts, or supports, that are used to elevate and support the floor framework (C) (Figure 14.6 and 14.7). These posts are typically placed between the ground and the horizontal beams ("Ōobiki") or joists of the raised floor, ensuring stability and ventilation.

Ōobiki

In traditional Japanese carpentry, "Ōobiki" refers to large horizontal beams (D) that are part of the floor framing system in a raised-floor structure (Figure 14.8). These beams are essential components of the subfloor framework, supporting the joists and ultimately the floorboards above. In addition to their structural function, these beams may also serve as extra nailing surfaces to secure the sub floor or flooring materials, a practice that echoes the precision of traditional joinery in Japanese architecture. The placement of these beams was key to connecting vertical struts and ensuring the stability of the building, particularly in regions prone to seismic activity.

Neda

In traditional Japanese architecture, "neda" refers (E) to floor joists, which are horizontal wooden beams that support the floorboards above (Figure 14.10-red arrow). These joists are essential components of the subfloor structure in raised-floor buildings.

OpenAI. (2024). ChatGPT (Mar 14 version) [Large language model]. https://chat.openai.com/chat

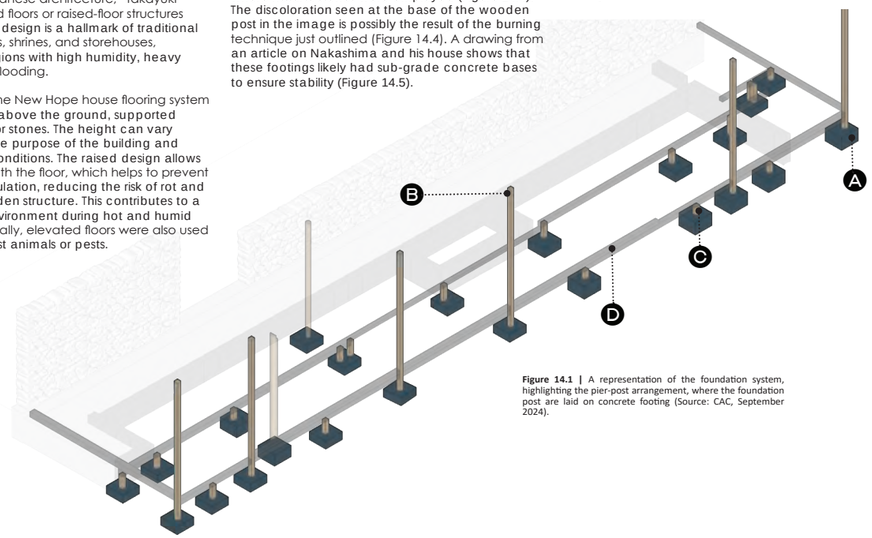

Figure 14.1 | A representation of the foundation system, highlighting the pier-post arrangement, where the foundation post are laid on concrete footing (Source: CAC, September 2024).

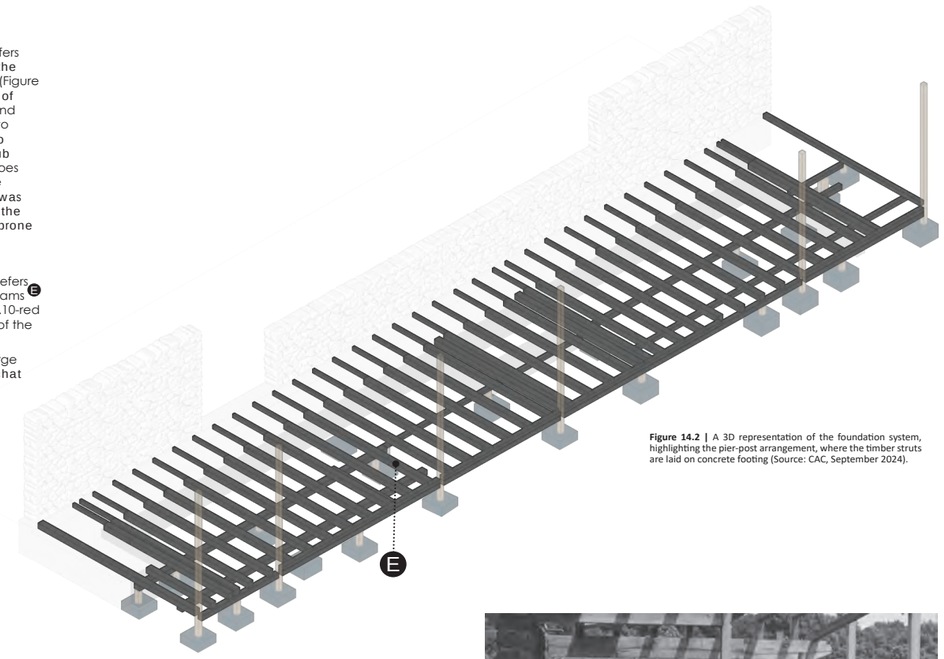

Figure 14.2 | A 3D representation of the foundation system, highlighting the pier-post arrangement, where the timber struts are laid on concrete footing (Source: CAC, September 2024).

Figure 14.3 | The house after the first phase was complete. This view helps illustrate how elevated the house originally appeared, June 1949 (Source: Nakashima Foundation for Peace).

Figure 14.4 | A rubble stone plinth beneath the post at the exterior southeast corner of the parents' bedroom reveals the original Japanese pier-and-post foundation system, February 1952 (Source: Nakashima Foundation for Peace).

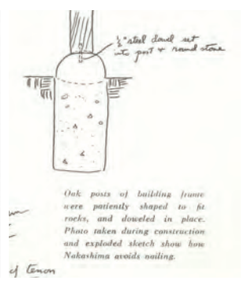

Figure 14.5 | A sketch from the article published in "House+Home" in *The Magazine of Building* depicts the original design for the footings. The sketch notes that the "posts were patiently shaped to fit the rocks and doweled in place," ca. 1952 (Source: Nakashima Foundation for Peace).

Figure 14.6 | A foundation post secured to the concrete footing using a metal plate (Source: CAC, June 2024).

Figure 14.7 | A foundation post secured to the concrete footing with no visible connectors (Source: CAC, June 2024).

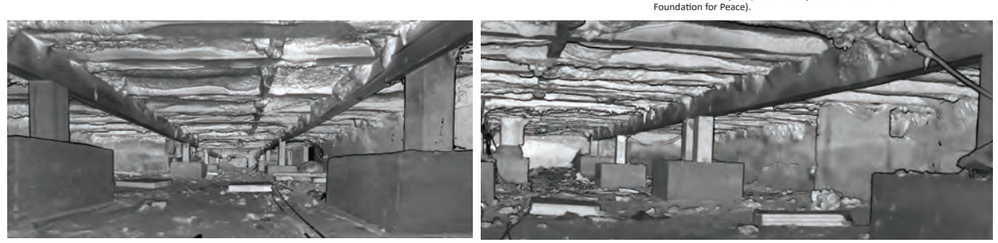

Figure 14.8 | Two images created from laser scan data reveal the complexity of the foundation area of the house including the major east/west, horizontal beams that are supported by the vertical struts, placed on top of concrete footings. The textured surface at the top of the images is the result of spray foam that was applied to the underside of the floor to improve insulation (Source: CAC, June 2024).

Figure 14.9 | A view looking east both the horizontal joists that run north/south, on top of the primary beams. In addition are several of the vertical struts that support the roof, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 14.10 | A view looking east of the floor joists resting on the summer beam positioned on the concrete blocks of the crawl space during the construction, ca. August 1947 (Source: Nakashima Foundation for Peace).

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SHEET NUMBER: 14

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

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SHEET DESCRIPTION: PHASE ONE: FOUNDATION SYSTEM and FLOOR STRUCTURE

PHASE ONE: POST AND BEAM FRAMEWORK

Beginning in the last quarter of the 19th century, almost all residential construction in the United States has used conventional framing, where the walls bear the load. Closely linked to advances in industrialization and the availability of standardized lumber and nails, the method allows for fast construction with limited skills.

While many of the design elements in the New Hope house are influenced by modernism, the construction method is consistent with the post-and-beam techniques used in traditional Japanese houses. This method, referred to as "tatami-zukuri" or "shikidai-zukuri", supports the roof, leaving the walls as non-load bearing, allowing them to be made of lightweight materials. The joints are meticulously crafted, often using intricate wood joinery techniques like mortise-and-tenon or dovetail joints (Figure 15.6 & 15.7), minimizing the need for nails or screws.

Primary Struts

The New Hope house began with concrete footings (A) on which vertical posts (struts) were placed to support the load of the roof (B). These full height struts directly supported the high girts below the roof (C). All primary struts were square (4" X 4") except two -- a single large, natural round strut installed in the living room (7" dia.) (D) and a second smaller, natural round strut embedded in the porous wall between the kitchen and living room (Figure 15.3). (E)

Intermediate Struts

Intermediate struts are smaller members used between primary struts to enhance stability. In the New Hope house, intermediate struts were used below the floor to help shorten the span of the primary floor girts (F) (Sheet 14). In addition, intermediate struts (G) were used on the north stone wall to frame the windows for both the kitchen and bathroom, as well as for Mira's bedroom (Figure 15.3). This was a critical detail, as the band of windows along the north side of the house (red dashed box)created a wide unsupported span and prevented the top girt from being attached to masonry, as it was for much of the rest of this elevation.

Angled Struts

Angle Struts are positioned at an angle, creating triangulation for additional lateral stability or load transfer.

Two sets of double diagonal struts were installed in the North/South walls (H) located between the kitchen and bathroom, as well as between the kitchen and Mira's bedroom and are currently concealed behind wall finishes (Figure 15.4). These diagonal braces, along with the concrete walls beneath them, are critical as they function as shear walls, strengthening the structure against horizontal forces, such as wind and earthquakes.

The Round Posts

These two posts both serve as primary struts helping to support the roof, but may also have a symbolic function that is very much in keeping with Japanese building traditions. The post in the living room is prominently displayed and may serve as a "Daikokubashira". In traditional Japanese homes, the "Daikokubashira" was a large central post symbolizing the strength and stability of the structure. In its role, it typically supports key beams while functioning symbolically, representing the heart of the home. In the New Hope house, its alignment is not on grid with the rest of the struts in the house (Sheet 3) which was likely intentional. It supports an oversized exposed girt (the mother beam) (I), eliminating the need for additional posts and allowing the living room to remain open.

Transverse Girts

Girts are typically positioned horizontally between vertical struts or columns in the wall of a timber-framed structure, transferring horizontal loads from the walls to the vertical struts and foundation.

North-south transverse girts (I) are connected to the primary struts. Each of these support smaller vertical struts that may directly reference traditional Japanese construction methods where small posts, called "tsuka" (J), are positioned between the transverse girts and roof components. All of the transverse girts, except for the mother beam in the living room, are constructed from two sections joined together using mortise and tenon, located above primary struts (Figure 15.7). Unlike the placement of the load bearing struts in the interior of the house, the two end walls are divided in half by a central primary strut (K). As a result, the transfer girts in these two locations are stepped, likely providing structural stability to the roof.

Purlins and the Change in Roofing

A purlin is a horizontal structural member in a roof's framework that supports the rafters or the roof decking (L). Purlins are essential in timber-framing, providing intermediate support for the roofing materials, while helping to distribute the roof load to the primary structural elements.

Roof purlins in the New Hope house run East/West, each being placed successively higher to create the necessary slope for the concrete tiles (Sheet 17). They are either placed directly on the transverse girt, secured by resting them in a "dado", or they are raised on small struts placed atop the girts (Figure 15.5).

Nakashima chose to use two different roofing materials for the original roof. To accommodate the weight and spacing of his two-foot concrete tiles, nine purlins were required, each spaced for a single tile length (Figure 15.5). On the eastern end of the house, Nakshima change to corrugated panels allowing him to widen the span between the purlins reducing their number to five (Figure 15.2).

Exposed Wood

In traditional Japanese houses "Shinkabe-zukuri" is an architectural style of wall construction characterized by a visible wooden frame with infill materials placed between the structural timbers. This technique is commonly used, in the New Hope house, showcasing the natural beauty of wood as a design element.

George Nakashima spoke of the importance of exposing the beauty of wood, as well as the influences he felt from his experiences in Japan. His integration of modern materials, like concrete, with traditional wooden joinery, exemplifies his hybrid approach, merging Japanese construction techniques with contemporary innovations to create a harmonious, enduring structure.

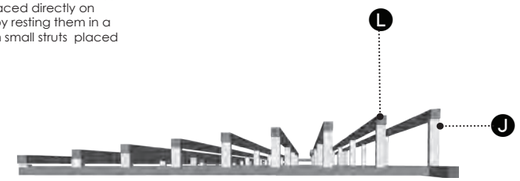


Figure 15.8 | Purlins raised on small struts to create the original mono-pitched roof line (Source: CAC, September 2024).

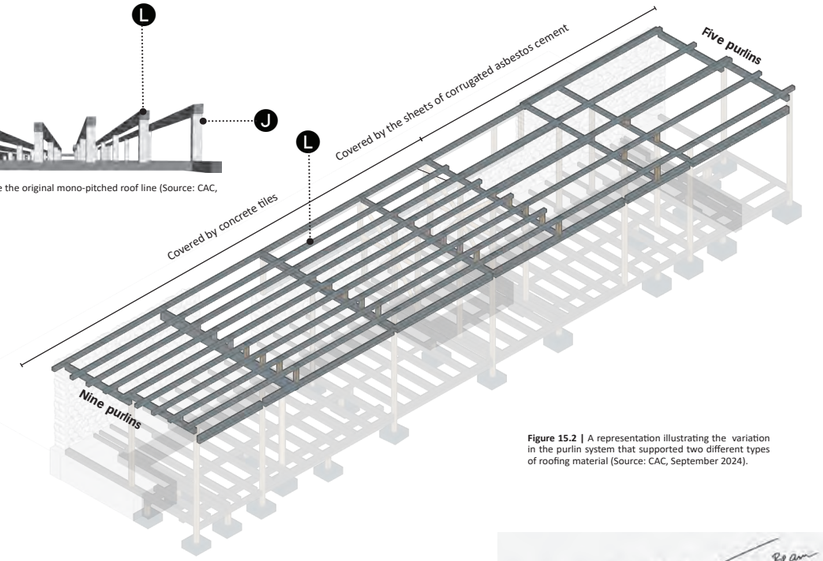


Figure 15.2 | A representation illustrating the variation in the purlin system that supported two different types of roofing material (Source: CAC, September 2024).

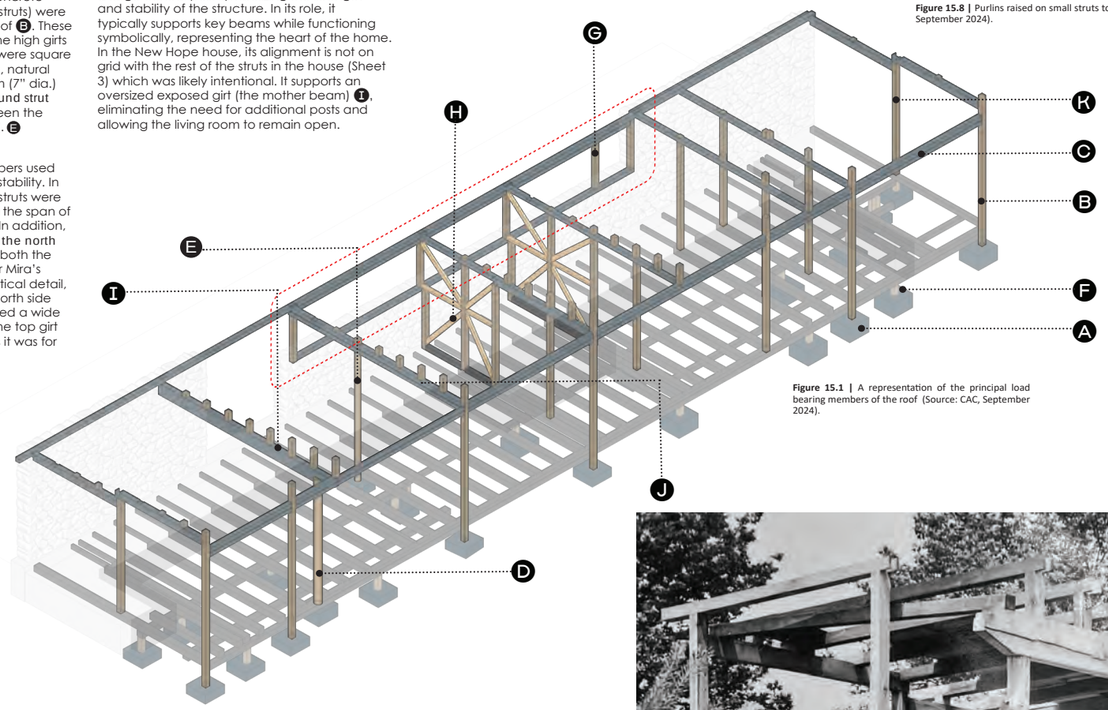
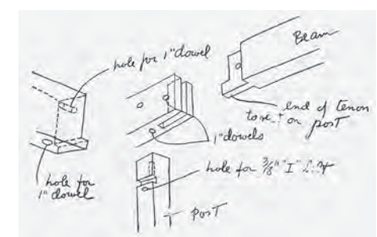


Figure 15.1 | A representation of the principal load bearing members of the roof (Source: CAC, September 2024).



15.6 | Transverse girts were connected using mortise and tenon joinery. A sketch in the article "House+Home" in *The Magazine of Building*, published in 1952 and possibly drawn by George Nakashima, illustrates the details of that joinery between beams and posts.

Figure 15.5 | A view looking west showing the small intermediate struts placed on top of the transverse girts ensuring the necessary slope for the roof purlins. Open mortises are visible and ready for connection to extend the purlins using tenon joinery, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 15.7 | Joint detail of transverse girts placed on the mother post, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 15.3 | A view looking southwest showing the primary girts running east/west and the transverse girts runnning north/south, ca. August 1947 (Source: Nakashima Foundation for Peace).

Figure 15.4 | A view looking southwest showing diagonal struts used in the walls around the bathroom, ca. September 1947 (Source: Nakashima Foundation for Peace).

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SHEET NUMBER: 15

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GRADUATE PROGRAM IN HISTORIC PRESERVATION
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DELINEATORS: Mojtaba Saffarian, Paridhee Goel
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SHEET DESCRIPTION: PHASE ONE: POST AND BEAM FRAMEWORK

PHASE ONE: THE ORIGINAL SOUTH VERANDA

In Japanese architecture the veranda, or "engawa" which translates to "edge side", is important as it functions as a roofed transition between the interior spaces of the house and the natural world. It is viewed as a room, but it is neither completely closed in nor open. In Japanese culture, it has played an important social role as a sitting place, a place to share a cup of tea, or a place to meet neighbors. Its function is diverse, serving as a hallway connecting rooms, as a shade cover, and as a seat for viewing the garden. Perhaps the most important function, though, is as a means for the inhabitants of the house to feel intimately connected with nature from the shelter of their home.

Nakashima was intimately aware of the importance and function of the veranda, describing his mother's ancestral home in Kamata, Japan as being "completely Japanese with a wooden veranda running around the whole structure."[1]

The original south veranda of the New Hope house embodied all of these aspects, including as a hallway connecting rooms. Large sliding doors at both the west end and the east end of the house allow the veranda to function as an exterior hallway (Figure 16.8).

As for the significance of connecting the outside world with the inside world, Nakashima himself emphasized that connection when he wrote that his New Hope property would allow he and his family to "exist close to the soil and trees."[2]

In traditional Japanese construction, the floor structure of a veranda is created by extending the interior floor joists to the outside, creating a cantilever. This may have been the case for the New Hope house, since historic photographs show that the original veranda deck had no supporting posts on its outer edge (Figures 16.5 and 16.7).

The bolting pattern on the front band board (Figure 16.5 and 16.6), however, indicates that the spacing of the veranda joists may have been wider than those of the interior floor. It is possible that different joists were cantilevered, separate from the floor joists, or not all of the floor joists were extended out.

The framework of the veranda's awning consisted of 28 rafters, spaced approximately 16 inches on center, with the last two rafters, on each end, being placed closer together (A). On top of the rafters were attached six evenly spaced purlins (B) that supported the roof decking on top (Figure 16.2 and 16.3).

Each rafter was cantilevered with the fulcrum being the top of the south elevation header beam running over the sliding door and windows (C). The rafters then extended into the attic cavity, with the back ends ultimately being held down by one of the East/West roof bearing members (D). This design eliminated the need for any bracing underneath, allowing the deck to remain protected but unobstructed.

All available evidence shows that this original veranda remained on the house after the construction of Kevin's Bedroom (Sheet 18), and that an exterior door onto the veranda from that bedroom was included, adding to its function as an exterior hallway.

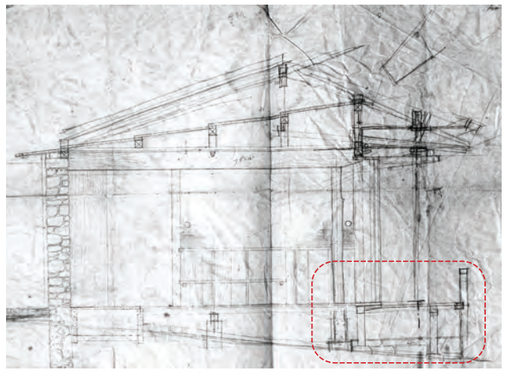

Figure 16.2 and 16.3 | Left: A transverse section through the living room (likely an original Nakashima drawing) appears to be a hybrid drawing where properly rendered elements represent the house before the 1982 modifications and hand sketched elements represent ideas for the 1982 changes. This includes the proposed new gable roof, but also shows the original cantilevered awning of the veranda. In this case, Nakashima was using the earlier drawing to do light studies, trying to determine if he could incorporate the original awning into the new gable roof, or if he would need to demolish and completely rebuild off the south elevation. The red boxed area illustrates the new flooring and parapet wall that would replace the original cantilevered deck, ca. 1946 with revision drawings of 1982 (Source: Nakashima Foundation for Peace). **Right:** A view during construction reveals that the veranda awning was cantilevered like the deck itself. In addition, the image shows that the original veranda and awning extended several feet eastward, beyond the junction between the concrete roofing tile and the corrugated roof panels, ca. September 1947 (Source: Nakashima Foundation for Peace).

Figure 16.4 | This image partially shows the connection of the deck joists to the floor structure, providing some insight into how the deck was supported and integrated into the overall framework of the house, ca. September 1947 (Source: Nakashima Foundation for Peace).

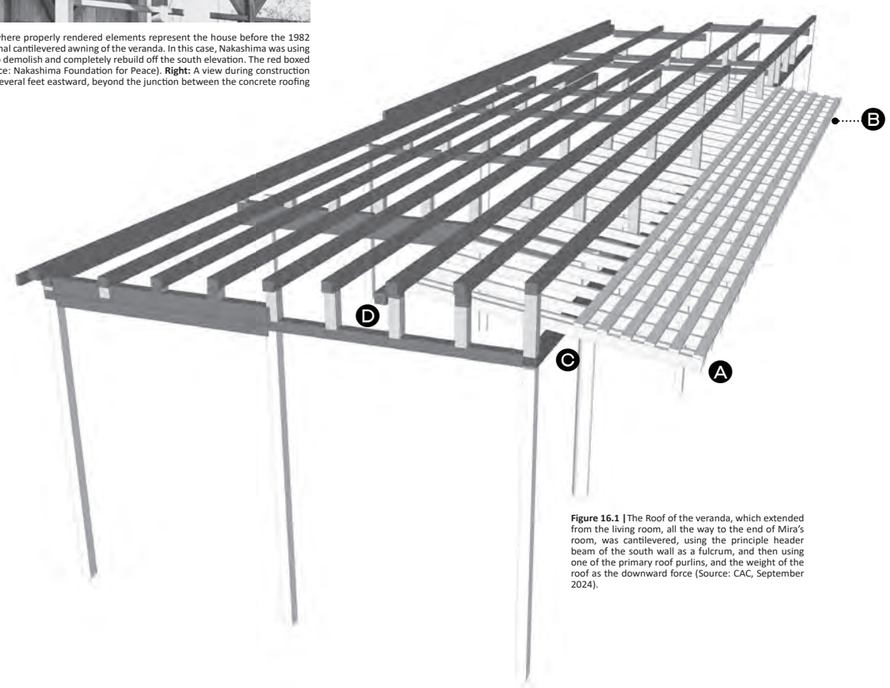

Figure 16.1 | The Roof of the veranda, which extended from the living room, all the way to the end of Mira's room, was cantilevered, using the principle header beam of the south wall as a fulcrum, and then using one of the primary roof purlins, and the weight of the roof as the downward force (Source: CAC, September 2024).

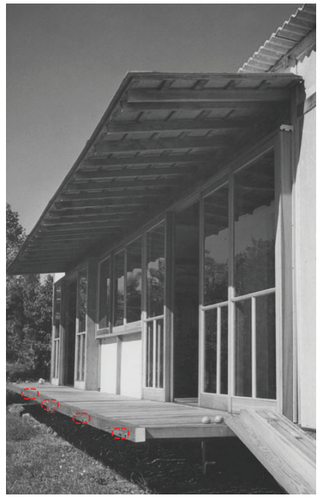

Figure 16.5 | Nakashima wrote that "what seemed necessary to [him] was to synthesize [Japanese] traditions with the demands of the contemporary world"3. The New Hope house sat in both worlds and the veranda reflects that by being both a traditional exterior hallway, but also a modern deck, ca. 1952 (Source: Nakashima Foundation for Peace).

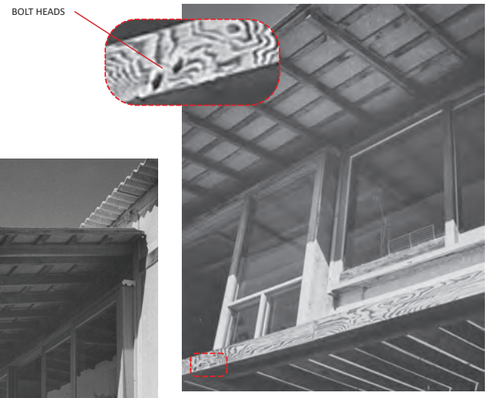

Figure 16.6 | The detail view of this image shows the heads of bolts that likely connected the band board with joists behind, ca. 1952 (Source: Nakashima Foundation for Peace).

Figure 16.7 | Formal outdoor access to the veranda may have been from a large stone located at its west end, February 1952 (Source: Nakashima Foundation for Peace).

Figure 16.8 | A photograph taken after the construction shows how the original veranda dominated the south elevation, June 1949 (Source: Nakashima Foundation for Peace).

1. Nakashima, George, The Soul of a Tree: A Woodworker's Reflections. First edition. Tokyo: Kodansha International, 1981. P. 56.
2. Ibid P. 70.
3. Ibid P. 69.

THE GEORGE NAKASHIMA FAMILY HOUSE
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SHEET NUMBER: 16

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

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DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET DESCRIPTION: PHASE ONE: THE ORIGINAL SOUTH VERANDA

PHASE ONE:MONO-PITCH ROOF ASSEMBLY

A Shed Roof

The New Hope house straddled the line between modernist ideals and traditional Japanese construction. Mono-pitched roofs, or single-sloped roofs, were not a common feature in traditional Japanese architecture, which typically favored more complex roof designs, until after 1940, especially in modern and postwar designs.

While he may have chosen a non-traditional roof shape, elements of the roof were still consistent with Japanese construction practices. To support the purlin of the roof, the New Hope house employed small posts, placed on top of the horizontal beams, just above the ceiling (Figure 17.2-red boxes & Sheet 15).

In addition, the concrete tiles of the New Hope house roof employ the same installation and function as traditional Japanese roofing tiles called "kawara". Historically, later designs of kawara employed a single tile, with a raised edge that served as a flashing over the tile beside it (Figure 17.3). In their earliest iteration, however, kawara tiles were a combination of a flatter bottom tile and a rounder covering tile to serve as the flashing (Figure 17.4).

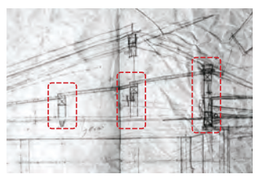

Figure 17.2 | A transverse section through the living room (likely an original Nakashima drawing). This view clearly shows the use of small posts placed on top of the top beams to support the pitched roof above, ca. 1946 with revision drawings of 1982 (Source: Nakashima Foundation for Peace).

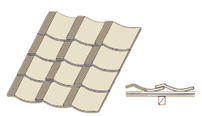

Figure 17.3 | A later kawara tile design that employs a lip to cover the tile beside it. This solution reduced the number of tiles that need to be installed.

Figure 17.4 | An earlier kawara tile design that employs two different tiles to solve the problems of water penetration.

Concrete Tiles

While elements of the tiling system suggest a connection to traditional Japanese roofing, Nakashima's choice to use concrete instead of terracotta broke from traditional fabrications.

This decision may have been related to his budget. He is quoted as saying "At no time did we have more than fifty dollars in cash, but by scrounging materials."[1]

The concrete tiles that were used to cover the western side of the original mono-pitched roof were cast by Nakashima on location (Figure 17.5). A historic sketch of the concrete tile configuration shows how the trimmed corners were use to allow a single tile shape to be use for the entire roof (Figure 17.6). The tiles were flat and rectangular, with chamfered corners on one end (Figure 17.8).

Figure 17.5 | A view of the house's initial construction from the northeast, looking toward the stone wall, shows the concrete tiles leaning against the wall. The chamfered corners of the tiles are visible as well, ca. August 1947 (Source: Nakashima Foundation for Peace).

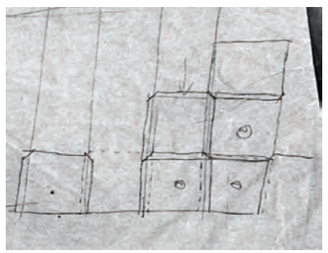

Figure 17.6 | An initial sketch, likely drawn by George Nakashima, illustrates how the concrete tiles are assembled, with the corners cut to allow for proper overlapping, ca. 1946 (Source: Nakashima Foundation for Peace).

To create the necessary pattern, tiles were laid in a specific sequence. The first course required that a set of "bottom" tiles be laid first, leaving gaps slightly smaller than a tile between them. Then a set of "top" tiles were used to cover those gaps (Figure 17.9). This sequence proceeded for each course up the entire slope of the roof.

Neither the available historic photos nor sketches provide clear details on the attachment method. The extremely shallow slope of the original roof may have allowed the tiles to remain in place mostly through the force of gravity (Figure 17.7). In older traditional Japanese constructions, "kawara" tiles were often set into a bed of mud or clay mixed with sand and straw. This acted as both an adhesive and a cushion. The tiles' weight and the interlocking design further secured them in place.

While effective, this method is less resistant to seismic forces and may degrade over time. Modern "kawara" installations often use metal clips or hooks to secure the tiles. These are attached to the roof structure and hold the tiles firmly without damaging them. Further investigation would be needed to determine the exact method employed.

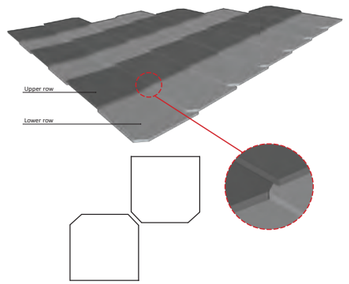

Figure 17. 8 | It is likely that a single tile shape, featuring two chamfered corners, was used and reversed on alternating rows to form the roof. The chamfered corners allowed the proper overlapping of the stacked tiles (Source: CAC, September 2024).

Figure 17.7 | view from the west shows the completed concrete tile construction, extending outward to create an awning over the window. This design not only provides shade but also helps protect the walls from rain, offering both functional and aesthetic benefits to the structure, ca. 1948 (Source: Nakashima Foundation for Peace).

Corrugated Asbestos Cement Sheets

As the roof purlins were arranged in a stepped configuration, they created the slope for installing the two-foot concrete tiles, starting from the west and extending to the wall between the bathroom and Mira's bedroom. The remainder of the roof was then finished using precast sheets of corrugated asbestos cement. Why Nakshima made the change is unknown, but changes in the roofing structure beneath (Sheet 15) indicates that the decision to make the change may have happened once the house was under construction. It is possible that he began to lay the concrete tiles before he closed in the house and realized that the process would be too time consuming to ensure that it be completed on time.

Once again, Nakashima's statement that "At no time did we have more than fifty dollars in cash, but by scrounging materials... and working evenings and weekends, I was able to build a rough structure by Thanksgiving."[1] supports the idea that it may have been due to both budgetary and time constraints. Pre-cast corrugated sheets may have been a more cost-effective option compared to producing additional concrete tiles, installing more timber beams, and paying for extra labor. The corrugated sheets had different dimensions and were lighter than the concrete tiles.

Historic photos, indicate that the post-and-beam framework, along with the shed roof, including the concrete tiles and corrugated sheets, were completed before the house was partially enclosed with walls (Figure 17.10).

Currently, despite the modifications made with the construction of the gable roof, the five purlins supporting the corrugated sheets remain visible on the eastern facade (Figure 17.11).

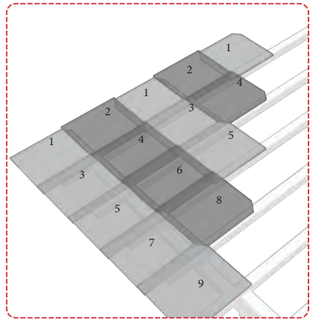

Figure 17.9 | The order to the laying of tiles was critical to ensure that a single tile shape could be used across the entire roof (Source: CAC, September 2024).

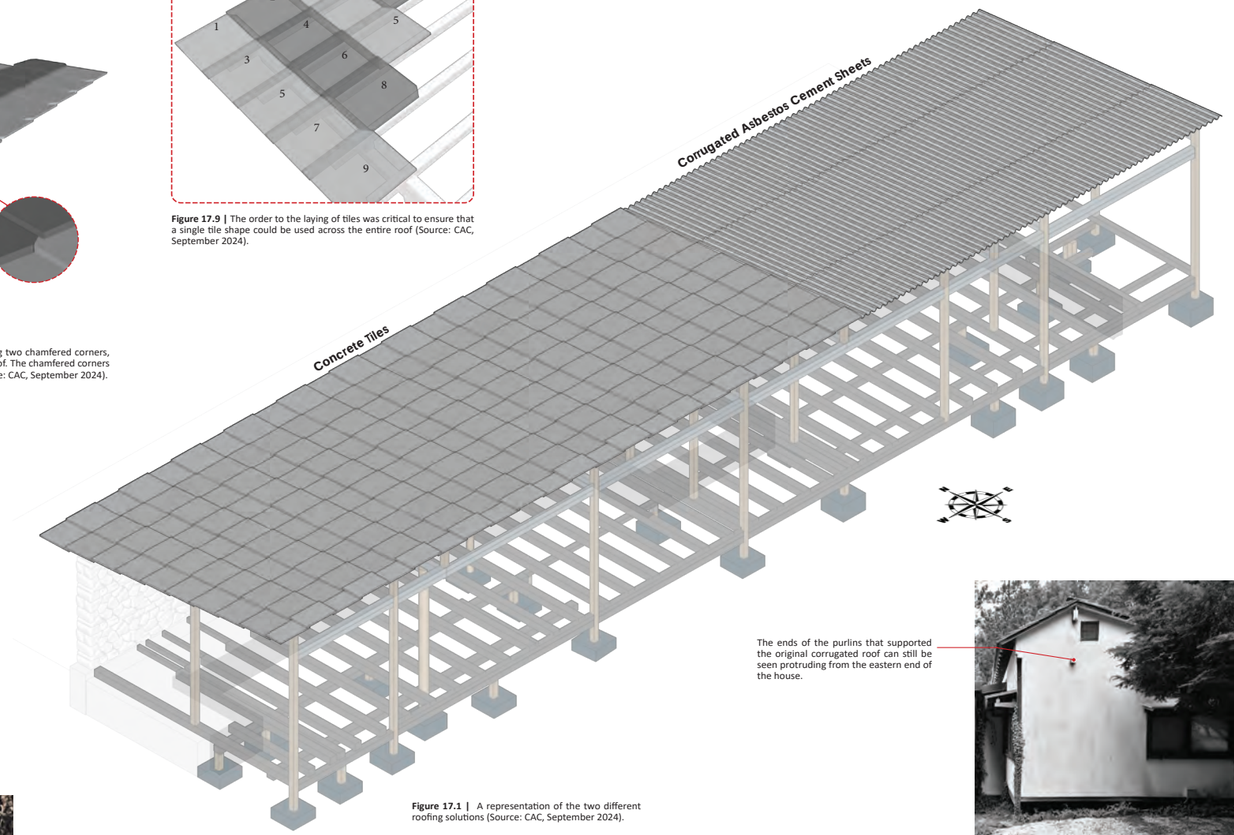

Figure 17.1 | A representation of the two different roofing solutions (Source: CAC, September 2024).

The ends of the purlins that supported the original corrugated roof can still be seen protruding from the eastern end of the house.

Figure 17.11 | East elevation of the Nakashima house with visible purlin supporting the original roof (Source: CAC, June 2024).

Figure 17.10 | A view of the north side of the house shows that the post-and-beam framework, along with the entire shed roof, both tile and corrugated sheet, were completed before the construction of the walls, ca. September 1947 (Source: Nakashima Foundation for Peace).

1. Nakashima, George, The Soul of a Tree: A Woodworker's Reflections. First edition. Tokyo: Kodansha International, 1981. P. 56.

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DELINEATORS:
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SITE RECORDING:
John Hinchman
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SHEET NUMBER: 17

SHEET DESCRIPTION: PHASE ONE:MONO-PITCH ROOF ASSEMBLING

PHASE TWO: CONSTRUCTION OF A BEDROOM ADDITION

With the birth of the Nakashima's son Kevin in December of 1954, the second phase of the building, which began in1955 was primarily to address a growing family, with the addition of a bedroom. This room, most commonly referred to as Kevin's room because he lived in it the longest, was originally for Mira. Possibly out of necessity and possibly out of desire, all evidence suggests that Nakashima wanted to limit the level of intervention on the existing structure and the decision to extend south was likely for just that reason. Adding to the west would have placed a bedroom directly off the living room; adding to the east would have required modifying the parent's bedroom, making it smaller by extending the hallway; and because the house was originally designed with its rooms aligned along the north wall, extending to the north would have required breaking up an existing room to allow a short hallway for accessing the extension.

A Hyphen to Connect

Placing the addition on the south side of the house required breaking up this critical elevation, which served as both a source of sunshine and heat, as well as a connection between the house's interior and the outside. The addition was 13 feet wide from east to west, but instead of using a full width connection, Nakashima chose a nine foot hyphen (a connecting link between two larger building elements). The choice of a hyphen served two purposes: it ensured that as much light as possible continued to enter the existing bedrooms of the house and it minimized the amount of change required to that south elevation. To limit the impact on the primary spaces of the house, Nakashima aligned the North/South centerline of the addition with the west wall of a closet situated between the two existing bedrooms in the original house (Figure 18.2- red line), using this 3-1/2 foot ancillary space to minimize the impact the addition would have on the bedrooms. To accommodate a large enough room, however, the addition needed to block some of the southern exposure of both of these other rooms. But the intervention required no damage. The decision of where to start the addition was simple; Nakashima placed the western wall to the west of the eastern most glass door/window panel in front of Mira's bedroom (Figure 18.3-red line), which he removed to create the entrance into Kevin's new room. The remaining connection of the hyphen was against the short, flat wall surface located between the remaining three large door/window panels and the windows on the parent's bedroom (Figure 18.2 and 18.3-green box). By limiting the length of the hyphen to nine feet, one of the largest benefits was that no part of that four panel window on the south elevation of the parent's room had to be removed (Figure 18.4).

Changing Floor Levels

Nakashima constructed the main floor level of the new addition 14 inches lower than the original house floor (Figure 18.9). An explanation for this is not documented in any primary sources; however, a logical explanation is related to available headroom and the existing height of the awning over the veranda. The addition's roof slopes in the opposite direction of the house's original mono-pitched roof (Figure 18.9-blue and green lines), but for both aesthetic reasons, as well as ease of construction, it maintains the same angle as the veranda awning. Since Nakashima was not removing the veranda or its awning, the new roof was built at the same height as the awning, ensuring that it could seamlessly connect. But as a result, based on the 13 foot North/South width of the new room, had the floor in the addition been built to the same height as the original house, the distance between the ceiling and the floor at the southern wall of the addition would have been just five feet, making that area unusable. By dropping the floor 14 inches, he increased the distance to just over six feet.

The hyphen provides both access to the addition, as well as ancillary space, currently occupied by a closet. These two areas share a common wall (Figure 18.2- blue line), but while they are aligned, their floor levels differ (Figure 18.9): the three-foot-wide entrance being at the same level as the original house and the closet being flush with the floor of the addition. Based on Nakashima's placement of the addition, it is very likely that the last three feet of the original veranda were repurposed as the floor for the entrance, helping to explain this change in height.

Once the addition was completed, the rest of the veranda was integrated into the new room with the addition of a door on the west elevation (A), however, this door was removed during the 1982 modification (Sheet 19). With the new addition, large stones were placed on grade at the junction between the original veranda and the addition, providing easy access to the garden below (B). In traditional Japanese houses, these stones are often referred to as "tobi-ishi". When placed as steps leading to an "engawa", they are larger and provide a transition from the ground level to the raised wooden floor of the house.

Windows

The south elevation of the addition was designed like the south elevation of the house, with more than half of its height being dedicated to windows (Figure 18.6). While the lower portion of the wall is stuccoed, The upper contains a double-slider window on the west (D), and a fixed window on the east (E), which combined, run the full width. Currently, in front of the windows, half of the area they occupy is filled with a sliding "kumiko" screen which differs from a shoji screen in that it is made solely of intricately joined wooden latticework without paper. (Figure 18.7). Historic images, however, show that originally this panel was a shoji screen (Figure 18.8).

A Concrete Box Below

A round chimney (Figure 18.5), which has since been removed, penetrated the new roof of the addition, most likely above the ancillary space of the hyphen (C). It is known that a sub-floor kerosene heater originally existed in what is now a shared closet between Mira's bedroom and the parent's bedroom. With the presence of a chimney here in the addition, it is very possible that the current closet space housed something similar to what was found between those other two rooms.

During the 2024 investigation, a concrete box was identified beneath this area (Figure 18.10) with the chimney directly above it, this concrete element may have served a traditional function. In Japanese houses, An "irori" is a square or rectangular pit, usually built directly into the floor, the pit itself being lined with fire-resistant materials. These pits were built to burn wood for warmth and cooking; however, modern adaptations, with the same sunken floor, often include electric or gas-powered heating elements, making them safer and more convenient to use indoors. If Nakashima had placed a kerosene heater here, he would have been able to leave the original exterior asbestos board panels in place as fire protection.

The Three-Dimensional Framing Model

In keeping with his original approach, Nakashima built the addition using post-and-beam similar to that of the main house (Sheet 15). During the 2024 investigation, the summer beams (G) were verified through both observation and point cloud data. In contrast, the beams depicted in light brown (H) are speculative, drawn as a proposed extension of the primary summer beam framework responsible for transferring loads to the foundation. A more invasive investigation would be required to confirm the complete floor structure of Kevin's bedroom.

4" X 4" square primary struts were used to transfer the roof load to the foundation (I). On top of the southern most struts, a horizontal girt was installed (J), that helped define the outer wall and carrying the load of the roof joists on top (K). Finally, purlins were added (L) to carry the load of the roof sheathing above.

No primary documentation was found that provided a reason for the existence of the concrete box mentioned earlier; however, one additional possibility for its existence was structural. In constructing the original house, Nakashima placed sheer walls above concrete foundation walls to help provide structural stability near the bathroom. The concrete box under the addition is directly beneath two of the room's primary struts , and also supports the north ends of the floor's summer beams (M), helping to anchor the elevated addition to the ground below.

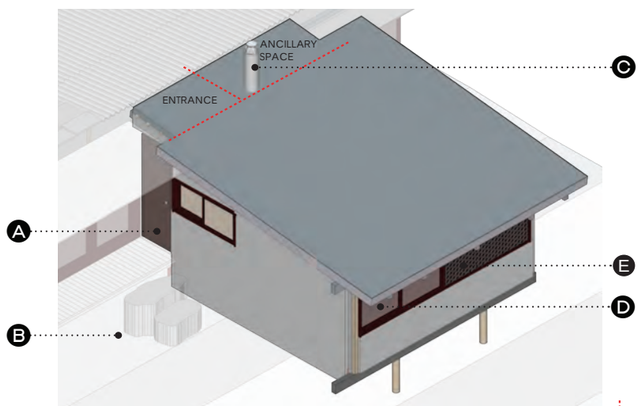

Figure 18.1 | A representation of Kevin's bedroom (Source: CAC, September 2024).

Figure 18.6 | An interior view of Kevin's bedroom featuring the exposed roof beam and joists, a double slider window on the east wall, a fixed and another double slider window on the south wall, September 1962 (Source : Nakashima Foundation of Peace).

Figure 18.7 | The same view of Kevin's bedroom's southern wall, with the Kumiko screen replaced (Source: CAC, June 2024).

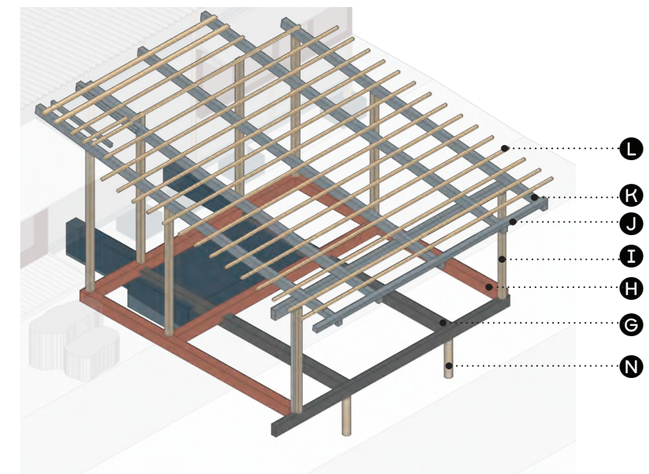

Figure 18.8 | A representation of roof and flooring system of Kevin's bedroom (Source: CAC, September 2024).

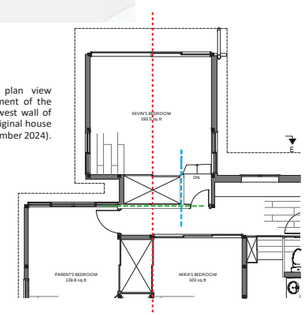

Figure 18.2 | A plan view showing the alignment of the addition with the west wall of the closet of the original house (Source: CAC, September 2024).

Figure 18.3 | Using a hyphen, Nakshima only lost the blank white wall on the right of the image, as well as the first door/window panel beside it, ca. 1952 (Source: Nakashima Foundation of Peace).

Figure 18.4 | Using the hyphen, Nakashima was able to retain the original four pane window on the south elevation of his own bedroom. While the addition blocked some of the window, his choice to extend out more than two feet ensured that the blockage would not significantly block the light (Source: Nakashima Foundation of Peace, June 1949 & CAC, June 2024).

Figure 18.5 | A view looking toward Kevin's bedroom showing its original state, featuring wooden cladding on the west elevation, a chimney on top, and an exterior front door that opened onto the deck, July 1963 (Source: Nakashima Foundation of Peace).

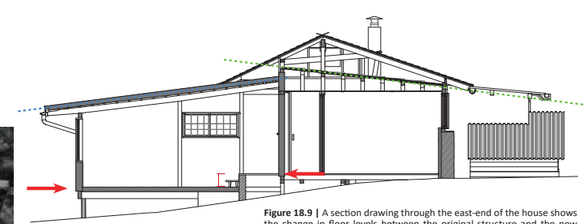

Figure 18.9 | A section drawing through the east-end of the house shows the change in floor levels between the original structure and the new addition (Source: CAC, September 2024).

18.10 | The box beneath Kevin's bedroom shows a wooden door on its south elevation. The ground visibly slops downward towards it suggesting a function possibly related to the foundation or an additional storage or access space beneath the bedroom (Source: CAC, June 2024).

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SHEET NUMBER: 18

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Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

DELINEATORS:
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SITE RECORDING:
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SHEET DESCRIPTION:
PHASE TWO: CONSTRUCTION OF KEVIN'S BEDROOM

PHASE THREE: MODIFICATIONS

In 1982, the house underwent significant modifications, most notably the construction of a new gable roof and extensions on both the west and south sides. As there are no historic photos available from the 1982 modifications showing the construction process or the exact state of the house after those changes, except for a few hand sketches, it is assumed that the current state of the house largely reflects the results of the 1982 modifications. Consequently, the additions and removals described in this report are based on the current condition of the house in comparison to the 1956 modifications.

South and West Extensions

Half of the west wall was extended outward approximately two feet, while the entire south wall, from the west side of the house to the junction with Kevin's bedroom, was extended outward by approximately three feet. These extensions increased the closed-in area of the southwest corner of the living room and essentially enclosed the area where the veranda (Sheet 16) had been.

The New Deck

By incorporating the area of the old deck into the house, a new square-shaped deck was added to the south elevation, positioned directly in front of the newly moved living room four-panel sliding door.

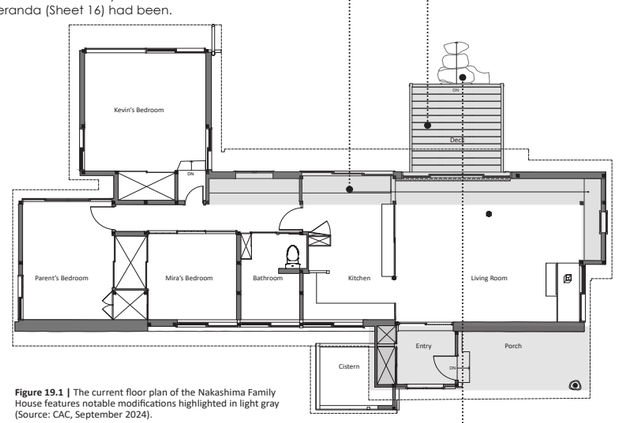


Figure 19.1 | The current floor plan of the Nakashima Family House features notable modifications highlighted in light gray (Source: CAC, September 2024).

The provided floor plan shows the house with the modifications from 1982 highlighted in light gray.

New Stone Steps

Three large irregular stones, surrounded by smaller stones, were used as steps in front of the new deck, reflecting the Japanese landscape style and providing access to the outdoors. These stones do not appear to be the same as the previous stone steps used for the old deck, as the earlier stones were more square in shape.

New Gable Roof

The most notable modification was the construction of a new gable style roof on top of the existing mono-pitch roof (Sheet 20). This new roof was added without destroying the original, however some modifications were required. The gable roof significantly altered the appearance of the house and the decision to do it may have been to make the house appear more traditional Japanese.

Chimneys

Of the two chimneys, the eastern one was removed, while the western chimney, serving the living room fireplace, was extended to match the increased height of the new gable roof.

New Awning

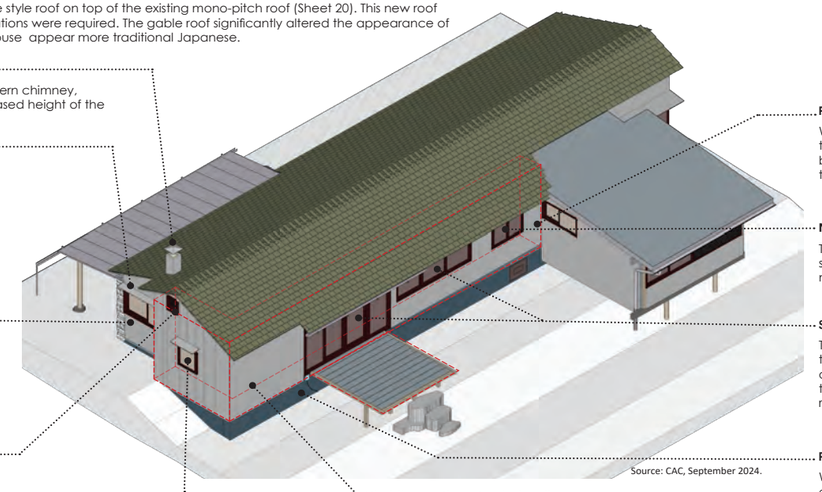
To accommodate the new gable roof, the overhanging portions of the original shed roof on the west elevation had to be removed, exposing the west-facing window. A new awning was installed not only for aesthetic purposes, but also to provide shade and protect the window from rain and snow. Similar to the original awning on the east elevation, this awning was built using sloped 2"x2" timbers supporting a plywood sheet covered with galvanized sheets.

Wall Claddings

Except for the exposed north stone wall and the extended section of the west wall, the remaining exterior walls, previously covered by asbestos cement panels or wood sheets, were finished with a white stucco or gypsum surface.

The New Gable Roof Vents

New wooden vents with a metal screen were installed in the new gables on the east and west ends. These vents allow air circulation in the attic cavity, helping regulate temperature and moisture levels. This prevents overheating in the summer, reduces strain on heating and cooling systems, minimizes condensation risk, and extends the roof's lifespan by reducing the chances of mold and wood rot.



Source: CAC, September 2024.

A New One-Panel Window

A new wooden, one-panel casement window, accompanied by an awning above it, was installed on the extended west wall, enhancing the living room by allowing more light to enter and providing an additional view of the outside.

Cladding on the Extended Wall

Gray wooden panels with a natural texture were used as the final finish for the extended section of the west wall. It appears that a galvanized layer is located behind the wooden panels; however, the full composition of the layers cannot be confirmed due to limited access and available resources.

Removal of the Kevin's Bedroom Exterior Door

When the old deck was incorporated into the interior space, the exterior door of Kevin's bedroom was removed. The bedroom could then only be accessed from the interior.

New Casement Window

The eastern three-panel sliding door on the south wall was removed and replaced with a new wooden double casement window.

Southern Sliding Door and Window

The four-panel sliding door, along with the three-panel sliding window, were also extended outward, remaining in the same position within the extended south wall, maintaining the living room's connection to the exterior space.

Foundation Space Enclosure

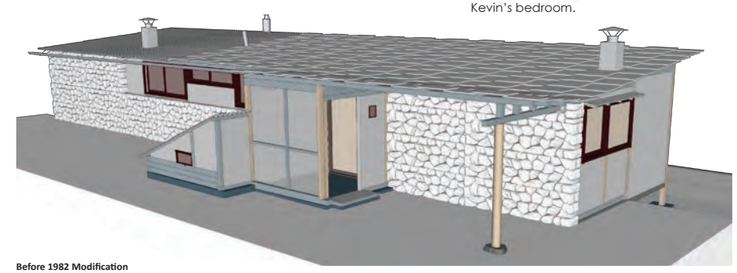
When the west wall and south wall were extended outward it radically changing the appearance of a floating floor. Concrete block walls were built rather than using the spread footings found in the original design completely enclosing the space below. This modification was likely intentional and served to protect the underside of the house while improving insulation, and pest prevention. To maintain access for maintenance, two small openings were created: one beneath the new deck and another near the junction of the house with Kevin's bedroom.

New Enclosure of the Entry

The northern glazed wall of the entry was removed and replaced with a solid wall, featuring a wooden double casement window at its center. Additionally, a wooden door was installed on the western wall, where previously there was none. This new configuration transformed the entry from a semi-open space into a fully enclosed part of the interior.

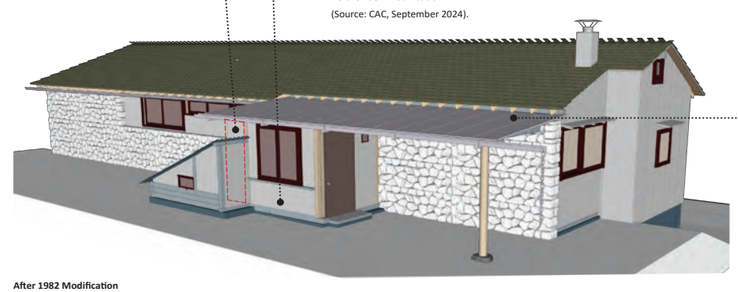
Entry Extension

In order to provide additional closet space in the entry foyer (Figure 19.2), the eastern wall of the Entry Foyer was extended into the cistern approximately two feet (Figure 19.3).



Before 1982 Modification

(Source: CAC, September 2024).



After 1982 Modification

(Source: CAC, September 2024).

New Shed Roof over Northern Porch and Entry Space

The north porch and entry also underwent significant modifications during the 1982 phase. The original roof over the porch and entry, made of concrete tiles in a stepped configuration, was entirely removed, being replaced with a new lighter shed roof made of plywood with a metal standing seam exterior finish. Unlike the original roof, which sloped in the opposite direction of the house's shed roof, the new shed roof now slopes in the same direction as the newly added gable roof. This updated configuration, which also includes a gutter with a chain for improved drainage, was likely implemented because the cistern was no longer needed for collecting rainwater for household use.

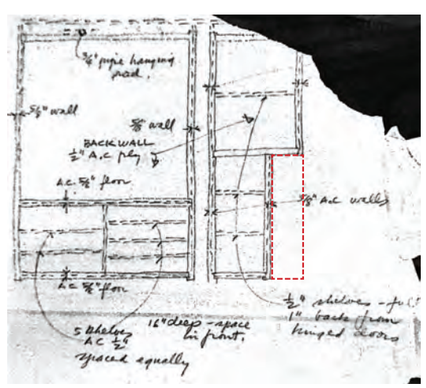


Figure 19.2 | An original, likely initial sketch of the closet design for the entry space showcases the layout and specifics of the materials used, with the location of the stone wall marked by red dashed lines, ca. 1982 (Source: Nakashima Foundation for Peace).

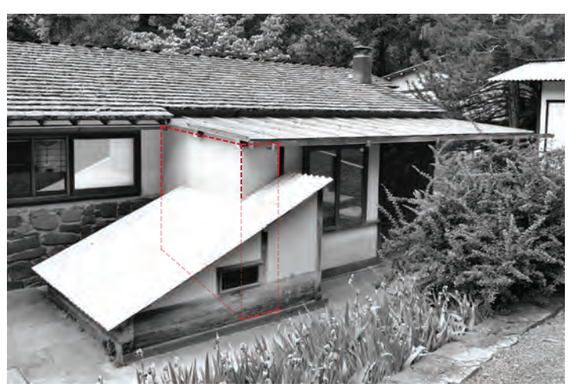


Figure 19.3 | A 2024 view of the entry, with dashed lines indicating its extension toward the cistern (Source: CAC, June 2024).

THE GEORGE NAKASHIMA FAMILY HOUSE
1847 Aquetong Rd, New Hope, PA 18938

This project is supported by a grant from the Pennsylvania Historical and Museum Commission's Keystone Historic Preservation Grant, a program funded by the Commonwealth of Pennsylvania.
The project is funded in part by a grant from the Johanna Favrot Fund for Historic Preservation of the National Trust for Historic Preservation.

SHEET NUMBER: 19

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
John Hinchman - Project Supervisor, University of Pennsylvania
Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

DELINEATORS: Mojtaba Saffarian, Paridhee Goel
SITE RECORDING: John Hinchman, Mojtaba Saffarian

SHEET DESCRIPTION: PHASE THREE: MODIFICATIONS

PHASE THREE : GABLE ROOF CONSTRUCTION

During phase three modifications, Nakashima chose to change his roof from the original mono pitch to a double pitch gable, but instead of removing the original, he chose to limit his intervention, adding it directly on top of the original roof. While adjustments were made to the post-and-beam framework to adapt to the new design, most of the original still remains intact (Sheet 15 & 17).

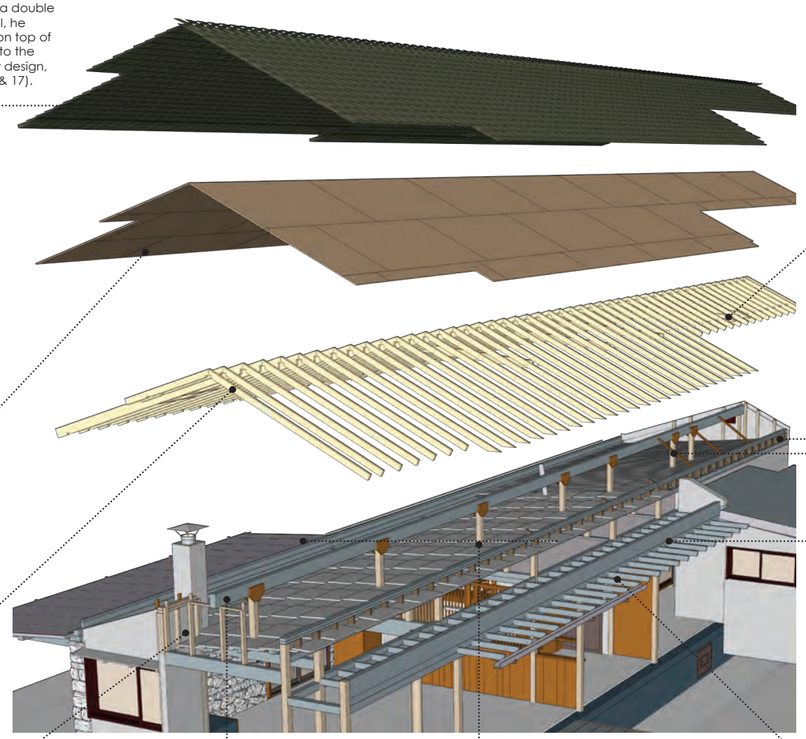


Figure 20.1 | Source: CAC, September 2024.

Shakes

Traditional Japanese roofs were often covered in wooden shingles. Referred to as "hiwadabuki" the method symbolizes the traditional Japanese ethos of harmony with nature, as it uses sustainable, natural materials.

In keeping with this tradition, the outer layer of the New Hope house is composed of wooden shakes providing a natural and rustic aesthetic. Each shake measures 24 inches in length but vary in their width. Spacing between the shingles ranges from 3/8 to 5/8 inches, accommodating natural expansion. The lowest course uses a double layer with offset spacing to ensure no moisture penetrates between them to the sheathing below (Figure 20.4). On all edges, the shakes extend beyond the sheathing also to help protect the wood below (Figure 20.4). They provide excellent insulation and durability; however, regular maintenance is essential to prevent issues such as rot and weather deterioration.

Sheathing

Traditional Japanese houses use thin, closely spaced wooden planks for sheeting, however, on the New Hope house, the sheathing consists of standard 4' X 8' plywood sheets A. An interesting choice for a woodworker who typically chose less engineered solutions, the decision to use plywood may have been for structural purposes. Panels provide a continuous surface creating a stress skin which is designed to handle tension, compression, and shear much better than planking.

Rafters

All the roof rafters B are spaced 16 inches apart; however, the roof is not symmetrical, with the north side spanning approximately 13 feet and the south side spanning only 10 feet. As a result of the shorter south span, and because of additional, load-bearing contact points (Figure 20.3 and 20.9-green arrows), Nakashima was able to make his rafters on this side only 2" X 4", whereas, on the north side the rafters are 2" X 6".

Rake Wall Studs

A rake wall follows the slope of a roof or other angled structure. For the New Hope house rake wall studs are positioned at the eastern and western gable ends of the roof. This was one area where Nakashima had to significantly alter the original roof, by cutting back the eave overhangs (Figure 20.2) and linking these new studs to the original post and beam framing below. Since he extended part of the western end of the building outward (Sheet 19), the process for attaching the rake walls to the building was likely different for each end.

Ridge Beam

A 4" X 8" ridge beam C, runs along the roof's peak, visibly extending from the east and west rake walls (FIGURE 20.2). In convention framing, ridge beams are not considered load-bearing and are, therefore, typically much smaller in size. Because of the post and beam approach of the house, in this case Nakashima may have chosen the larger size to keep with Japanese tradition, where heavy ridge beams, known as "munagi", are considered structural and often hold symbolic meaning, representing strength and stability.

Intermediate Struts

In addition to being supported by the two rake walls at each end of the building, the ridge beam is supported by seven intermediate struts along its length D, that are each posted directly on top of the existing roof below: there was no evidence found of any penetrations. The spacing of these struts is not uniform, but instead reflect the location of load-bearing primary struts from the original construction below.

Ties

The gable roof of the New Hope house is clearly a hybrid of both conventional framing and post and beam. The choice of common rafters spaced 16" on center was likely driven by the use of plywood for the sheathing; however, due to the existence of the original shed roof and Nakashima's choice of a larger ridge beam, some of the most common elements of a conventionally framed roof are either missing or modified. Due to the original roof remaining in place, rafter ties (at the intersection of the rafters and the wall cap plates) could not be installed; however the post and beam construction of the original house would have made them redundant. Additionally, collar ties (top 1/3 of the rafters) were not installed, likely due to the depth of the ridge. In six location, however, intermediate ties were installed E. Not consistently spaced down the length of the building, these ties function as both rafter ties and collar ties, with three of them being directly tied to intermediate struts F. What makes them even more perplexing is that on the west end, above the original corrugated sheeting, the three that are not connected to struts are set at a slight diagonal pitch instead of being horizontal.

Knee Wall

To accommodate the new roof, Nakashima would have had to remove the top eave overhang of the mono pitched roof from the full length of the southern elevation. Observation from laser scanner data revealed that on the eastern end of the house, a knee wall K was installed directly above the vertical south wall to help support the roof (Figure 20.8); however, on the west end of the house no knee wall was visible, suggesting that it may not run the full length of the house(Figure 20.9). This possible variation may have been the result of the difference in original roofing material. Unfortunately, due to the addition of spray foam on top of the original roof it is difficult to know if the west end lacks this knee wall, or if it is just covered with a deeper layer of foam Figure 20.9-green arrow..

Diagonal Knee Wall Braces

Three 2" X 4" diagonal H braces were found in the eastern end of the attic cavity with their contact points being the ridge beam and the bottom of the knee wall. While their function is not fully understood, the combination of rafter, brace, and knee wall creates a rigid triangle (Figure 20.8-green triangle) that would prevent the knee wall from toppling under the outward force from the load of the roof above. The fact that these braces were only found in the eastern end of the building may support the argument that the knee wall does not run the full length of the house.

Header Beam

The shifting outward of the entire south elevation of the house required that Nakashima remove the original veranda awning and rebuild. To accommodate this change as well as support the smaller rafters of the new roof, a 4" X 10" header was installed on top of the original East/West girt.

New Awning

Both historical (Figure 20.10) and contemporary evidence suggests that Nakashima chose to completely rebuild what was the veranda awning, in order to create the flat ceiling for the southward expansion and ensure that the new gable roof could slope at the proper angle. Originally, the veranda awning sloped downward to the south, being cantilevered from within the attic cavity of the house. The replacement, however, is flat, with the outer ends of the joists being at a higher level than before. While it remains unclear if the original joists from the awning were reused, measurements indicate that the exposed part of the joists, in both versions, are of similar length. The southern portion of the joists now rest on the new south exterior wall and their tips function as an additional connection points for the rafters of the gable roof.

Double Top Plate

While most of the significant changes for the new gable roof occurred on the southern side of the house, the north wall was not left unchanged. Once again the eave extensions of the old roof were removed. The rafters currently rest on a double-top plate, formed by stacking two horizontal wooden members on top of the stone wall (Figure 20.3-red arrow). To accommodate this, a new 4x4 beam was placed on top of the existing beam providing the required height.

A cock's comb roof

One of the most distinctive aspects of th roof is the alternating extension of the wooden shakes above the ridge line (Figure 20.7), an approach typically referred to as a cock's comb roof. This style is often found in traditional or historic architecture, particularly in some European and colonial designs, and while it is not common in Japanese traditional houses, it is still used.

Figure 20.4 | Source: CAC, June 2024.

Figure 20.5| Source: CAC, June 2024.

Figure 20.6 | Source: CAC, June 2024.

Figure 20.7 | Source: CAC, June 2024.

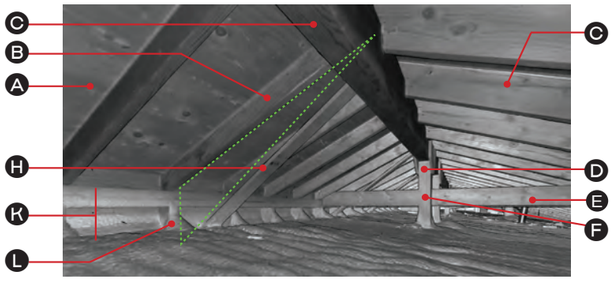


Figure 20.8 | Source: CAC, June 2024.

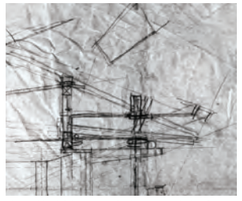


Figure 20.10 | Source: Nakashima Foundation for Peace.

Figure 20.9 | Source: CAC, June 2024.

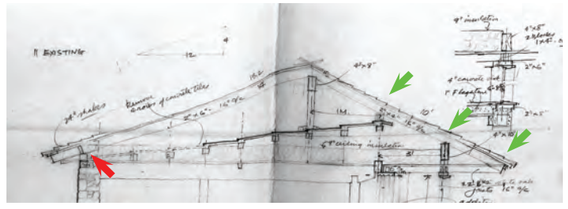


Figure 20.3 | The drawing appears to represent a refined stage of the design for the new roof, presenting structural elements along with their dimensions. It is unlikely to be an "as-built" drawing, as some details conflict with the current state of the structure. For example, text on the drawing states "remove four rows of concrete tiles"; however, based on current observations, it does not appear that any of these tiles were actually removed. Date unknown (Source : Nakashima Foundation of Peace).

Figure 20.2 | Top-left: January 1948, Bottom-left February 1952, (Source : Nakashima Foundation of Peace).
Top and bottom right: CAC, June 2024.

THE GEORGE NAKASHIMA FAMILY HOUSE
1847 Aquetong Rd, New Hope, PA 18938

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SHEET NUMBER: 20

CENTER FOR ARCHITECTURAL CONSERVATION
GRADUATE PROGRAM IN HISTORIC PRESERVATION
STUART WEITZMAN SCHOOL OF DESIGN - UNIVERSITY OF PENNSYLVANIA

Frank Matero - Project Director, University of Pennsylvania
John Hinchman - Project Supervisor, University of Pennsylvania
Mojtaba Saffarian - Field Team, University of Pennsylvania, Paridhee Goel - Layout, University of Pennsylvania

DELINEATORS:
Mojtaba Saffarian
Paridhee Goel

SITE RECORDING:
John Hinchman
Mojtaba Saffarian

SHEET DESCRIPTION: PHASE THREE - GABLE ROOF CONSTRUCTION

ENVIRONMENTAL IMPROVEMENTS REPORT

An Amendment to the *2023 Collections Assessment for Preservation Survey Report*

NAKASHIMA FAMILY HOUSE
New Hope, Pennsylvania

Photo Credit: Michael C. Henry

Prepared for
The Nakashima Foundation for Peace

Funded by
Pennsylvania Historical & Museum Commission (PHMC)
and by
The National Trust for Historic Preservation Favrot Fund.

Prepared by

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Project 23008

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Project 23010.02

Final Report
30 August 2024

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Project **ENVIRONMENTAL IMPROVEMENTS REPORT**
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1847 Aquetong Road,
Solebury Township, New Hope, PA 18938

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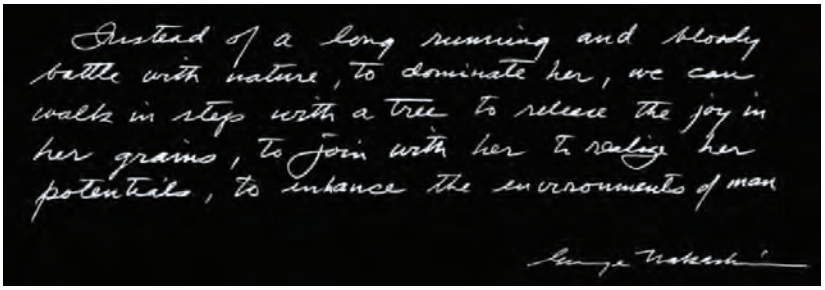
Funding Pennsylvania Historical & Museum Commission (PHMC)
and
The National Trust for Historic Preservation Favrot Fund

The statements and opinions contained herein are for the use and information of The Nakashima Foundation for Peace. The opinions reflect the judgments of Collections and Building Conservation Professionals performing with the care and skill ordinarily used by other Collections and Building Conservation Professionals, when dealing with buildings and collections respectively at the same time and in the same or similar localities. Conclusions drawn in this report are based on those conditions and surfaces accessible to the unaided visual observation of the Consulting Team. No warranties or guarantees can be inferred from, or implied by, the statements or opinions contained in this report.

End of Project Directory



PART 1 - INTRODUCTION

BACKGROUND

In June 2023, the Nakashima Foundation for Peace contracted with Wendy Jessup Associates, Inc., and Michael C. Henry, LLC, to prepare a *Collections Assessment for Preservation Survey Report for the Nakashima Family House*. The on-site assessment took place in October 2023, and the report was submitted in December. Under separate funding, the NFP initiated an environmental monitoring program in June 2023, and subsequently engaged Michael C. Henry, LLC, to review and analyze data and provide a more substantial assessment of the environment of the Nakashima Family House than was possible when the *Collections Assessment for Preservation Survey Report* was written.

This *Environmental Improvements Report* expands on the environmental review contained in the *Collections Assessment for Preservation Survey Report for the Nakashima Family House* and is intended to supplement and update the information in that report, including the section *Preliminary Assessment of Potential Environmental Performance* (p. 35-36). In order to avoid duplication of necessary historical, spatial, and contextual information on the Nakashima Family House and its collections, this *Environmental Improvements Report* is written as an amendment to the prior report. To avoid the risk of dissociation of the two reports, and to facilitate access to the content of the prior report, the entire *Collections Assessment for Preservation Survey Report for the Nakashima Family House* is included as an Appendix to this *Environmental Improvements Report*.

PURPOSE AND SCOPE

The purpose of this report is to:

- Review and analyze twelve months of environmental monitoring data collected by the Nakashima Foundation for Peace.
- Determine a realistic and achievable ASHRAE A24 class of environmental control that can be maintained in the Nakashima Family House and the Garage.
- Identify the performance improvements that might be made to the building envelope with minimal impact to the integrity and appearance of the building fabric.
- Identify the possible approaches to mechanical (HVAC) and non-mechanical management of the interior environment that might be made with minimal impact to the integrity and appearance of the building fabric.
- Identify the types of collections that could be located in the Nakashima Family House.

APPLICABLE GUIDANCE

This report is informed by current professional guidance for museum collections in historic buildings:

- The Secretary of Interior's *Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, 2017;
- The *New Orleans Charter for the Joint Preservation of Historic Structures and Artifacts*, adopted by the Association for Preservation Technology and the American Institute for Conservation for Historic and Artistic Works;
- The American Institute for Conservation for Historic and Artistic Works *Code of Ethics*; and,
- The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) *2022 ASHRAE HVAC Applications Handbook, Chapter 24: Museums, Galleries, Archives and Libraries*.

ACKNOWLEDGEMENTS

Michael Henry and Wendy Jessup appreciate the opportunity to assist in the planning for the preservation of the Nakashima Family House and its collections. Special thanks to Zorianna Siokalo for her diligent execution of the monitoring program.

End of Part 1 - Introduction

PART 2 - ANALYSIS OF THE CURRENT INTERIOR ENVIRONMENT

THE ENVIRONMENTAL MONITORING PROGRAM

In June 2023, the NFP initiated a program to monitor environmental conditions in the Nakashima House utilizing Testo 160 WiFi capable temperature and relative humidity dataloggers (Appendix B). Measurements are taken at 15-minute intervals and data are automatically uploaded to the Testo Cloud and accessed through the Testo Saveris 2 website.

The dataloggers used in the monitoring program were:

Logger	Location	Photo	Deployment Date
Marion's Bedroom	Figure 2.1 ①	Figure 2.2	June 2023
Kevin's Bedroom	Figure 2.1 ②	Figure 2.3	June 2023
Office Bedroom	Figure 2.1 ③	Figure 2.4	November 2023
Dining Room	Figure 2.1 ④	Figure 2.5	November 2023

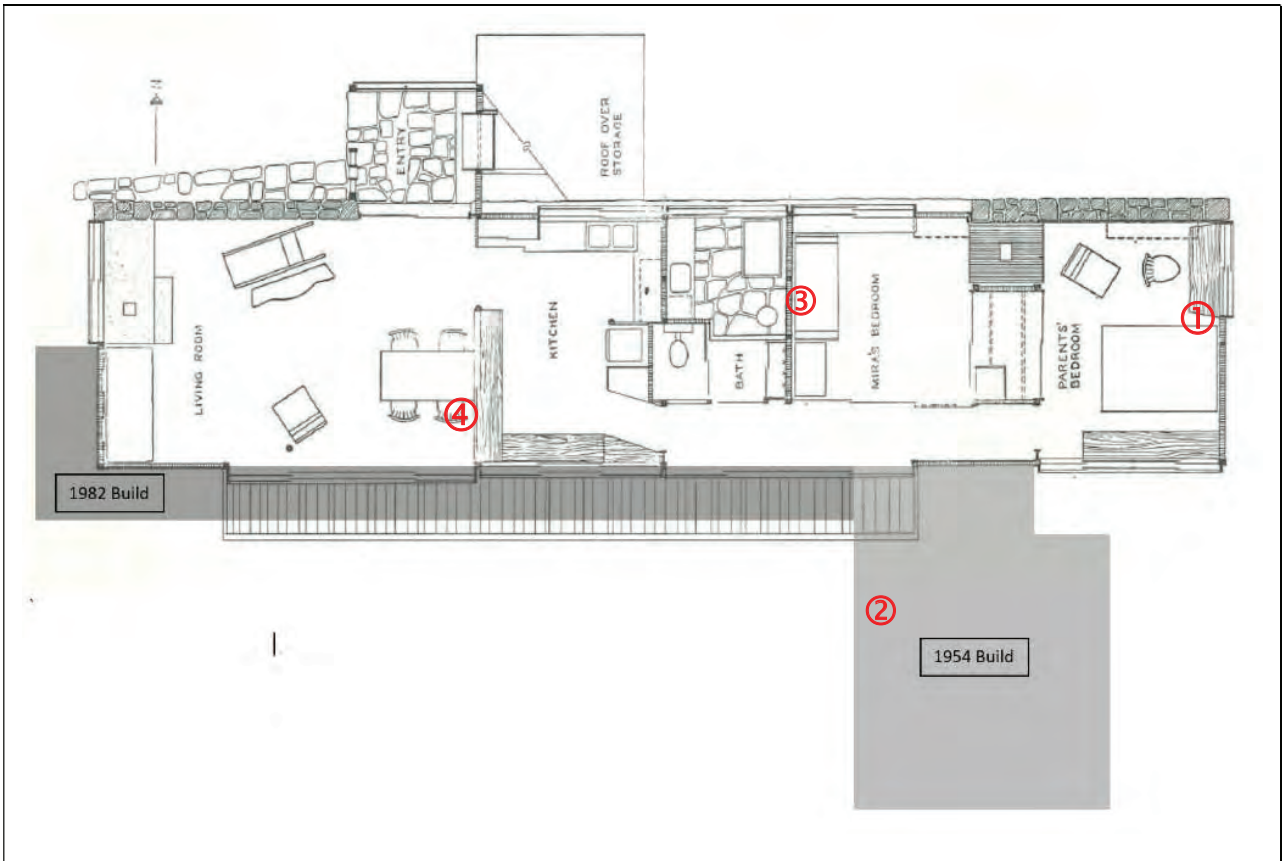


Fig. 2.1 Nakashima Family House 1946 Floor Plan (Fig. 2.2) with approximations of 1954 and 1982 Builds and locations of dataloggers
Credit: Michael C. Henry

Fig. 2.2 Datalogger ① in Marion's Bedroom
Photo credit: Zoriana Siokalo June 2024

Fig. 2.3 Datalogger ② in Kevin's Bedroom
Photo credit: Zoriana Siokalo June 2024

Fig. 2.4 Datalogger ③ in Office Bedroom
Photo credit: Zoriana Siokalo June 2024

Fig. 2.5 Datalogger ④ in Dining Room
Photo credit: Zoriana Siokalo June 2024

The results of the Environmental Monitoring Program will inform:

- Temperature and relative humidity conditions to which the collections are exposed.
- Relationship of the interior and exterior conditions, including moisture vapor, from which an understanding of building envelope performance can be derived.
- Effects of occupancy and visitation on the interior environment.
- Suggested strategies for improving the environmental performance of the building envelope, the mechanical system and the operation of the building by occupants.

ANALYTICAL METHODS

The following variables are useful for understanding the environmental management in a building;

- Dry bulb temperature (°F) - air temperature;
- Dew point temperature (°F) - dew point temperature is the temperature at which the water vapor in the air will condense on a surface, coincident with 100% relative humidity. It is an indirect indication of the amount of moisture vapor that is in a unit volume of dry air; and,
- Relative humidity (%RH) - for a given dry bulb temperature, relative humidity is the ratio of the moisture content of a unit volume of air relative to the maximum possible moisture content of a unit volume of air at that temperature. Relative humidity is dependent on both atmospheric moisture vapor and temperature. For a fixed amount of moisture vapor in a container, relative humidity increases when dry bulb temperature decreases; therefore, relative humidity decreases when the dry bulb temperature increases. At a constant temperature, relative humidity increases with an increase in moisture vapor (increasing dew point temperature) and decreases with a reduction in moisture vapor (decreasing dew point temperature).

Exterior conditions were not monitored at the site, so exterior data, including precipitation, was sourced from Trenton-Mercer County Airport WMO #724095 (40.77N, 74816W, Elevation 190 feet), 8.4 miles southeast of the site.

After reviewing the available monitoring data, the following date ranges were selected for analysis.

Logger	Start Date & Time	End Date & Time
Marion's Bedroom	01 July 2023 12:00AM	01 July 2024 12:AM
Kevin's Bedroom	01 July 2023 12:00AM	01 July 2024 12:AM
Office Bedroom	09 Nov. 2023 12:00AM	01 July 2024 12:AM
Dining Room	09 Nov. 2023 1:00 PM	01 July 2024 12:AM

The monitoring data and Trenton weather data were uploaded to *eClimateNotebook®* (https://www.eclimatenotebook.com/) for analysis.[1]

eClimateNotebook® was used to:

1. Compare moisture vapor levels in the House as an indication of source moisture control and moisture vapor exchange through the envelope.
2. Compare the recorded conditions in the Nakashima Family House to the reasonably achievable ASHRAE Type C environmental conditions recommended in the *Collections Assessment Survey Report* (Appendix A);
3. Generate Preservation Metrics® which "transform temperature and relative humidity data into quantitative numerical measures of collection decay risk."

The results of these analyses and their interpretation are discussed in the following sections.

[1] Wendy Jessup and Associates, Inc., and Michael C. Henry, LLC, maintain a subscription account with *eClimateNotebook®*.

ANALYSIS OF SOURCE MOISTURE CONTROL AND MOISTURE VAPOR EXCHANGE

The *Collections Assessment For Preservation Survey Report* noted that source moisture control (Appendix A, pp. 27 - 29) and hygrothermal performance of the building envelope (Appendix A, pp. 32- 34) were important aspects of managing the interior environment especially with respect to relative humidity.

Precipitation is the primary source of liquid moisture in the site and materials of a building; evaporation of precipitation will elevate local atmospheric vapor, as reflected by dew point temperature. Although the environmental monitoring program did not include precipitation, precipitation data (Fig. 2.6) are available for the Trenton-Mercer County Airport, WMO #724095. It is notable that:

- The total precipitation for the July 2023 to June 2024 portion of the monitoring period was 15% greater than the total average precipitation for the years 1998 through 2019.
- Total monthly precipitation for July through October 2023 was 5% greater than the total monthly precipitation for the same months in 1998 through 2019.
- Total monthly precipitation for November 2023 through June 2024 was 23% greater than the total monthly precipitation for the same months in 1998 through 2019.

Fig. 2.7 presents trend graphs of the interior and exterior dew point temperatures for the 2023-2024 monitoring period (exterior dew point temperatures are not available for June 2024):

- During July through October, interior and exterior dew point temperatures track closely with 62°F average interior dew point versus 58.4°F average exterior dew point. Variations in each are also small with a standard deviation of 5.7°F for the interior and 9.7°F for the exterior.
- During November through May, interior and exterior dew point temperatures diverge with 45.6°F average interior dew point versus 35.5°F average exterior. Variations also diverge, with a standard deviation of 5.8°F for the interior and 13.9°F for the exterior.

Fig. 2.8 presents the average monthly interior and exterior dew point temperatures, based on the same data as the trend graphs in the prior figure.

The dew point temperature data suggest the following:

- From June through early October, precipitation increases soil moisture and building material moisture. Evaporation of soil moisture and building materials moisture toward the interior will increase interior moisture vapor, but this increase may be offset by natural ventilation when windows and doors are open, provided that exterior moisture vapor is lower than the interior moisture vapor.
- From November through May, precipitation increases soil moisture and building material moisture. Evaporation of soil moisture and building material moisture toward the interior will increase interior moisture vapor, but dilution with drier exterior air is limited because windows and doors remain closed.
- Throughout the year, building materials and building contents effectively buffer changes in atmospheric moisture.

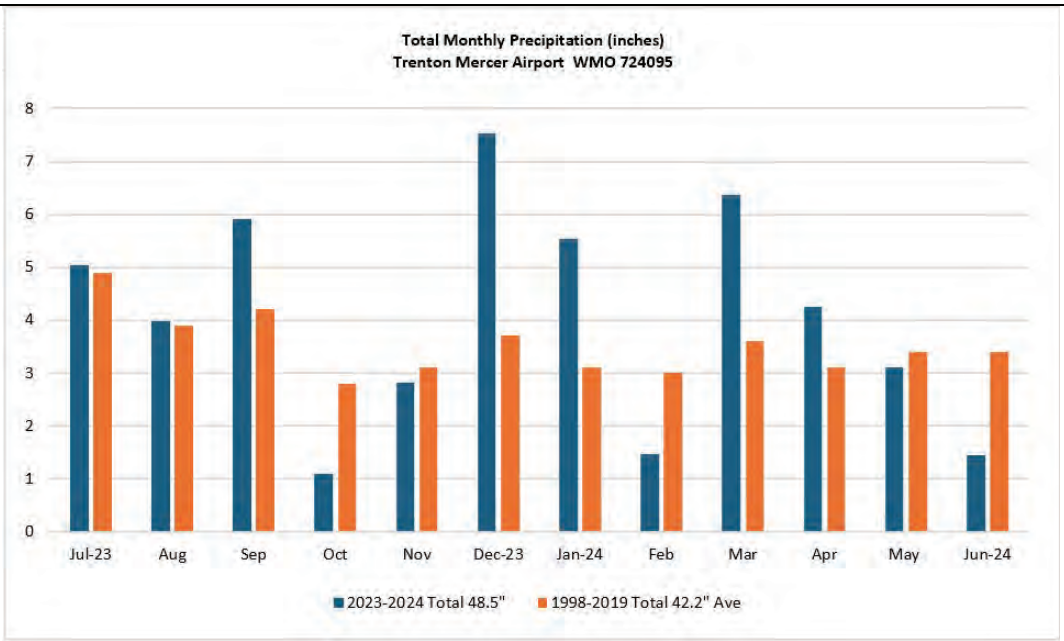


Fig. 2.6 Nakashima House Environment: Precipitation 07/01/23 to 07/01/24 and 07/1998 to 07/2019

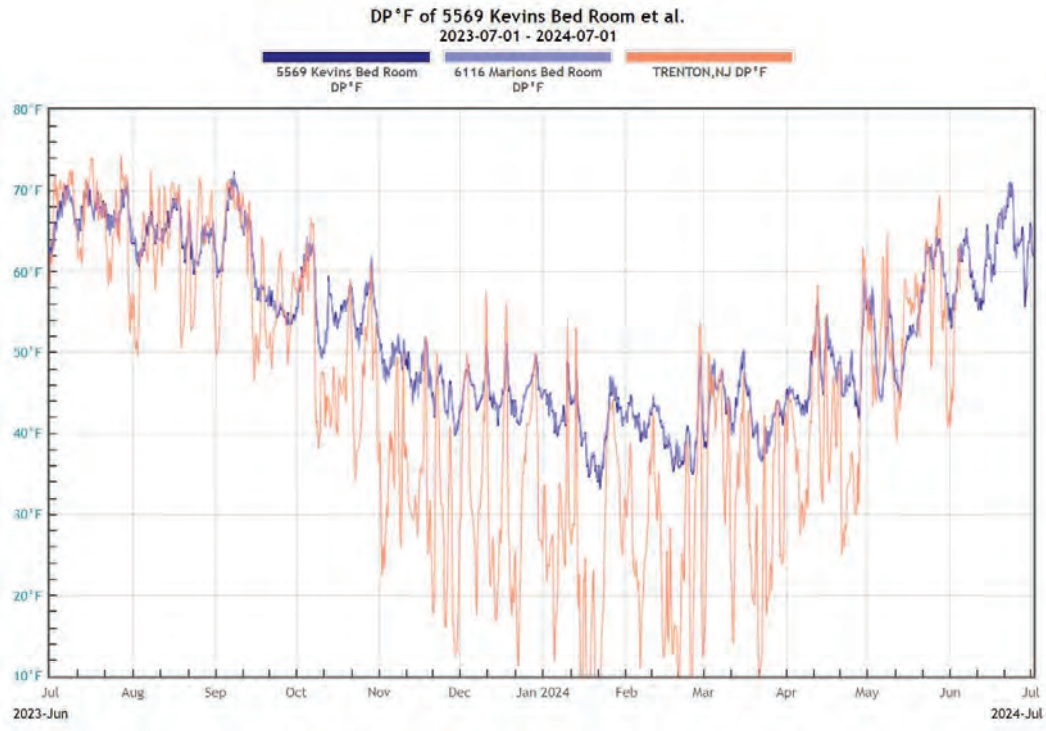


Fig. 2.7 Nakashima House Environment: Interior and Exterior Dew Point Temperature 07/01/23 – 07/01/24

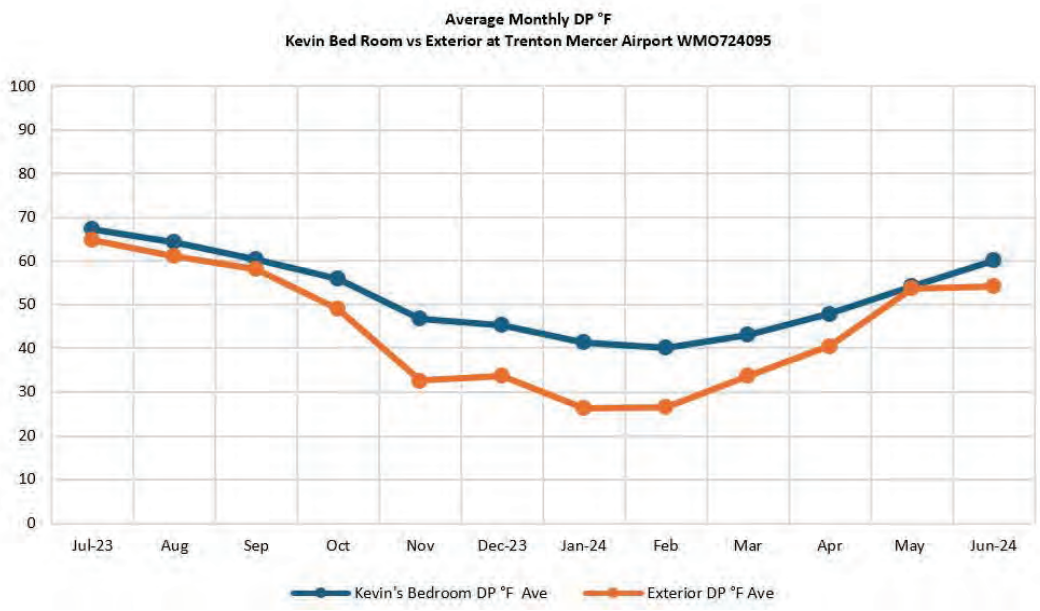


Fig. 2.8 Nakashima House Environment: Average Monthly Interior & Exterior Dew Point Temp 07/01/23 – 07/01/24

ANALYSIS FOR CONFORMANCE WITH ASHRAE TYPE C ENVIRONMENT

The *Collections Assessment For Preservation Survey Report* (Appendix A, pp. 35-37) found that it is realistic and achievable to maintain an ASHRAE Type C environment at the Nakashima Family House:

The Nakashima Family House is in climate zone 4A Mixed-Humid, and based on the above building envelope performance characteristics, ASHRAE Table 11 indicates that it is realistic and achievable to maintain Type C interior environmental control at the House. ASHRAE Type C has maximum and minimum limits for relative humidity and temperature but does not limit the range of short term (24 hour) fluctuations in either variable. ASHRAE Table 13A states the collections benefits and risks for Class C as:

Mold germination and growth, and rapid corrosion avoided.

Tiny risk of mechanical damage to many artifacts and most books; moderate risk to most paintings, most photographs, some artifacts, some books; high risk to high-vulnerability artifacts.

Even greater care is needed than provided in [Class] B when handling objects made with flexible paints and plastics that become brittle when cold, such as paintings on canvas.

Chemically unstable objects deteriorate significantly within decades at 68°F, twice as fast each 9°F higher. Conversely, cool winter season can extend their life.

For the Nakashima Family House, the target operating parameters for Type C Control would be:

ASHRAE A24 Type C control criteria applied to the Nakashima Family House				
Table 13A Control Class	Relative Humidity (primary control)		Temperature (secondary to RH)	
C	Not less than 25% RH	Generally below 65% and not higher than 75% RH (dehumidification req'd)	55°F when RH approaches 25% or less	Ambient or higher to keep RH below 75%

ASHRAE Chapter 24, Table 13A states that relative humidity should be "Not continually above 65% rh for more than X days" and references a chart showing the relationship of mold germination time versus relative humidity at 75°F (Fig. 2.9). For the Nakashima Family House, it would be prudent to stipulate that relative humidity would be "not continually above 65%RH for more than 30 days and never higher than 75%RH".

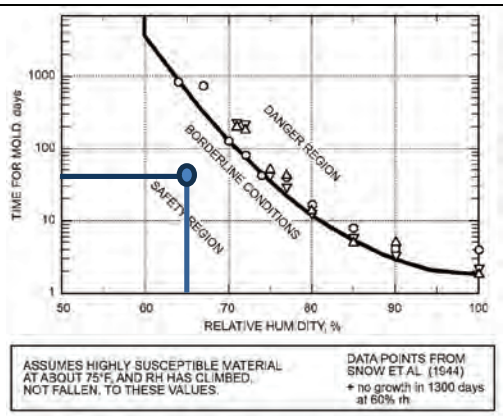


Fig. 3 Time Required for Visible Mold Growth

Fig. 2.9 Relationship of RH & Mold Growth at 75°F (ASHRAE Chapter A24) annotated with 65%RH at 30 days

The recorded monitoring data were analyzed for variance from an ASHRAE Type C environment. The results are illustrated in the following tables and trend graphs (Fig. 2.10 through 2.14), and summarized below:

- Dry Bulb Temperature (Type C range from 50°F to 75°F)
  As expected, dry bulb temperatures frequently exceed the Type C limit 75°F from June through mid-September and temperature fluctuations are wide, driven by exterior conditions and the absence of mechanical cooling. From mid-September through May, dry bulb temperatures are mid-range and temperature fluctuations are comparatively small, presumably due to thermostatic control of the heating system. The temperature in Marion's Bedroom is lower than the other spaces in winter; this is likely due to placement of the datalogger low on an exterior wall with minimal air circulation.
- Dew Point Temperature (Type C range from 17 to 62°F)
  Moisture vapor frequently exceeded the Type C limit of 63°F limit during late-May through early-October, tracking closely with exterior conditions and high air exchange rate due to open windows and doors during warm and hot days. From mid-October through mid-May, dew point temperature is mid-range and does not track with exterior moisture vapor; this suggests that the air exchange rate with windows closed is relatively low and that there is effective moisture buffering from the building materials and contents and possible moisture vapor from the crawl spaces.
- Relative Humidity (Type C limits of 25%RH to 65%RH)
  Relative humidity is typically within Type C extreme limits, but from early August through early November, relative humidity is within the 65%RH to 75%RH range for longer than 30 days, greatly increasing the risk of mold germination. Note that relative humidity is a function of dry bulb temperature and dew point temperature (moisture vapor). If the high dry bulb temperatures are decreased to within Type C limits, the high dew point temperatures must also be decreased to within Type C limits, otherwise relative humidity will be increased. In short, dehumidification, separate from cooling, will be required.

5569 Kevins Bed Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-07-01	T°F Mean	67	%RH Mean	60	DP°F Mean	52.5	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	64.3	%RH Median	61	DP°F Median	50.8	T°F [50,75]	78%	%RH [25,65]	66%	DP°F [17,63]	78%
	T°F Min	54.6	%RH Min	37	DP°F Min	33.2	T°F >75	22%	%RH >65	34%	DP°F >63	22%
	T°F Max	85.4	%RH Max	82	DP°F Max	72.4						
	T°F Stdev	7.7	%RH Stdev	8	DP°F Stdev	9.9						

6116 Marions Bed Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-07-01	T°F Mean	65.2	%RH Mean	64	DP°F Mean	52.6	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	63.1	%RH Median	64	DP°F Median	50.9	T°F [50,75]	81.1%	%RH [25,65]	53.6%	DP°F [17,63]	77.8%
	T°F Min	50.6	%RH Min	45	DP°F Min	34	T°F >75	18.9%	%RH >65	46.4%	DP°F >63	22.2%
	T°F Max	84.2	%RH Max	84	DP°F Max	72						
	T°F Stdev	8.4	%RH Stdev	7	DP°F Stdev	9.9						

7642 Dining Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-11-09	T°F Mean	65.9	%RH Mean	53	DP°F Mean	47.9	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	63.9	%RH Median	52	DP°F Median	45.9	T°F [50,75]	90.2%	%RH [25,65]	95.5%	DP°F [17,63]	94.1%
	T°F Min	57.1	%RH Min	25	DP°F Min	26.9	T°F >75	9.8%	%RH >65	4.5%	DP°F >63	5.9%
	T°F Max	83.7	%RH Max	77	DP°F Max	70.4	PARTIAL YEAR					
	T°F Stdev	5.4	%RH Stdev	7	DP°F Stdev	7.5						

7679 Office Bed Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-11-09	T°F Mean	65.7	%RH Mean	52	DP°F Mean	47.6	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	63.5	%RH Median	52	DP°F Median	45.4	T°F [50,75]	90.6%	%RH [25,65]	96.3%	DP°F [17,63]	93.4%
	T°F Min	57.9	%RH Min	37	DP°F Min	33.8	T°F >75	9.4%	%RH >65	3.7%	DP°F >63	6.6%
	T°F Max	84.6	%RH Max	73	DP°F Max	71.3	PARTIAL YEAR					
	T°F Stdev	5.4	%RH Stdev	7	DP°F Stdev	7.9						

Fig. 2.10 Nakashima House Environment: Conformance with ASHRAE Type C 65%RH limit

5569 Kevins Bed Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-07-01	T°F Mean	67	%RH Mean	60	DP°F Mean	52.5	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	64.3	%RH Median	61	DP°F Median	50.8	T°F [50,75]	78%	%RH [25,75]	99.6%	DP°F [17,63]	78%
	T°F Min	54.6	%RH Min	37	DP°F Min	33.2	T°F >75	22%	%RH >75	0.4%	DP°F >63	22%
	T°F Max	85.4	%RH Max	82	DP°F Max	72.4						
	T°F Stdev	7.7	%RH Stdev	8	DP°F Stdev	9.9						

6116 Marions Bed Room

Date Range	Temperature		Relative Humidity		Dew Point		T Limits		RH Limits		DP Limits	
Start 2023-07-01	T°F Mean	65.2	%RH Mean	64	DP°F Mean	52.6	T°F <50	0%	%RH <25	0%	DP°F <17	0%
End 2024-07-01	T°F Median	63.1	%RH Median	64	DP°F Median	50.9	T°F [50,75]	81.1%	%RH [25,75]	97.2%	DP°F [17,63]	77.8%
	T°F Min	50.6	%RH Min	45	DP°F Min	34	T°F >75	18.9%	%RH >75	2.8%	DP°F >63	22.2%
	T°F Max	84.2	%RH Max	84	DP°F Max	72						
	T°F Stdev	8.4	%RH Stdev	7	DP°F Stdev	9.9						

Fig. 2.11 Nakashima House Environment: Conformance with ASHRAE Type C 75%RH maximum 07/01/23 – 07/01/24

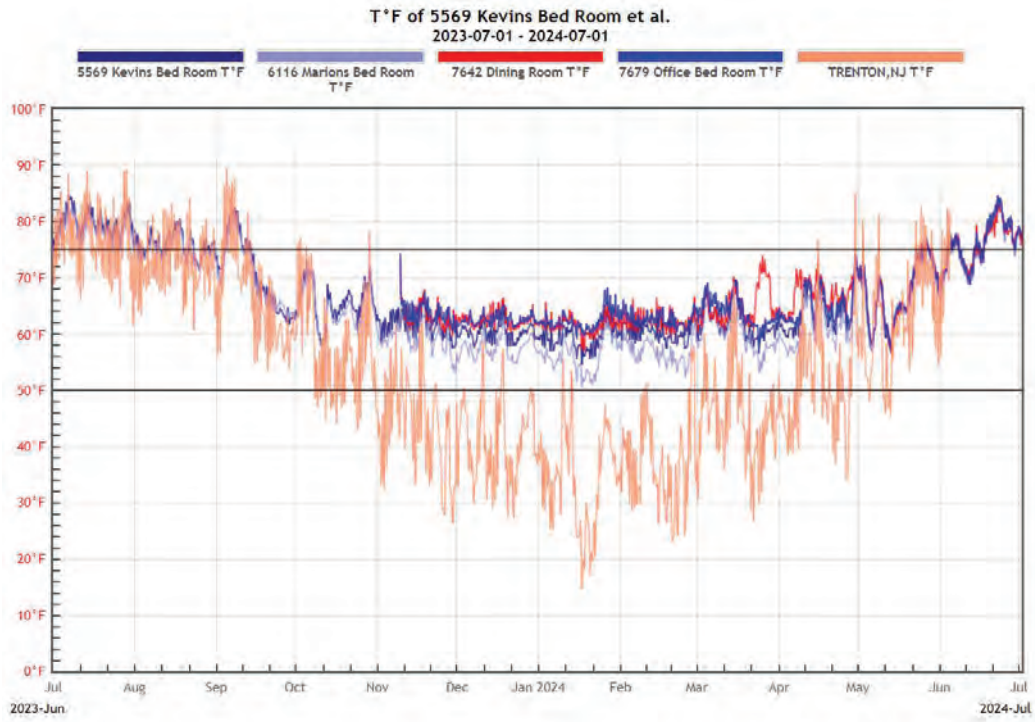


Fig. 2.12 Nakashima House Environment: Conformance w. ASHRAE Type C 50 to 75°F Dry Bulb Temp 07/01/23 – 07/01/24

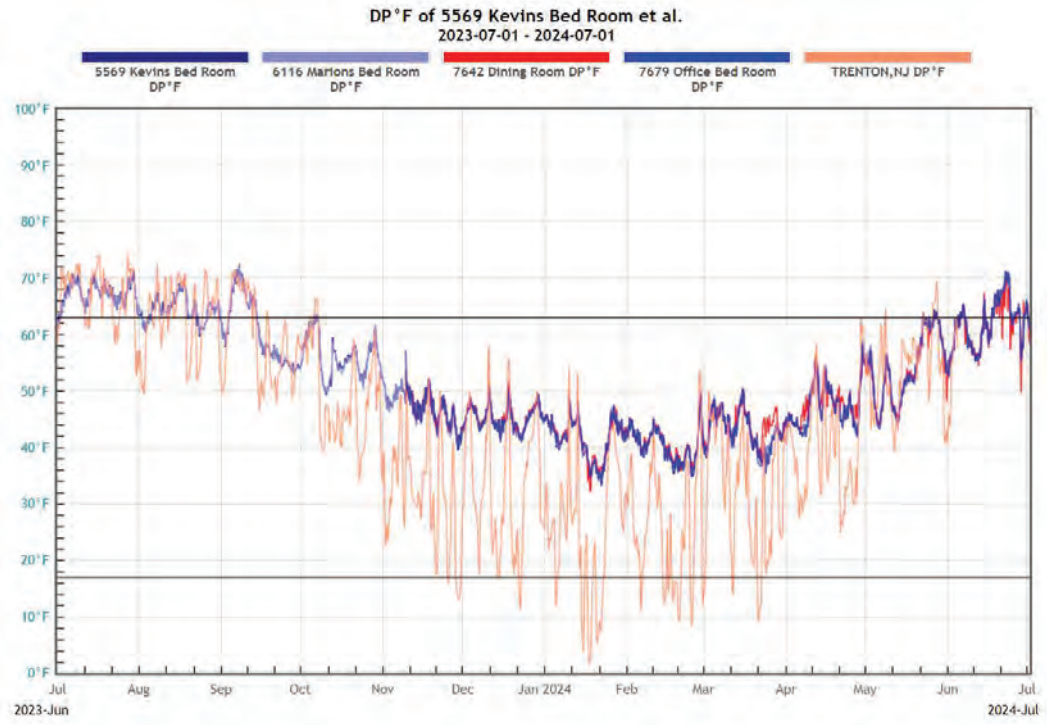


Fig. 2.13 Nakashima House Environment: Conformance w. ASHRAE Type C 17 to 63°F Dew Pt Temp 07/01/23 – 07/01/24

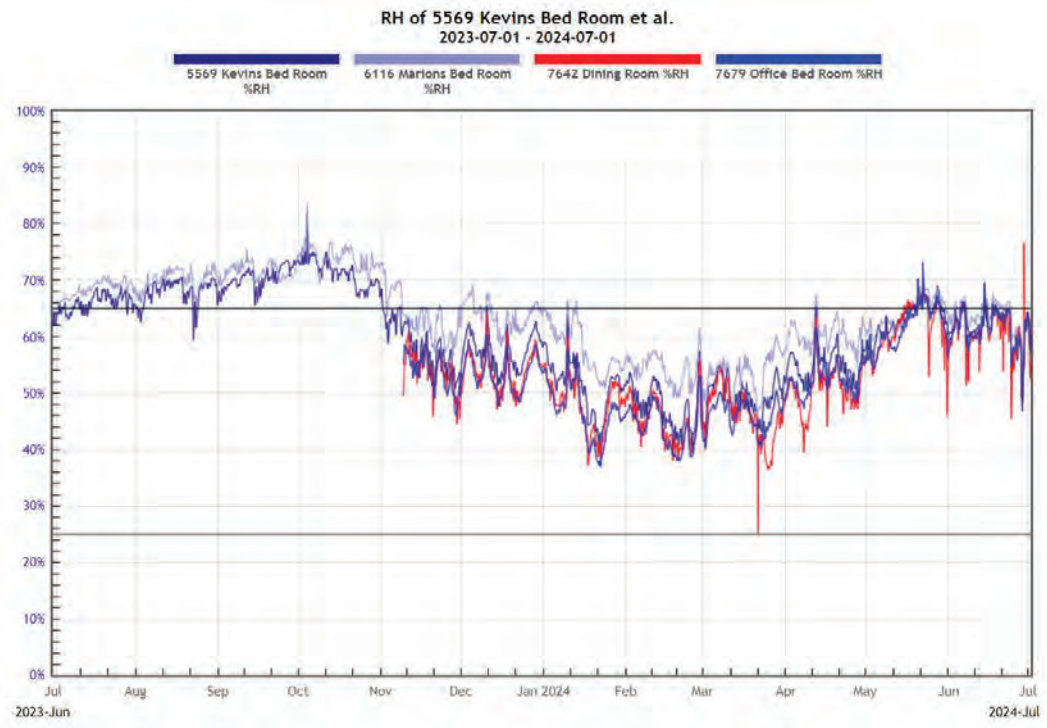


Fig. 2.14 Nakashima House Environment: Conformance w. ASHRAE Type C 25%RH to 65%RH 07/01/23 – 07/01/24

ANALYSIS OF ENVIRONMENTAL RISKS TO COLLECTIONS

The environmental monitoring program addresses interior temperature and relative humidity. As noted in Table 3.1 of the *Collections Assessment For Preservation Survey Report* (Appendix A, p. 45), the diversity of materials in the collections in the Nakashima Family House results in great variation in the vulnerabilities of the collections to environmental risks from temperature and relative humidity:

Table 3.1 Nakashima Family House Collections Potential Vulnerabilities to the 10 Agents

● : high vulnerability ◑ : medium vulnerability ○ : vulnerable : negligeable vulnerability

Collection Types (quantities)	Higher Risk ← Direct physical Forces	Thieves & Vandals	Fire	Water	Pests	Pollutants & Contaminants	Light, UV & IR Radiation	Incorrect Temperature	Incorrect Relative Humidity	Custodial Neglect & Disassociation → Lower Risk
Arms and armor/weapons (1-100)	◑	●	●	●	○ D	◑ D	○ D	○ D	◑	●
Baskets (1-100)	◑	●	●	●	●	◑	●	●	●	●
Ceramics/glass (1-100)	●	●	●	●						●
Ethnographic artifacts (1-100)	◑	●	●	●	● D	◑ D	● D	◑ D	●◑	●
Furniture (1-100)	◑	●	●	●	○	○	◑	○	●◑ D	●
Library/Books/Archival materials (101-1000)	●	●	●	●	●	◑ D	●	●	●	●
Metal Objects (1-100)	◑	●	●	●		●			●	●
Paintings (1-100)	◑	●	●	●	○	◑	◑	◑	◑	●
Photographic materials (1-100)	◑	●	●	●	○	◑	●	●	●	●
Sculpture (1-100)	◑	●	●	●	○ D	○ D	○ D	○ D	○ D	●
Textiles and costume (1-100)	◑	◑	●	●	●	●	●	●	●	●
Time based media (film, audio recordings, etc.) (1-100)	◑	●	●	●	○	●	●	●	●	●
Works on Paper (1-100)	◑	●	●	●	●	◑	●	●	●	●
Wood objects (1-100)	◑	●	●	●	◑	◑	◑	◑	●◑	●

D: Depends upon material

For the range of collections currently in the Nakashima Family House, the *Collections Assessment For Preservation Survey Report* (Appendix A, pp. 48-49) also identified the following benefits and risks of an ASHRAE Type C environment:

Table 3.2 Risks and Benefits to the Nakashima Family House collections from ASHRAE Class C control

Collection Types (quantities)	Mold avoided	Rapid corrosion avoided	Tiny risk of mechanical damage	Moderate risk of mechanical damage	High Risk to high-vulnerability objects	Embrittlement when cold	Chemical deterioration at high temperatures
Arms and armor/weapons (1-100)	✓	✓	✓				
Baskets (1-100)	✓		✓				
Ceramics/glass (1-100)	✓	✓					
Ethnographic artifacts (1-100)	✓		✓				
Furniture (1 – 100)	✓		✓**				
Library/Books/Archival materials (101-1000)	✓			✓			✓
Metal objects (1-100)		✓					
Paintings (1-100)	✓			✓		✓	
Photographic materials (1-100)	✓	✓		✓		✓	✓
Sculpture (1-100)	✓	✓	✓**				
Textiles & costume (1-100)	✓	✓				✓	✓
Time based media (film, audio recordings, etc.) (1-100)	✓				✓	✓	✓
Works on Paper (1-100)	✓			✓		✓	✓
Wood objects (1-100)	✓		✓**				

** Because many of the wooden objects have been located in the House, it is anticipated that they have been exposed to extreme seasonal or annual fluctuations in relative humidity and temperature. This exposure has likely caused mechanical strain and in certain cases may have caused damage. Objects that have already experienced maximum mechanical strain can be considered "proofed"; consequently, further environmental fluctuations to the same degree have a very low risk of further damage unless they have been repaired.[1]

In order to assess the environmental risks to collections presented by the recorded temperature and relative humidity monitoring data, the data were analyzed with *eClimateNotebook®* and Preservation Metrics®. Preservation Metrics® were developed by the Image Permanence Institute of the Rochester Institute of Technology as a way to "transform temperature and relative humidity data into quantitative numerical measures of collection decay risk"; however, Preservation Metrics® do not include other risk factors such as

light, ultraviolet radiation exposure, theft or fire. A detailed explanation of the individual metrics and their formulation and risk assessment is in Appendix C.

The environmental risks were evaluated for two intervals of time:

- From 01 July 2023 to 01 November 2023, when environmental conditions conformed with ASHRAE Type C limits for relative humidity but did not conform with ASHRAE Type C for dry bulb temperature and dew point temperatures.
- From 01 November 2023 to 01 July 2024, when environmental conditions conformed with ASHRAE Type C limits in all respects - dry bulb temperature, dew point temperature and relative humidity.

The resultant Preservation Metrics® are summarized the table below (Fig. 2.15) followed by an explanation:

Location Dataset	Date Range	Natural Aging	Mechanical Damage	Metal Corrosion	Mold Risk	T°F	%RH	DP°F	TWPI	%DC Max	%EMC Min	%EMC Max	MRF
5569 Kevins Bed Room	2023-07-01 to 2023-11-01	RISK	RISK	RISK	RISK	72.9	69	62	18	0.55	12	14	0.71
6116 Marions Bed Room	2023-07-01 to 2023-11-01	RISK	RISK	RISK	RISK	72	71	62	18	0.54	12.4	14.3	1.35
Average (2 locations)						72.5	70	62	18	0.5	12.2	14.2	1.03

Location Dataset	Date Range	Natural Aging	Mechanical Damage	Metal Corrosion	Mold Risk	T°F	%RH	DP°F	TWPI	%DC Max	%EMC Min	%EMC Max	MRF
5569 Kevins Bed Room	2023-11-01 to 2024-07-01	RISK	OK	RISK	GOOD	63.9	56	47.7	43	0.82	8.8	11.8	0.02
6116 Marions Bed Room	2023-11-01 to 2024-07-01	RISK	OK	RISK	GOOD	61.8	60	47.8	43	0.68	9.8	12.2	0.05
7642 Dining Room	2023-11-09 to 2024-07-01	RISK	OK	RISK	GOOD	65.9	52	47.9	42	0.84	8.5	11.5	0.01
7679 Office Bed Room	2023-11-09 to 2024-07-01	RISK	OK	RISK	GOOD	65.7	52	47.6	42	0.9	8.3	11.6	0.01
Average (4 locations)						64.3	55	47.8	42.5	0.8	8.9	11.8	0.02

Legend
TWPI Time Weighted Preservation Index
MRF Mold Rick Factor
%DC Max Maximum % Dimensional Change
%EMC Max Maximum % Equilibrium Moisture Content
% EMC Min Minimum % Equilibrium Moisture Content

Fig. 2.15 Nakashima House Environment: Summary Preservation Metrics® and statistics 07/01/23 to 11/01/23 and 11/01/23 to 07/01/24

- ***Natural aging or chemical change in organic materials using the Time-Weighted Preservation Index (TWPI)***:
  The rate of chemical decay of organic materials increases with increasing temperature and/or relative humidity. Materials deteriorate faster during warm, moist periods. During cool, dry periods they deteriorate slower. The TWPI is a quantitative estimation of the comparative rate of chemical deterioration of organic materials exposed to a given set of environmental conditions.
  Organic materials, especially paper, in the Family House are at risk of accelerated aging or chemical change which result from cumulative exposure to high temperature and high relative humidity during both intervals – 01 July 2023 to 01 November 2023 and 01 November 2023 to 01 July 2024.
- ***Mold risk or the potential for biological decay:***
  Mold growth is driven by heat and especially by moisture. Mold spores require a sustained high relative humidity level for a certain period of time in order to propagate.
  At the Family House, organic materials and inorganic materials with organic films are at risk of mold activity or biological deterioration between 01 July 2023 to 01 November 2023.

- ***Dimensional change or mechanical damage***:
  Environmentally induced mechanical damage is primarily driven by extremes of relative humidity, although temperature extremes can affect the degree of risk. Hygroscopic (water-absorbing) materials respond to the amount of humidity in the environment by expanding and contracting as they absorb and release moisture. This puts physical stress on objects and can lead to structural or mechanical damage in vulnerable collections. Composite objects are particularly sensitive.
  Objects that have sustained damage due to historic exposures to environmental extremes are considered to have been "proofed," but this applies to stress relieving cracks, rather than progressive mechanical damage to veneers or marquetry.
  Risk of mechanical damage is indicated for the interval 01 July 2023 to 01 November 2023.
- ***Moisture-induced corrosion***:
  Metal objects or objects with metal components, including some images, textiles, and inks experience corrosion when relative humidity exceeds 55%RH. The corrosion rate will increase at higher relative humidity or when combined with elevated temperature and reactive pollutants. However, the presence of pollution, dust, salts, oils, or active corrosion can allow corrosion to occur at humidity levels below 55%RH. There is a risk of corrosion during both intervals – 01 July 2023 to 01 November 2023 and 01 November 2023 to 01 July 2024.

End of Part 2 - Analysis of the Current Interior Environment

PART 3 - RECOMMENDATIONS

INTRODUCTION

This part of the *Environmental Improvements Report* presents recommendations for improving environmental management of the Nakashima Family House. These recommendations supplement the existing recommendations in the *2023 Collections Assessment for Preservation Survey Report* (CAP).

SOURCE MOISTURE CONTROL (CAP p. 27)

No changes recommended.

EXISTING ENVIRONMENTAL MANAGEMENT AND MONITORING (CAP pp. 30-32)

*Add the following new recommendations to **Immediate Implementation:***

Expand the environmental monitoring program to include the Garage and the enclosed crawl spaces under the House. Data on crawl space conditions is needed to determine if vapor in the crawl spaces is beneficial to interior relative humidity in the winter; this will inform future decisions regarding installation of vapor retarders in the crawl spaces.

- Install a Testo 160TH WiFi datalogger with internal temperature and relative humidity sensors (0572 2021) in the vehicle bay of the Nakashima Garage. Upload the data to the Saveris2 cloud, and if necessary, extend the existing WiFi network to the Garage.
- Install a Testo 160E WiFi datalogger (0572 2022) with external temperature and relative humidity probe (0572 2156) and 8-foot-long extension cable (0554 2005) to monitor crawlspace conditions under the Living Room/Kitchen. The datalogger should be installed in a first-floor room where it can be accessed for service and the sensor cables should be routed through an existing opening in the floor with the sensor bodies in the crawlspace, away from any heating piping. Upload the data to the Saveris2 cloud.
- If the crawlspace under Marion's Bedroom is separated from the crawlspace under the Living Room/Kitchen, install a Testo 160E WiFi datalogger (0572 2022) with external temperature and relative humidity probe (0572 2156) and 8-foot-long extension cable (0554 2005) to monitor crawlspace conditions under Marion's Bedroom. The datalogger should be installed in a first-floor room where it can be accessed for service and the sensor cables should be routed through an existing opening in the floor with the sensor bodies in the crawlspace, away from any heating piping. Upload the data to the Saveris2 cloud.
- Continue the environmental monitoring program as long as collections are in the House.

*Add the following new recommendations for **Near-Term Implementation:***

Near-Term Implementation
Based on the present environmental monitoring data, the present mechanical system is adequate for maintaining ASHRAE A24 Type C conditions in winter, and humidification is not necessary during winter. However, cooling and dehumidification are both required in summer, and dehumidification (without cooling) is necessary in September and October. The existing hot water heating system, particularly the fan coil units in the spaces and possibly the piping, are approaching the end of functional service life and cannot be upgraded to cooling and dehumidification.

Possibilities for a replacement heating and cooling system for the House include:

- An air to water heat pump, located in the present Heating House, which would provide hot/chilled water to replacement fan coil units in the present locations, or,
- An air to refrigerant heat pump, located in the present Heating House, which would deliver refrigerant to ductless evaporator cassettes in concealed locations, such as closets.

Dehumidification, separate from the heating/cooling system should be provided for the House. The Nakashima Foundation for Peace has had excellent experience with desiccant dehumidification for lumber storage and for the Archives. A similar approach could be used for the House: however, for ease of access and to reduce the risk of fire, the dehumidifier should not be located in the House, including the crawl space(s).

If the Garage envelope is upgraded for collections storage, heating and cooling could be provided with an air to refrigerant heat pump and ductless evaporator cassette with a separate desiccant dehumidifier.

To proceed with the above, the Nakashima Foundation for Peace should engage a Professional Engineer to undertake a feasibility study for the above options and then prepare plans and specifications for the preferred approach.

BUILDING ENVELOPE AND HYGROTHERMAL PERFORMANCE (CAP pp. 32 -34)

Replace the present text (p. 34) with the following

Recommendations for Building Envelope and Hygrothermal Performance
The Nakashima Family House was originally designed to provide non-mechanical solar heating through south-facing windows in winter and natural ventilation through open windows and doors in summer; mechanical systems for heating were added over time. In order to effectively manage the interior environment to ASHRAE A24 Type C criteria with heating, cooling, and dehumidification for preservation of the collections, it will be necessary to reduce certain environmental characteristics of the House that were intentional and necessary in its original use as a residence. These actions include:

- Reducing air and moisture vapor infiltration through existing openings.
- Reducing air and moisture vapor infiltration at windows and exterior doors.
- Reducing heat gain through south-facing windows during summer.

Immediate Implementation

- Examine the building for perforations that are no longer functional or necessary, such as exhaust fans in the bathroom or kitchen, fireplace flues, and window-mounted air conditioners.
- Examine windows for fit, operability, and air infiltration. Use reversible unobtrusive methods, such as closed cell polyethylene backer rod, to reduce air/vapor infiltration through gaps between window sash and frames.
- Examine exterior doors for fit, operability, and air infiltration. For manufactured sliding doors, investigate the availability of upgrade kits to reduce air leakage. For hand-built wood doors, consider retrimming and rehanging the door/frame where there are excessive gaps from operation, wear or slight settlement. If necessary and visually acceptable, consider installation of high-quality copper weather-stripping.
- Examine historic photographs and south-facing windows for evidence of shading devices, such as sliding *shoji* panels, grilles, roller shades or fabrics to reduce entry of sunlight. Replace/restore operability of historic shading devices and consider adding replica shading devices where needed to reduce heat gain.

- Establish protocols for seasonal and daily operation of shading devices.

Near-Term Implementation

- Each year, confirm that established protocols for seasonal and daily operation of shading devices in the House are implemented.
- Each year, confirm that established protocols for seasonal and daily operation of shading devices in the House are implemented.
- After one year of monitoring the relative humidity and temperature conditions in the Garage, and in conjunction with the recommended (CAP pp. 64-65) determine the realistic and achievable ASHRAE A24 Type of Control that can be maintained in the Garage and the appropriate upgrades to the Garage envelope that will be needed. It is likely that the existing sectional overhead door will have to be made inoperable and will need to be isolated from the storage space to minimize thermal losses and infiltration of air and moisture vapor.

PRELIMINARY ASSESSMENT OF POTENTIAL ENVIRONMENTAL PERFORMANCE (CAP pp. 35 -36)

Part 2 of this *Environmental Improvements Report* demonstrated that the interior relative humidity rarely exceeds the ASHRAE Type C upper limit of 75%RH, but interior relative humidity exceeded the ASHRAE Type C requirement for "generally less than 65%RH" during the four-month interval from 01 July through 01 November 2023 posing a high risk for mold germination and for increased metals corrosion as indicated by the Preservation Metrics® analysis.

Refinement of the ASHRAE A24 Type C criteria is needed to avoid this problem at the Nakashima Family House.

Replace the ASHRAE A24 Type C criteria (CAP p. 36) with the revised table below.

ASHRAE A24 Type C criteria adapted for the Nakashima Family House				
ASHRAE A24 Table 13A Control Type	Relative Humidity (primary control)		Temperature (secondary to RH)	
C	Not less than 25% RH	Not continually above 65%RH for more than 30 days ~~Generally below 65%RH~~ and never ~~not~~ higher than 75% RH (dehumidification req'd)	~~55~~ 50°F when RH approaches 25% or less	Less than 75°F for 95% of the time ~~Ambient or higher to keep RH below 75%~~

End of Part 3 - RECOMMENDATIONS

COLLLECTIONS ASSESSMENT FOR PRESERVATION SURVEY REPORT

NAKASHIMA FAMILY HOUSE
New Hope, Pennsylvania

Photo Credit: Michael C. Henry

Prepared for
The Nakashima Foundation for Peace

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Final Report
22 December 2023

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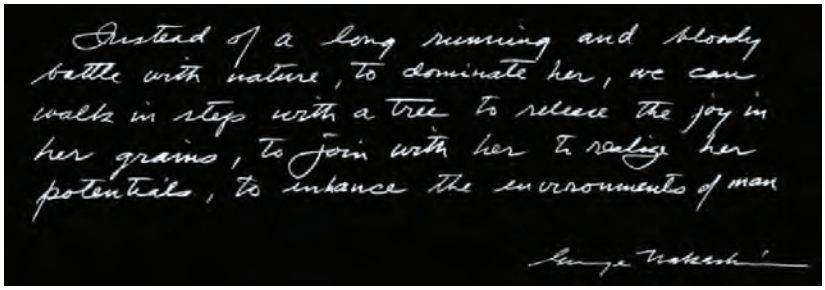
The statements and opinions contained herein are for the use and information of The Nakashima Foundation for Peace. The opinions reflect the judgments of Collections and Building Conservation Professionals performing with the care and skill ordinarily used by other Assessors, Collections and Building Conservation Professionals, when dealing with buildings and collections respectively at the same time and in the same or similar localities. Conclusions drawn in this report are based on those conditions and surfaces accessible to the unaided visual observation of the Assessors. No warranties or guarantees can be inferred from, or implied by, the statements or opinions contained in this report.

End of Project Directory



PART 1- EXECUTIVE SUMMARY AND OVERARCHING ISSUES

THE NAKASHIMA FAMILY HOUSE [1]

The George Nakashima Woodworker Complex, a National Historic Landmark, and included on the World Monument Fund Watch List, is the historic home and studio of internationally renowned furniture designer, master woodworker, and University of Washington and MIT-trained architect George Nakashima (1905-1990). A leader in American design and the American craft movement, he combined international styles and modernist influences with traditional Japanese carpentry and craft traditions. His design work is held in collections of the Metropolitan Museum of Art, among others.

A place of peace and beauty, the Nakashima compound continues to serve as an historic site and active studio and workshop. A cohort of Nakashima's descendants and fellow craftsmen continue to successfully practice a manual, craftsman approach to design. As such, this is the only place in the world that the public can engage with Nakashima's design legacy in an environment that he, himself, designed, and where the active making of his designs continues to this day. The site spans nearly 9 acres with 14 structures built by Nakashima between 1946 and 1975 that feature novel engineering construction methods, materials, and shapes such as thin-shell concrete, plywood, and hyperbolic paraboloid roofs. The property integrates the best of Nakashima's architecture, furnishings, landscape, and woodworking. The only other examples of his architectural work outside the New Hope complex are Ben Shahn's house expansion (1950s) in Roosevelt, New Jersey, the Catholic Church of Christ the King (1965) in Katsura, Japan, the Chapel and Guest House of the Monastery of Christ in the Desert (1972) in New Mexico, and La Soledad Chapel (1975) in San Miguel de Allende, Mexico – but none of these are sites whose mission include the interpretation of his life and work.

The site has benefited in popularity with the widespread interest in so-called "Mid-Century Modernism." Nakashima is associated as an important – possibly central – artist of this period.

George Nakashima started to build the Family House in 1946, which was continuously occupied by the family until 2020. Not only is the house an enduring testament to Nakashima's midcentury Japanese folk craft, it is filled with handcrafted furniture and built-in cabinetry, as well as books, art work by Ben Shahn, Mildred Johnstone, and Morris Graves, artifacts, family photo albums, clothing, and letters related to family history. Located in historic and scenic Bucks County — a significant draw to artists for more than a century — the New Hope area draws visitors from around the globe interested in the artists who lived and worked there. The compound is almost unique in the region as a site that celebrates the life and accomplishments of a Japanese American – serves as an inspiration to the community, to the

[1] This description is from a 23 February 2023 draft grant application prepared by the Nakashima Foundation for Peace for the Pennsylvania Historical & Museum Commission.

endurance of those who persevered through the dark times of forced relocation and the positive story of his success despite the odds.

The Nakashima Foundation for Peace (NFP) was created by George Nakashima in the 1980s primarily to facilitate building Altars for Peace on each continent, but is now responsible for the preservation and interpretation of the site, and for raising awareness of Nakashima's history and legacy. In 2021, after the 2020 death of George's son Kevin, the last Nakashima Family House resident, and the "curator" of family history and lore, the NFP assumed ownership and care of the House and its contents. Collections include the largely untouched artifacts and archives related to the family's history and incarceration in the WWII internment camps for Japanese Americans and its impact on the career of George Nakashima. The NFP will plan for the preservation of the House with the primary intent to preserve the Nakashima legacy and more fully interpret the historic site with greater emphasis on the Japanese American experience that shaped his life and work.

… Unlike most other structures on the Nakashima compound – which speak most directly to his legacy as a leading furniture designer – the Nakashima House is a place for the public to engage with his family experience as a Japanese American.

The Nakashima House and collections engage with diverse themes in the humanities, from the Japanese American experience, to 20th century American modern furniture and architecture design. Nakashima collections are regularly used for exhibitions, scholarly publications, and interviews. Several thousand visitors annually participate in tours and in virtual programs; additionally, 10,000 individuals throughout the U.S. and around the globe are informed of the Nakashima legacy and activities of the NFP through newsletters and digital media.

THE ASSESSMENT

In 2023, the Nakashima Foundation for Peace (NFP) engaged Wendy Jessup and Associates, Inc. (WJ&A), Preventive Conservation and Collections Care, and Michael C. Henry, LLC (MCH), to conduct a general conservation assessment of the Nakashima Family House (NFH) through the Collections Assessment for Preservation (CAP) program of the Institute of Museum and Library Services, administered by the Foundation for Advancement in Conservation (FAIC). The CAP program is a national initiative to provide small to mid-sized museums with a general conservation assessment of collections and environmental conditions, resulting in a report that identifies conservation priorities to assist in developing strategies for improved collections care, and for long-range planning and fund-raising.

The assessors jointly performed a two-day site visit to the Nakashima Family House on 04-06 October 2023 during which Wendy C. Jessup focused on the collections and Michael C. Henry focused on the House and the Garage. On 05 October, Gianna Puzzo, a student in the University of Delaware/Winterthur Graduate Program in Art Conservation, accompanied the assessors for educational purposes.

During the site visit, the assessors were accompanied by key stakeholders, including Mira Nakashima, John Lutz, Zoriana Siokalo, David Long, and Jon Yarnel. The entry and exit meetings on 04 and 06 October were attended by the assessors, the above stakeholders and William Whitaker, Archivist at the Architectural Archives, Stuart Weitzman School of Design, University of Pennsylvania.

This report documents the observations and recommendations made by the assessors and consists of three parts plus appendices:

- Part 1 is an overview that integrates the significant observations and recommendations of the building and collections assessments. Michael Henry and Wendy Jessup are the authors.
- Part 2 presents the observations and recommendations pertaining to the building and its immediate site context. Michael Henry is the author.
- Part 3 presents the observations and recommendations pertaining to the collections. Wendy Jessup is the author.

This *CAP Report* will be followed by two related projects funded by the Pennsylvania Historical & Museum Commission (PHMC) and by the National Trust for Historic Preservation Favrot Fund.

- An *Environmental Management Report* based on evaluation of 12 months of environmental data from the House under a contract with Michael C. Henry, LLC.
- Preparation of drawings and a digital model of the House as part of an *Historic Structure Report* under contract with the Department of Historic Preservation at the Weitzman School of Design in the University of Pennsylvania and led by Frank G. Matero.

STRENGTHS AND OPPORTUNITIES

The assessors identified the following strengths and opportunities associated with the Nakashima Family House*:*

- **Recognition**. The House is one of the first two buildings that George Nagashima erected on the site. The House is a critically important element in a site complex that is listed as a National Historic Landmark for its architectural, artistic, and cultural significance. George Nakashima's architectural work included his international project with Antonin Raymond for *Golconde* in Puducherry (Pondicherry), India.
- **Integrity**. For over seven decades, the House has been in its first use as the residence of two generations of the Nakashima family. Although not occupied as a residence since 2020, it remains in its as-left state and contains the furnishings, art, objects, documentation, and personal effects of the family. The surrounding site complex also retains integrity because it remains in its first use for the production of Nakashima furniture.
- **Significance**. The House is the distinctly original and personal work of George Nakashima, different in purpose and in design from the other Nakashima-designed buildings that were subsequently erected on the site.
- **Collections**. The collections will be key to future stewardship and interpretation of the House. Documents and correspondence will provide insights into the design process and construction chronology of the House, and objects, furnishings, and ephemera will be necessary to accurately populate and interpret family life in the House.
- **Interpretive opportunities and public interest**. The House and collections present opportunities for a variety of interpretive themes of interest to the public, including family history and the story of internment, Nakashima furniture in a functional context, woodworking craft on a building scale, mid-20th century architectural design, influences of Japanese architectural design, and bioclimatic environmental design.
- **People and commitment**. Leadership and staff at the site are highly qualified and are exceptionally committed to preservation and interpretation of the House specifically and the Complex as a whole.
- **On-site capacity for certain repairs**. The furniture shop and personnel have the capacity to produce wood trim and assemblies if needed to repair or replicate damaged woodwork at the House.
- **Relationships with other sites/organizations**. Strong friendship and past architectural connection with the Antonin Raymond family provide the potential for future coordination between the two sites. A similar opportunity exists with *Shofuso* - Japan America Society of Greater Philadelphia (*www.japanphilly.org/shofuso.org*).

- **Academic and professional connections**. The past and continuing working relationships with the University of Pennsylvania Architectural Archives and the Department of Historic Preservation and with the Center for Conservation of Art and Historic Artifacts provide access to information and expertise.
- **Building size and cost of stewardship**. The House is small in size, not a sprawling historic mansion. The costs of preventive conservation and maintenance should be manageable.
- **Economic potential**. The revenue from the infrequent high-value site and House tours and the continued production of furniture may partially contribute to the stewardship of the House.
- **Successful funding applications for subsequent studies**. Grants have been awarded for an *Environmental Management Report* under a contract with Michael C. Henry, LLC, and for preparation of drawings and a digital model of the House as part of an *Historic Structure Report* under contract with the Department of Historic Preservation at the Weitzman School of Design in the University of Pennsylvania and led by Frank G. Matero.

ISSUES AND CONCERNS

The assessors also identified the following areas of concern, which when addressed, will improve stewardship of collections and the Nakashima Family House:

- **The Collections need definition and policies for management and stewardship.** When the contents of the House was donated to the Foundation, it contained important furniture and artwork, family documents and ephemera, garments, and assemblages of personal interest materials accumulated over seven decades of occupancy by the family. A clearly articulated and defined definition of the collection is needed: one that describes what is in the collection and why, and how it supports the mission of the Nakashima Foundation for Peace. As a non-profit cultural heritage organization holding collections in the public trust, policies for collections management and stewardship need to be written.
- **The House is congested and supports a severe infestation**. Despite the ongoing inventories and judicious disposal of materials identified to have little bearing on the Nakashima legacy and central family story, the House is extremely congested. The totality of material stored in closets and furniture has enabled establishment of a severe infestation of clothes moths, which if left unchecked, risks irreparable damage to or complete loss of garments and accessories known to have direct association with family members. The congestion is likely to also mask other deterioration to the House and its contents.
- **The House is not suitable for long-term storage of collections.** The House lacks sufficient space for safe, secure, and pest-free storage of collections that are not exhibited. The microclimates in furniture or built-in storage or closets can deviate significantly from room conditions especially when placed against exterior walls. An extreme storm event could put stored collections at risk of water damage from window or roof leaks, and a structural fire will result in water-based fire-fighting operations. At present, the House cannot maintain temperature and relative humidity conditions suitable for long-term preservation of environmentally vulnerable collections. Based on a preliminary assessment of the building envelope in Part 2 of this *CAP Report*, the House might be able to maintain between 25% RH and 75% RH, but this will require cool, uncomfortable interior temperatures in winter (<68°F) and warm (>75°F) interior temperatures in summer. Spatially adequate and environmentally suitable storage is urgently needed for the processed collections.
- **Daylight and ultraviolet radiation are damaging collections and architectural fabric.** The bioclimatic design of the House resulted in windows and glass doors being concentrated in the south-facing walls of the House. Penetration of daylight and solar radiation into the House interior has resulted in damage to collections and architectural fabric; this is most pronounced during the late fall and winter when the angle of the sun is low, and daylight can penetrate more deeply into the House.
- **Asbestos-Containing Materials (ACM)**. Many building materials in the mid-20th century contained asbestos and its use continued until the 1970s. Articles published after the initial construction of the House cite the

use of ACM in the walls and roof assemblies of the House. The fibers within the asbestos mineral can be harmful when inhaled. When left intact and undisturbed, these materials do not pose a health risk to building occupants. However, a serious health risk arises if the ACM is deteriorated or, cut or damaged, so that fibers are released. The Pennsylvania Department of Environmental Protection regulates activities related to asbestos in non-residential buildings.[2]

- **A *Conservation Management Plan* will be needed**. Decisions pertaining to future use and interpretation of the House and the interventions needed must be informed by a *Conservation Management Plan* (CMP). The *CMP* will provide an overarching and comprehensive plan for conservation, interpretation and use of the House and the collections and set out the principles and priorities for subsequent preservation and conservation projects. Executing individual projects without the benefit of a *CMP* may result in well-intended, but inadequately informed work. Completion of the *Historic Structure Report* will be required to start the *CMP*.
- **Limited interior access.** Small rooms, a narrow hallway, and physically vulnerable collections and *shoji* partitions will limit the size of tours through the House.

Other Issues and Concerns
Parts 2 and 3 of this *CAP Report* set out specific recommendations to resolve or address the major issues listed above, as well as issues identified in two Parts. The recommendations are interrelated and should not be viewed in isolation; strategic planning and design decision-making in one area will affect those efforts in other areas. Therefore, it is important to advance all recommendations in concert with each other, with equal emphasis.

A WAY FORWARD

The assessors recommend the following actions, listed in order of relative priority:

- **Triage materials infested with clothes moths.** Take actions to begin mitigating the clothes moth infestation.
  a. Isolate important family garments inside of tightly closed plastic bags.
  b. Dispose of items that are either too badly damaged by moths, such as the rugs from the living room and the south bedroom, or materials that have been determined to be outside the scope of the collection. If a determination cannot be made as to whether an item falls within the collections scope, isolate the object inside until a decision can be made.
  c. Continue monitoring pests with pheromone traps and maintain documentation to track the extent of the infestation.
  d. Use a HEPA filter vacuum to clean areas with known infestations.
  e. Engage a conservator with demonstrated experience in Integrated Pest Management (IPM) to develop and oversee a pest eradication plan appropriate for the infested materials and develop IPM protocols for the House.
- **Collections policies and procedures.**
  a. Continue inventory, cataloging, and processing the materials in the House.
  b. Prepare a *Scope of Collections Statement* to define the collections and establish an intellectual framework for the Nakashima Family House and its role in the Nakashima Family story and legacy.
  c. Prepare a *Collection Management Policy* and associated procedures and protocols for providing stewardship and collections care.

  The American Alliance of Museums has established Core Standards for Museums, which provide useful guidance as to commonly accepted standards for organizations that steward collections and can help guide the Nakashima Foundation for Peace in developing policies and procedures. The Core Standards are "broad,

[2] https://www.dep.pa.gov/Business/Air/BAQ/BusinessTopics/Pages/Asbestos.aspx

outcome-oriented statements that are adaptable and expected of museums of all types and sizes, with each museum fulfilling them in different ways based on its discipline, type, budget, governance structure, and other unique circumstances… that are applicable to museums of all types and disciplines… The Core Standards are grouped into the following categories: *Public Trust and Accountability*, *Mission & Planning*, *Leadership and Organizational Structure*, *Collections Stewardship*, *Education and Interpretation*, *Financial Stability*, and *Facilities and Risk Management*."[3]

- **Boiler controls**. Modify the heating boiler controls as described in Part 2.
- **Collections storage space.**
  a. Identify and prepare adequate space(s) for storage of the collections after processing and pest elimination. Candidate spaces include the Garage and the west bay of the New Lumber Storage Building.
  b. Engage an experienced collections conservation professional to assist with storage furniture selection, housing materials, environmental upgrades, and building modifications needed to make the spaces suitable for collections storage.
  c. Relocate processed and pest-free collections stored in the House, closets, and built-in storage cabinets to the upgraded storage space(s).
- **Asbestos Containing Materials (ACM).** Engage an Environmental Health and Safety Consultant with experience with historic properties to advise the NFP on compliance with laws and regulations regarding ACM. Develop policies and procedures for preventing disturbance of ACM and for identifying and tracking the location of ACM in the building. Do not cut or disturb interior or exterior finishes or wall/floor/ceiling/roof assemblies without first determining whether or not ACM may be disturbed.
- **Fire Department Coordination**. Each year, meet with the New Hope Eagle Fire Company Midway Volunteer Fire Company and review their firefighting plans for the Nakashima Family House. Keep a copy of the firefighting plan with the *Disaster Preparedness & Emergency Response Plan* so that staff are aware of placement of firefighting apparatus and hose lays.
- **Electrical system assessment.** Engage a licensed electrician with experience in historic buildings to inspect and assess light fixtures, fixture wiring, devices, branch circuits and panels for fire risk. At a minimum, the scope of work should include identification of risks associated with insulation, connections, amperage load and amperage capacity, and overload protection. Infrared survey of circuits and panels under load is strongly recommended.
- **Light and ultraviolet radiation reduction.** Implement measures to reduce light and ultraviolet radiation damage to the collections. Apply ultraviolet filtering film to window glass and develop protocols for managing window coverings to reduce/eliminate daylight entry when the building is closed to the public.
- **Fund a *Conservation Management Plan.*** Secure funding to engage a professional team to prepare a comprehensive, integrated, multi-disciplinary *Conservation Management Plan for the Nakashima Family House.* New projects for the House, other than those listed above, should be deferred until the *Conservation Management Plan* has been completed. Guidance on conservation management plans can be found in the *Burra Charter* and in the example plans listed in Part 2 of this *CAP Report*.

ACKNOWLEDGEMENTS

Michael Henry and Wendy Jessup appreciate the engagement, thoughtfulness, candor, and responsiveness of Mira Nakashima, John Lutz, Zoriana Siokalo, David Long, and Jon Yarnel during the entire CAP process. The site stakeholders were generous with hospitality and with their time and provided opportunities for extended discussions concerning the important cultural resource that is the Nakashima Family House.

End of Part 1 – Overarching Issues

[3] https://www.aam-us.org/programs/ethics-standards-and-professional-practices/core-standards-for-museums/

PART 2 – THE BUILDING

METHODOLOGY

This part of the *Collections Assessment for Preservation* (*CAP*) *Report* addresses issues related to the Nakashima Family House identified by Michael C. Henry of Michael C. Henry, LLC (MCH) through:

- Observation of the existing conditions;
- Review of the available documentation;
- Discussions of issues with the NFP Executive Director and stakeholders; and,
- Collaborative discussion and analysis with the Collections Assessor, Wendy Claire Jessup.

This portion of the *Collections Assessment for Preservation Report* addresses the following topics for the Nakashima Family House:

- Overview of the George Nakashima Woodworker Complex
- Summary Description of the Buildings in this CAP Report
- Present Uses of the Buildings
- Stewardship of the Nakashima Family House and the Garage
- Climate
- Situation
- Soils and Seismicity
- Source Moisture Control
- Environmental Management and Monitoring
- Building Envelope and Hygrothermal Performance
- Potential Target Environmental Criteria
- Emergency Power Generation
- Wireless and Internet Communications
- Fire Prevention, Detection & Protection
- Security & Intrusion Detection

For each topic, the salient observations are presented, followed by a summary opinion of the issues as appropriate, then recommendations on a prioritized basis - immediate, near-term, and long-term.

The recommendations presented in this section of the *CAP Report* are based on a holistic philosophical approach to the preservation of the building fabric and conservation of collections within the limitations inherent in an existing building. The recommendations reflect current historic preservation and conservation trends for implementing this philosophy, with emphasis on preventive conservation for the collections, as well as the building.

Implementation of many of the recommendations will require the engagement of a Registered Architect and/or a Professional Engineer to provide advice, guidance, designs, construction observation, and post-construction follow-through. This *CAP Report* is not intended to be used without engaging those necessary and essential professional architectural and engineering services.

OVERVIEW OF THE GEORGE NAKASHIMA WOODWORKER COMPLEX

The Nakashima Family House is part of the George Nakashima Woodworker Complex (the Complex), a two-parcel twelve-acre property located at 1847 and 1858 Aquetong Road, Solebury Township, Bucks County, Pennsylvania. The Complex was designated a National Historic Landmark on 22 August 2014. The nine-acre south parcel (Figure 2.1) contains eighteen buildings, each designed by George Nakashima. This *CAP Report* focuses on the following buildings on the south parcel, referencing the building numbers shown in Figure 2.1:

- George Nakashima Family House (1946), #7
- Lanai (1958), #9
- George Nakashima Garage (1967), #10
- Heating House (1977), #8.

To provide context, the remaining buildings on the south parcel include:

Workshop (1946), #6
Showroom (1954), #5
Finishing Department (1955), #4
Main Lumber Storage Building (1956; 1968), #12
Chair Department (1957), #3
Pool Storage House (1958), #15
Pool House (1960), #16
Swimming Pool (1960), #17
Conoid Studio (1957-60), #2
Arts Building and the Cloister (1964-67), #1, #1B
Reception House (1975-77), #13
New Lumber Storage (1982), #11
Pole Barn (1990), #14

The National Historic Landmark nomination states:[4]

> *The buildings and structures generally reflect the International Style with some also possessing traditional Japanese influences. Materials used include stone, cement block, concrete, glass, stucco, and wood. Some of the roof types also constitute significant experiments with engineering systems not widely applied, particularly with regard to residential or small-scale structures. These include a conoid shell roof which is a shape generated from a section of a cone; a hyperbolic paraboloid which is a saddle-shaped surface; and a scissors truss, which is a truss that is asymmetrical resembling a partially open pair of scissors. The buildings and the setting retain physical integrity and continue to be used for a variety of purposes The buildings and the setting retain physical integrity and continue to be used for a variety of purposes including residences, education, production, storage, and administration related to the legacy of internationally known furniture craftsman George Nakashima.*
>
> …
>
> *The setting for the property consists of sparsely wooded areas with intermittent open mown areas; approximately 50 percent of the property is open space. A gravel driveway and footpaths are the primary means of vehicular and pedestrian circulation within the complex of buildings. Generally, there is no signage for pathways or on buildings. After entering the complex, there is a small parking area to the right (west) for workers and visitors. Many of the buildings are built along a south-facing ridge and have large windows on the south facing side allowing natural light and heat into the buildings and providing a view of open mown areas, scattered trees, and densely wooded areas.*

The Nakashima Woodworker Complex has operated as an interpreted historic site since 1972 while continuing in its first use to produce George Nakashima's distinctive line of furniture and Mira Nakashima's design additions to that line.

[4] https://npgallery.nps.gov/GetAsset/cb995759-75e4-425c-9b39-17bb6de164a4 accessed 08 November 2023.

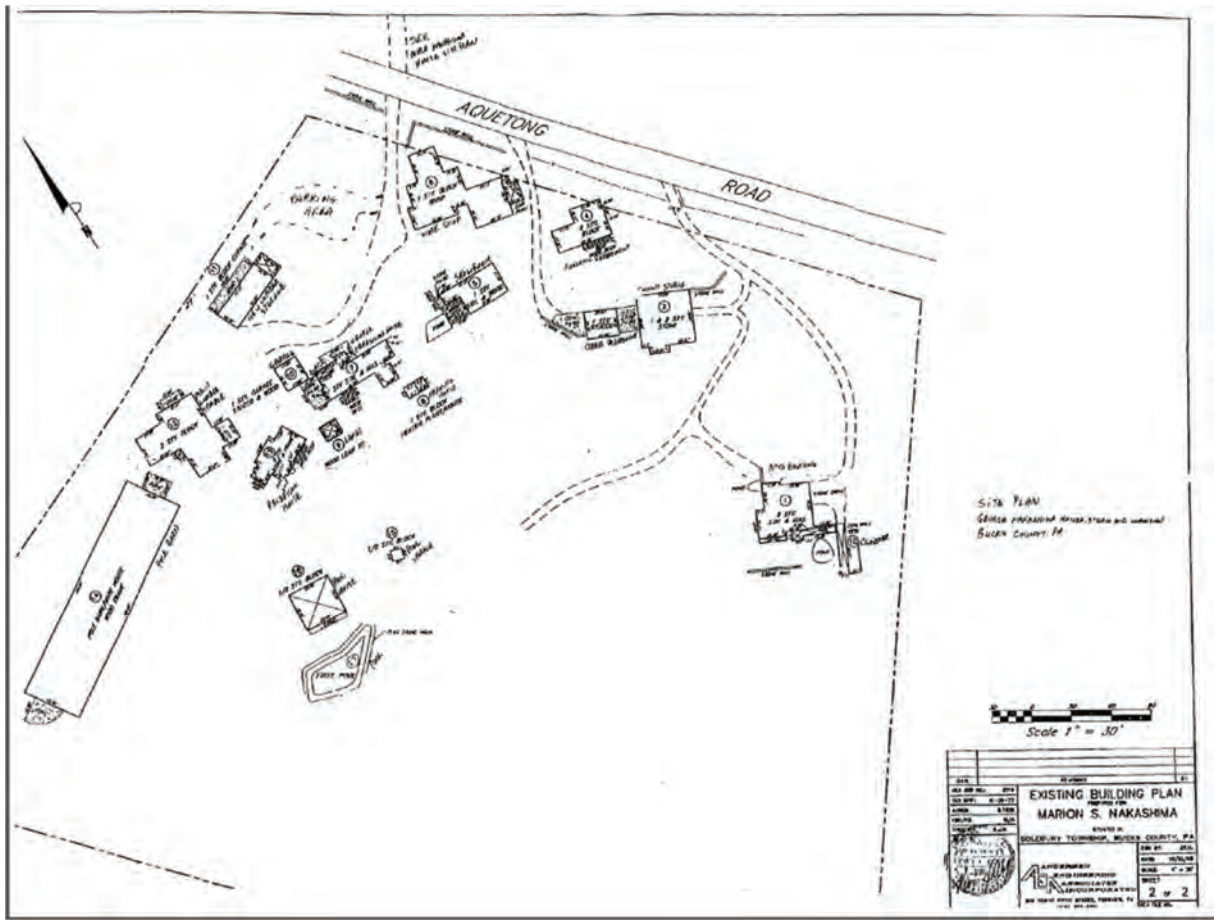


Fig. 2.1 Nakashima Family House General Location Credit: NHL Nomination

SUMMARY DESCRIPTION OF THE BUILDINGS IN THIS *CAP REPORT*

George Nakashima House (1946)
The George Nakashima Family House was the primary residence for the George and Marion Nakashima and their children Mira and Kevin. Kevin resided in the House until his passing in 2020.

Three distinct builds have been identified for the one-story house (Figures 2.2 and 2.3). The 1946 first build was a one-story structure was approximately 60 feet by 14 feet in plan with the long dimension on an east-west axis (Figure 2.2). The 1954 second build (Figure 2.3) consists of a 14± foot by 17± foot addition near the east end of the south elevation. The floor of the addition is two steps lower than the rest of the house. The 1982 third build (Figure 2.3) relocated the south exterior wall approximately three feet southward and the south half of the west exterior wall approximately three feet westward. Fenestration in the south wall was reconfigured. The 1982 third build included erection of a gable roof structure clad with wood shakes. The 1982 roof assembly (Figure 2.6) extended the eave line to include the 1982 expansions in plan and was set on top of the first build single slope roof structure, clad with site-cast concrete tiles and corrugated asbestos fiber reinforced cement panels (Figure 2.5). The underside of the 1982 roof assembly and the extant 1946 roof assembly could not be clearly observed through the ventilation opening in the east end wall of the House.

There have been smaller, yet important, changes to the interior and exterior which have not been identified by date of alteration. One example is the reconfiguration of the original open-ended entry to an enclosed vestibule (Figures 2.4 and 2.5).

In its present configuration, the house sits on a ledge near the top of a ridge to the north. A low retaining wall opposite the north wall of the House allows the House to nest slightly below the brow of the ridge (Figure 2.6). From the ridge, the ground slopes down to the south and, as a result, the floor of the House is elevated above grade on the south side. The resulting crawl space is enclosed by a concrete unit masonry under the third build (Figure 2.7) and a portion of the crawl space under the second build is enclosed by wood construction and the balance is open (Figure 2.8). A gravel surfaced podium extends out from the House to a stone retaining wall. Beyond the retaining wall the slope of the hill steepens towards the south.

The January 1950 article on the Nakashima House in art & architecture described the building materials as:

> *…framing-mostly oak, milled by the owner; roof – corrugated transite and 1 inch thick concrete tiles, cast by owner; walls - stone, 3/8 inch pressures pure asbestos (war surplus), and walnut, cherry and cedar paneling; ceilings 20" wide solid poplar, 3/8" pressed asbestos with insulation batts; floors – wide planks of walnut, oak, ash, birch and beech for various rooms; sash – sliding of cypress with double strength glass and inner sash of paper shoji, …"*

The north exterior wall is constructed of full-height and partial-height local stone set in mortar. The upper portion of the north wall and all of the remaining walls are wood-framed and appear to be clad with 1½ inch thick panels (Figure 2.10). The panels are likely to be *Cemesto* (Figure 2.9), a building product available from the 1930s until the early 1950s and popular with low-cost housing construction. *Cemesto* consists of a core of chemically treated sugar cane fiber (*bagasse*) sandwiched between 1/8-inch-thick asbestos fiber-reinforced cement panels.[5] The exterior surfaces and exposed edges appear to be finished with skim coat of finely aggregated white cement mortar (Figure 2.10) and may not have been painted. Joints between panel sections are tight and flush (Figure 2.11) and are framed by unpainted wood trim at building corners and wall openings. The west end of the 1982 extension is clad with vertical planks of weathered wood.

The exterior walls include site-built wood windows in a variety of sash configurations, including sets of sliding sash, some of which have been retro-fitted with insulated glass units (Figure 2.12). The unpainted sash and frames are typically set flush with the wall panels. Nearly all of the window openings incorporate rain protection from a generous roof overhang or a small eave (Figure 2.13) or both. Many of the window openings are also fitted with site-built sliding *shoji* panels on the interior (Figure 2.14). A set of commercially available sliding glass doors are on the south exterior wall. The hand-crafted north entry door is wood.

The interior reflects George Nakashima's love for the natural beauty of unpainted wood and his attention to exposed connections and small details (Figures 2.15 and 2.16). Based on materials listed in contemporary magazine articles, where wood was not used for interior wall surfaces, some interior surfaces may be *Cemesto* panels or single layer asbestos-cement panels rather than gypsum wall board. The north wall of the parents' bedroom is finished with patterned rice paper (Figure 17) and the west wall features a sliding door finished with patterned fabric or paper (Figure 2.18). The east wall of Mira's bedroom features a painted mural on fabric by Mira Nakashima, and dates from the first build (Figure 2.19). Moveable *shoji* panels were used in interior partitions in the north wall (Figure 2.20) of the first build hallway. These panels "borrowed" year-round light,

[5] *Cemesto* was used for exterior wall by Charles and Ray Eames in their 1949 residence. See *Eames House Conservation Project, Cemesto Panel Investigations Phase I, by* César Bargues Ballester *et al*, Getty Conservation Institute, 2023. https://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/eames_house_conservation_project_cemesto_panel.pdf

solar radiation in winter, and ventilation in summer from the south exterior openings (Figure 2.21) for Mira's bedroom and the bathroom. The effectiveness of this design strategy was diminished by the second and third build changes to the south elevation.

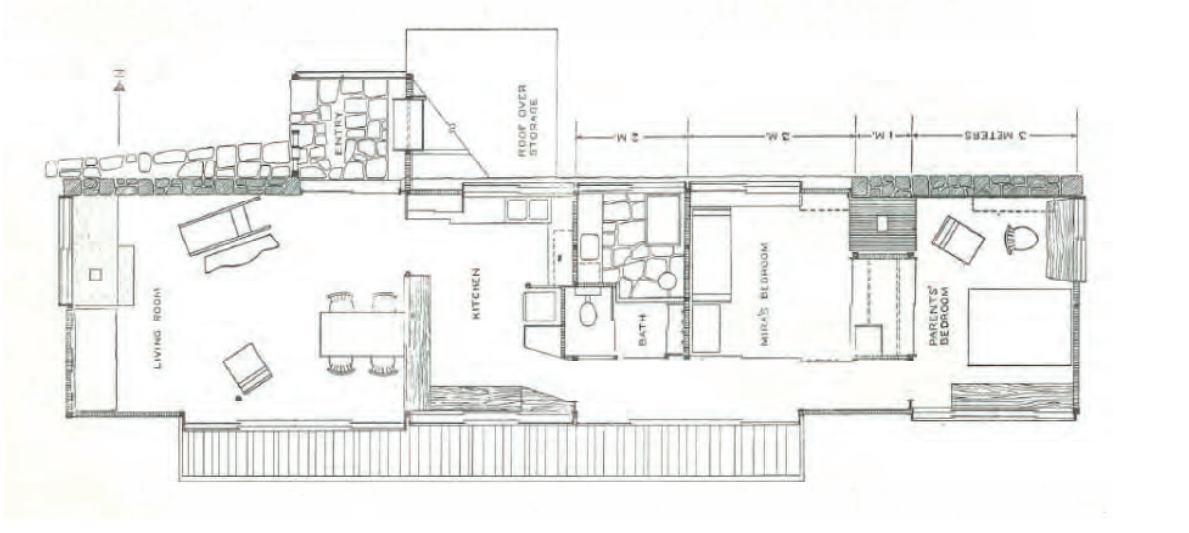


Fig. 2.2 Nakashima Family House 1946 First Build Floor Plan Credit: *Arts & Architecture Magazine*, January 1959

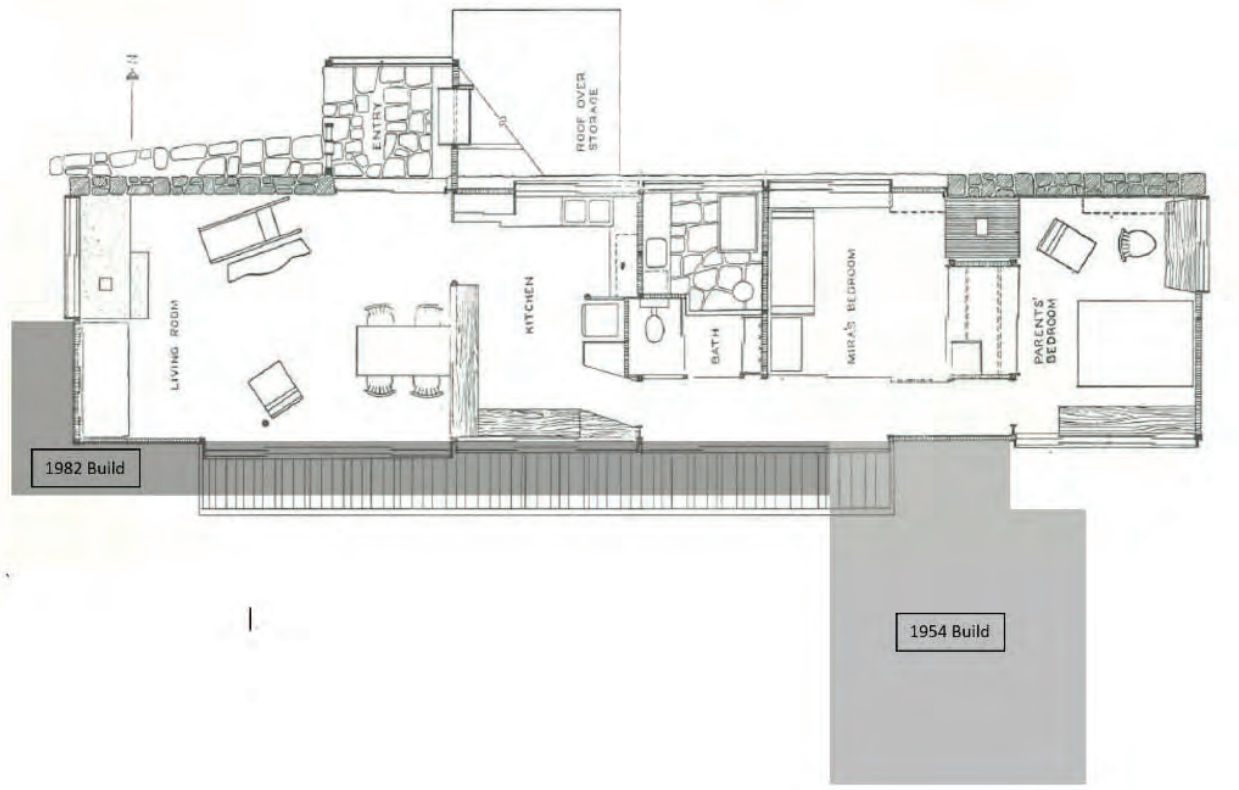


Fig. 2.3 Nakashima Family House 1946 Floor Plan (Fig. 2.2) with approximations of 1954 and 1982 Builds Credit: Michael C. Henry

Fig. 2.4 Enclosed Entry
Photo credit: Michael C. Henry October 2023

Fig. 2.5 Open-ended entry and two roofing materials
Photo credit: Ezra Stoller No date

Fig. 2.6 1982 Third Build Roof, House set into brow of hill
Photo credit: Michael C. Henry October 2023

Fig. 2.71982 Third Build south wall
Photo credit: Michael C. Henry October 2023

Fig. 2.8 1954 second build with partially open crawl space
Photo credit: Michael C. Henry October 2023

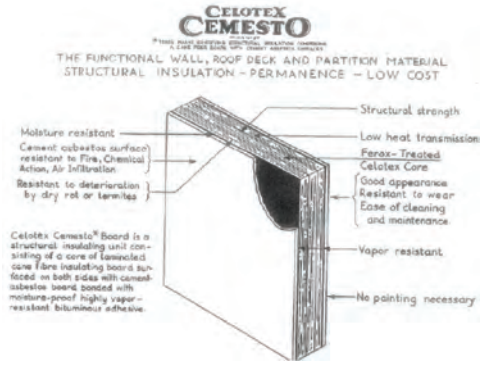


Fig. 2.9 Detail of *Cemesto* product
Photo credit: Celotex Corp. Product Literature no date

Fig. 2.10 Exposed edge of *Cemesto* Panel, SE corner, first build
Photo credit: Michael C. Henry October 2023

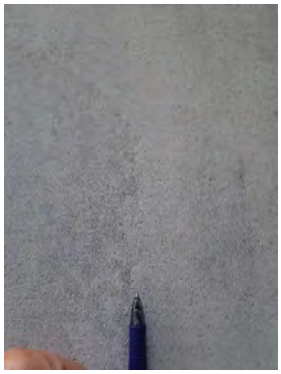


Fig. 2.11 Apparent panel joint, SE corner, first build
Photo credit: Michael C. Henry October 2023

Fig. 2.12 Detail of window sash and insulated glass unit
Photo credit: Michael C. Henry October 2023

Fig. 2.13 Protective overhang at window
Photo credit: Michael C. Henry October 2023

Fig. 2.14 Shoji panels at exterior window
Photo credit: Michael C. Henry October 2023

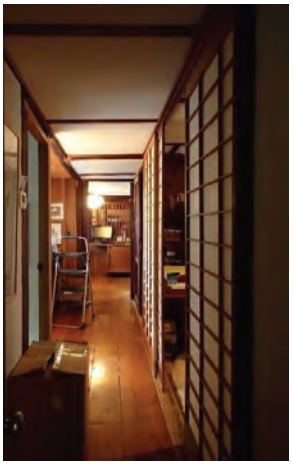
Fig. 2.15 Interior woodwork at kitchen
Photo credit: Michael C. Henry October 2023

Fig. 2.16 Handle on interior door
Photo credit: Michael C. Henry October 2023

Fig. 2.17 Rice paper finish on north wall, main bedroom
Photo credit: Michael C. Henry October 2023

Fig. 2.18 Fabric-covered sliding door, main bedroom
Photo credit: Michael C. Henry October 2023

Fig. 2.19 Painted fabric mural in Mia's bedroom
Photo credit: Michael C. Henry October 2023



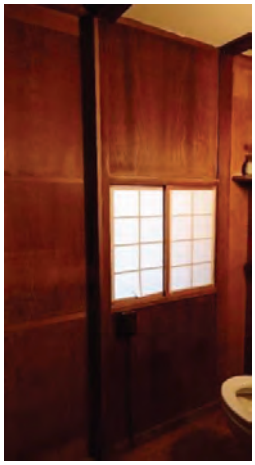


Fig. 2.20 Interior *Shoji* panels, Mira's bedroom & bathroom
Photo credit: Michael C. Henry October 2023

Fig. 2.21 Open ventilation to Mira's bedroom, first build
Photo credit: Ezra Stoller N.D.? House & Home 1952?

Lanai (1958)
The Lanai is a small open structure set on the southwest extension of the gravel podium on the south of the House. George Nakashima designed the Lanai for the Simpson Redwood Company as an example of an outdoor living space. Two angled reinforced concrete structural bents support a wood-framed roof clad with wood shingles. The roof shelters a cylindrical stone masonry firepit and a broad wood bench for seating and a wood stockpile. Thoughtful details include a small seat and a covered shelf for kindling and a pot. (Fig. 2.22 and 2.23)

Fig. 2.22 Lanai from the east
Photo credit: Michael C. Henry October 2023

Fig. 2.23 Lanai from the southwest
Photo credit: Michael C. Henry October 2023

George Nakashima Garage (1967)
The Garage is a rectangular structure, 20 feet by 20 feet in plan, set on a concrete unit masonry foundation and located immediately northwest of the house. The floor level of the garage is higher than the floor level of the House and meets a gravel driveway. The exterior wall surfaces of the Garage may be similar to the House, with sanded paint or stucco on single thickness asbestos cement boards or on *Cemesto* panels. The Garage encloses two spaces, a bay for a car on the east side and a narrow room along the west side. The north elevation contains a commercial sectional wood overhead door for the automobile bay and a wood and glass swinging door to the adjoining room which has a similar door at the south wall. The east wall features a large diameter round window and the west elevation has a bank of windows. The simple wood-framed gable roof is clad with corrugated asbestos fiber reinforced cement panels commonly known as “transite”. (Figures 2.24 through 2.29)

Fig. 2.24 Garage from southeast Fig. 2.25 Garage from east Fig. 2.26 Garage from north
Photo credit: Michael C. Henry October 2023

Fig. 2.27 Garage from west
Photo credit: Michael C. Henry

Fig. 2.28 Garage auto bay interior

Fig. 2.29 Garage west room interior
October 2023

Heating House (1977)

The Heating House consists of a concrete unit masonry enclosure and adjacent open space set into the slope off the southeast corner of the Nakashima Family House. A low stone retaining wall engages the north side of the open space and extends east from the structure. The enclosed space has a concrete floor slab that is lower than the concrete floor slab at the open space. A wood-framed gable roof, clad with wood shingles protects both spaces and is pierced by a concrete masonry chimney. The enclosed space is accessed by a pair of low height wood doors and contains a boiler, pump, and controls for the hot water heating system in the House. The open space contains a storage tank for fuel oil. The present heating plant replaces a wood-fired boiler and woodpile. (Figures 2.30 and 2.31)

Fig. 2.30 Heating House from the southeast
Photo credit: Michael C. Henry October 2023

Fig. 2.31 Heating House from the southwest
Photo credit: Michael C. Henry October 2023

PRESENT USES OF THE BUILDINGS

George Nakashima House (1946)
The Nakashima Family House was occupied as a private residence until 2020. Currently, the contents of the House are being inventoried and assessed as collections (see Part 3 of this report) with this activity taking place in the second build bedroom and the dining area of the living room.

The House is infrequently open for small group tours, but these are limited in size and duration by the availability of staff for supervision and security, and by the on-going inventory of the contents.

The future use and interpretation of the Nakashima Family House has not been determined by the NFP. These decisions would benefit from the historical analysis of a *Historic Structure Report* and a *Conservation Management Plan*. Until those documents are available, changes to the building to accommodate existing or new uses should be minimized as discussed in Part 2, Stewardship.

Lanai (1958)
The Lanai is currently static but remains available for its first use.

George Nakashima Garage (1967)
The west room of the Garage contains a sink and appliances for washing and drying laundry as well as a water treatment system and an electrical panel, these appear to be its first use. The automobile bay has been insulated and is used for furniture storage.

Heating House (1977)
The Heating House continues to serve its original function housing the oil-fired boiler and storage tank that are the source of heat for the Nakashima Family House. Separation of the two buildings reduces the risk of fire and smoke damage and fuel leaks at the NFH.

The need for a stand-alone heating plant for the NFH would be eliminated if the campus-wide energy system proposed in the 2022 *George Nakashima Woodworker Energy + Carbon Assessment* were to be implemented. If so, the Heating House might be adapted to house the necessary air handling nit, which could serve the NFH via buried supply and return air ducts.

STEWARDSHIP OF THE NAKASHIMA FAMILY HOUSE AND THE GARAGE

Building Conservation Criteria
The George Nakashima Woodworker Complex was listed as a National Historic Landmark (08000782) on 22 April 2014. The NHL nomination states that:

> *The George Nakashima House, Studio, and Workshop complex retains a high degree of historic integrity. Very few noncontributing resources are located on the property; with few exceptions most of the buildings remain unaltered and the setting and overall landscape of the property are outstanding. The noncontributing buildings on the property have designs that fit with the existing buildings. For example, the pole barn, while a very large storage building, is covered with naturally weathered boards and exposed rafter tails that mimic other buildings on the property. The workshop is one building that has been altered due to the growth of the manufacturing operation. However, many of the changes that have occurred to the building fall within the period of significance and were executed by Nakashima; therefore, the changes are*

> *similar to and fit in with the buildings on the property. The setting for the property includes many small landscape elements that add considerably to the historic value of the property. These landscape elements include small ponds, scattered trees, some of which are unique specimens to the area, clusters of boulders, and stone walls. Overall the property retains all aspects of historic integrity including its location, setting, materials, design, workmanship, feeling, and association.*

To assure continued architectural integrity of the Nakashima Family House and the Garage, work on the buildings and immediate landscape should be undertaken in conformance with the following guidance:

- *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings*, 2017 https://www.nps.gov/tps/standards/treatment-guidelines-2017.pdf;
- *New Orleans Charter for the Joint Preservation of Historic Structures and Artifacts* (Appendix A);
- The American Institute for Conservation *Code of Ethics*; and,
- *Chapter 24 Museums, Galleries, Archives and Libraries* of the 2022 *Applications Handbook* of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).

Documentation and Planning

Although George Nakashima was an architect, he personally executed his building projects as a craftsman and builder. As a result, conventional architectural and engineering documentation - in the form of drawings, details, and specifications - of the Family House do not exist for the first, second, or third builds. In addition to easily recognizable major changes, any home is the result of a succession of minor changes and adaptations, and the Family Home is no exception in this regard.

Future stewardship decisions regarding physical interventions and use of the House must be informed by documentation of the existing dimensions and configuration of the House as well as the sequence of physical changes that have taken place. Fortunately, the Foundation has secured funding to support preparation of drawings and a digital model of the House as part of an *Historic Structure Report* to provide documentary, graphic, and physical information about the history and existing condition of the House and the Garage.

The Foundation has also secured funding for an *Environmental Management Report* based on evaluation of 12 months of environmental data. This work will identify a realistic and achievable interior environment that can be maintained to reduce the potential for temperature-driven and relative humidity-driven damage to the collections.

The *Historic Structure Report* and the *Environmental Management Report* will inform decisions by the Foundation regarding the future use and interpretation of the Nakashima Family Home. Given the conservation issues discussed in this *CAP Report*, these decisions should be made as part of a comprehensive, multi-disciplinary *Conservation Management Plan (CMP)*. Guidance for a CMP can be found in the *Burra Charter*.[6] Examples of *Conservation Management Plans* include:

- *Eames House Conservation Management Plan*, published by the Getty Conservation Institute; [7]
- *Miller House and Garden Conservation Management Plan*, published by PennPraxis for Newfields, the Indianapolis Museum of Art and funded by the Getty Conservation Institute.[8]

[6] https://australia.icomos.org/publications/burra-charter-practice-notes/
[7] https://www.getty.edu/conservation/publications_resources/pdf_publications/eames_cmp.html
[8] https://www.design.upenn.edu/pennpraxis/work/miller-house-and-garden-conservation-management-plan

Ongoing Documentation
Easy access to accurate information concerning the design, construction, repair, and alteration of a building, site, and systems is critical to effective and efficient stewardship.

When work is undertaken on the building, "as-built" drawings, construction submittals, test reports and warranties, and operating and maintenance manuals should be secured, compiled, and digitized for future reference. Systematic cataloging and archiving of architectural and building-related documents will differ from other types of documents, and the advice of an architectural archivist will be helpful in this endeavor.

Preventive Conservation
A fundamental goal of stewardship of cultural heritage is to reduce deterioration to the slowest possible rate. In the case of historic buildings, physical evidence of decorative artisanship and building craftsmanship constitute part of the significance, and preservation of the original building fabric takes precedence over restoration or replacement. Therefore, preventive conservation and routine maintenance are preferred over episodic restoration or renewal of historic features.

Heritage Reinvestment Plan
A *Heritage Reinvestment Plan* (Appendix B) provides the basis for budgeting and setting aside reserve funds for future capital projects needed for preservation of an historic building. A *Heritage Reinvestment Plan* is an important supplement for other documents that inform stewardship of an historic building, such as an *Historic Structures Report*, and a *Conservation Management Plan*.

Recommendations for Stewardship
The recommended actions for stewardship of the Nakashima Family Home and the Garage are:

Immediate Implementation
- Collect and organize records pertaining to past projects on the House and the Garage from first construction through the present. These records will be needed for the preparation of the *Historic Structure Report*.
- Undertake and complete the *Historic Structure Report* and the *Environmental Management Report*.
- Investigate funding and resources available for a *Conservation Management Plan* for the House and the Garage, including the Heating House and the Lanai.

Near Term Implementation
- Make sure that complete records for construction, repair or building conservation projects are identified as deliverables in contracts and are turned over to the Foundation at the completion of work.
- Secure funding for a *Conservation Management Plan* for the House and the Garage.
- Engage a team of highly qualified professionals to prepare the *Conservation Management Plan.*
- Implement the recommendations and policies of the *Conservation Management Plan*.

Intermediate Term Implementation
- Engage a heritage property professional to prepare a *Heritage Reinvestment Plan* (sometimes known as a *Reserve Study*) for the Nakashima Family House.
- Provide regular capital infusions to the Heritage Reinvestment Fund.
- Undertake future capital projects and major repairs using the Heritage Reinvestment Fund.

CLIMATE

The exterior climate for the location of the Nakashima Family House (40.339W, 74.956N, elevation ~290 ft NAVD88) may be characterized by published data for the Trenton Mercer County Airport, WMO 724095 (40.277N, 74.816W, elevation 190 feet), 8.4 miles southeast of the site:

- Summer median extreme high temperature: 97°F (dry bulb), 117 grains[9] water/lb. dry air;
  Summer 1.0% occurrence, high temperature: 90°F (dry bulb), 105 grains water/lb. dry air;
  Winter 99.0% occurrence: 13°F (dry bulb), 5 grains water/lb. dry air;
  Winter median extreme low temperature: 2°F (dry bulb), 3 grains water/lb. dry air;
- Summer median high humidity ratio: 83°F (dry bulb), 142 grains water/lb. dry air;
  Summer 1.0% occurrence, high humidity ratio: 81°F (dry bulb), 124 grains water/lb. dry air;
- Median daily dry bulb temperature range: 18°F;
- Average precipitation:
  ≥4.0 and <5.0 inches per month: July, September;
  ≥3.0 and <4.0 inches per month: January, February, March, April, May, June, August, November, December;
  ≥2.5 and <3.0 inches per month: October.

The exterior climate is classified as International Climate Zone 4A, Mixed-Humid. Seasonally, the climate may be characterized as having hot summers with periods of very high relative humidity and cold winters with periods of very low relative humidity. Spring and fall are characterized as having high variable relative humidity driven by variations in dew point temperature due to seasonal transition between dry winters and humid summers. On a daily basis, high relative humidity is likely in the night and mornings throughout the year.

Mean Heating Degree Days (HDD65, 65°F Base) dominate from October through May, and Mean Cooling Degree Days (CDD65, 65°F Base) dominate from June through September. The total annual Heating Degree Days is about 4.4 times the Cooling Degree Days. For make-up air and air infiltration, about 10% of the total infiltration heating load (68°F, 30% RH) is attributable to latent heating (humidifying) and about 64% of the infiltration cooling load (75°F, 60% RH) is attributable to latent cooling (dehumidifying). Heating loads from infiltration dominate from October through May and cooling loads dominate from June through August. During September, it will be to both humidify and dehumidify infiltrating air.

Throughout the year, the prevailing winds are from the North-West-South sectors.

The NCDC statistics are based on data collected between 1973 and 1996 and are the latest statistical data available from NCDC. The 2021 *ASHRAE Handbook – Fundamentals* contains slightly warmer data for the Trenton-Mercer monitoring station between 1998 and 2019. The NCDC and ASHRAE data sets are included with this *CAP Report* (NCDC and ASHRAE Climate Data, Appendix C).

Unfortunately, the NCDC and ASHRAE data do not include the projected changes in climate for the vicinity of Bucks County, PA.

[9] 7000 grains of water vapor equal one pound of water.

The Fourth National Climate Assessment includes Nakashima Family House vicinity in the Northeast region.[10, 11, 12, 13] Based on the report, it would be prudent to take the following projected impacts for future climatic conditions into consideration when considering long-term climatic issues at *Nakashima Woodworker Site*:

- Warmer and possibly shorter Winters, with fewer nights with subfreezing temperatures;
- Higher Summer temperatures and increased frequency of nights with temperatures greater than 75°F;
- Longer overall duration of Summer conditions;
- Higher atmospheric moisture in Summer and Fall, the latter increasing the need for dehumidification independent of cooling;
- Increased precipitation in Winter and Spring, resulting in increased potential for flooding. *This is particularly important considering the potential for erosion of the steep slope immediately south of the Nakashima Family House. Increased precipitation will exacerbate the management of water from roof and site runoff described elsewhere this report*;
- Increased number of extreme precipitation events; and,
- More frequent power interruptions due to storms. *This is of concern at the Nakashima Woodworker Site because of the increased potential of wind and lightning damage from the trees and overhanging limbs near the buildings.*

Climate change may lead to new pest infestations of the woodlands and invasive grasses/vegetation. These factors may also include dead or dying trees, increasing the risk of fire in the adjoining woods.

Recommendations for Climate
The recommended actions for climatic context of the Nakashima Family House are:

Near-term Implementation

- Once a year engage an arborist to examine the trees surrounding the buildings and, while preserving the design intent of the landscape, stabilize or remove limbs that pose a threat to the buildings;
- Plan to mitigate the risks and adverse effects of climate change on the Nakashima Family House, especially the increased frequency and severity of storms. Increased precipitation and storm intensity will exacerbate moisture at the House due to surface water runoff, subsurface water below the north exterior wall, increased roof drainage into the adjoining soil, and soil erosion around tree roots on the slope south of the House.

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[10] USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp. https://www.globalchange.gov/browse/reports/climate-science-special-report-fourth-national-climate-assessment-nca4-volume-i

[11] USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018 https://nca2018.globalchange.gov/chapter/front-matter-guide/

[12] https://statesummaries.ncics.org/

[13] The *Fifth National Climate Assessment* was released on 14 November 2023 as this CAP Report was being written. https://nca2023.globalchange.gov/

SITUATION OF THE NAKASHIMA FAMILY HOUSE AND THE GARAGE

The Nakashima Family House is situated on a gravel driveway, approximately 200 feet southwest of Aquetong Road, a paved two-lane road without shoulders that intersects with River Road (PA32) one mile to the south and with Windy Bush Road (PA232) 0.4 mile to the north. The driveway follows the contour of the hill near its crest to the north (Figures 2.1 and 2.32).

The single-track driveway closes in a loop back to the entrance from Aquetong Road. Space for parking is limited. The House is served by a private, on-site well water supply and by a private on-site septic system. Electrical power is provided by a public utility; an 18-kW propane-powered emergency generator located next to the Main Lumber Storage Building (#12) serves the House.

The Federal Emergency Management Administration Flood Map Service Center locates the Nakashima Family House in an "Area of Minimal Flood Risk"[14] (Figure 2.33). In a storm or flood event, access to the site may be impaired if the Delaware River floods River Road, or if one of the many nearby streams floods a roadway.

The Vaisala Lightning Flash Density Map indicates that Bucks County has a recorded lighting flash density of 19.9 events/mi^2/year[15]. The trees near the House are at risk of a lightning strike, based on the simplified lightning risk calculator in *NFPA 780: Standard for the Installation of Lightning Protection Systems*.[16] The calculation includes factors such as geographic location, lightning strike density, site features, building configuration and construction, occupancy, importance of contents and continuity of critical systems.

The site-related observations include:

- Visitor capacity of the site is inherently limited by the available parking and the staff available for tours.
- In the event of a fire or site emergency, arrival time at the site by fire apparatus or ambulance will be slowed by the narrow roads and potential for spectator traffic along the path for travel. Road conditions during heavy rainstorms, winter snow and ice storms will further delay arrivals.
- Emergency access on the site by fire apparatus or ambulance is extremely limited by the narrow driveway, overhanging tree limbs and tight radius of the loop.
- Although the Nakashima Family House is not located in a FEMA designated Flood Zone, access to the site by emergency services located in New Hope could be impeded by flooding of River Road or at one of the many stream crossings or watersheds between New Hope and the site.

Recommendations for the Situation of the House and the Garage

Recommendations pertaining to the situation of the Nakashima Family House include:

Immediate Implementation

- Review the *2021 Bucks County Hazard Mitigation Plan* and advise the Bucks County Department of Emergency Planning of any special considerations needed for the Nakashima Family House and the Nakashima Woodworker Complex.
- To minimize delays in accessing the site during weather or emergency events with traffic restrictions, work with the Bucks County Emergency Management Office to provide essential NFP personnel and essential

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14 https://msc.fema.gov/portal/search?AddressQuery=1847%20and%201858%20Aquetong%20Road%2C%20Solebury%20Township%2C%20Bucks%20County%2C%20Pennsylvania Accessed 14 November 2023.

15 https://www.vaisala.com/en/product/1256 Accessed 15 November 2023.

16 https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=780 Accessed 10 November 2023.

service contractors with the documentation and identification necessary to access the Nakashima Family House during or after a major emergency or weather event.

- Identify and secure the materials and supplies necessary for essential NFP staff to occupy and maintain the site in an emergency.

Near-Term Implementation

- Develop an *Emergency Response Plan* that addresses site-based emergencies as well as off-site emergencies, such as road closures, which can adversely affect access to the site.
- Engage a lightning protection specialist to inspect and assess the existing lightning protection system for the Nakashima Family House. Implement any upgrades or repairs recommended by the professional .

Fig. 2.32 Nakashima Family House General Location Credit: USGS Topo[17]

[17] https://ngmdb.usgs.gov/topoview/viewer/#15/40.3385/-74.9563 Accessed 14 November 2023

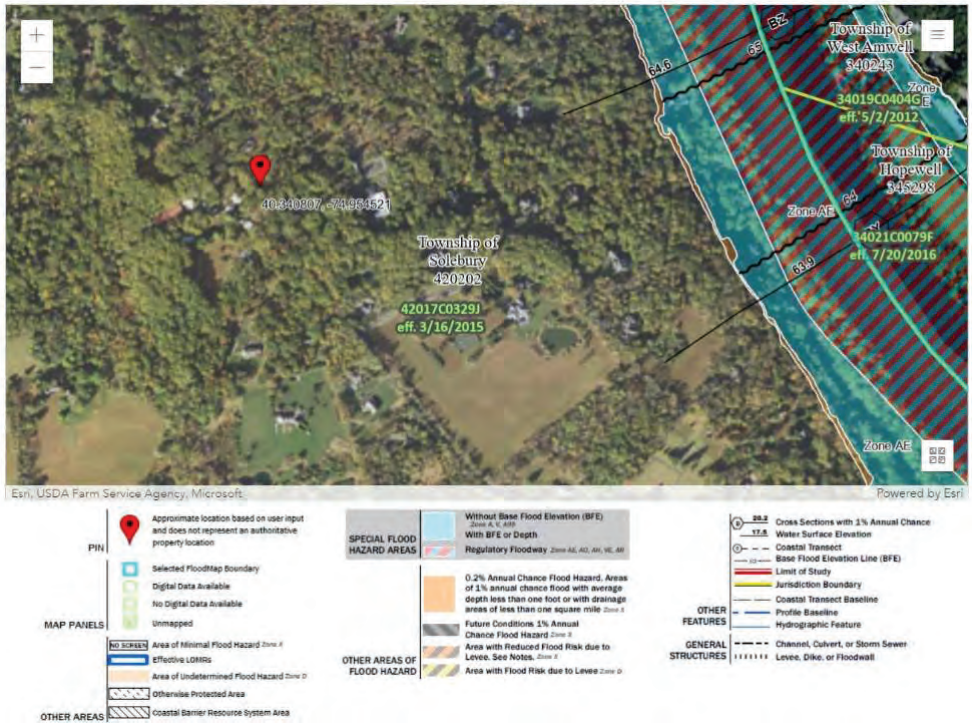

Fig. 2.33 FEMA Flood Map for area surrounding *Nakashima Woodworker Complex*
Image Credit: https://msc.fema.gov/ November 2023

SOILS AND SEISMICITY

Site Soils

The soils in the vicinity of a building can exacerbate risks to the building and/or its contents. Soils can be an important source of airborne reactive and abrasive particulates as well as moisture in liquid and vapor states.

The Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture provides a broad assessment of the soils at the Nakashima Family House. *Mount Lucas Silt Loam 3 to 8% slope (MlB)* is the major soil surrounding the house and garage (Figure 2.34). The slope south of the House is identified as *Mount Lucas Silt Loam, 8 to 25 percent slopes, Extremely Stony (MmD)*.

The NRCS characterizes the properties of the soil surrounding the House and Garage as:[18]

Property	**Mount Lucas Silt Loam (MlB)**
% clay—sand—silt (0 to 60 inches)	19.6%—48.4%—32.1%
Natural drainage class	Moderately well drained
Capacity to transmit water	Moderately low to moderately high
Saturated Hydraulic Conductivity (K_{Sat})	11.5 micrometers per second
Depth to water table	12 to 30 inches
Corrosion risk to concrete	Moderate
Corrosion risk to steel	High
Frost action	High
Wind erodibility class	5 of 8 (56 tons/acre/year)

[18] https://websoilsurvey.sc.egov.usda.gov/App/HousePage.htm, accessed 6 November 2023.

Fig. 2.34 Site Soils at The Nakashima Family House site Credit: *WebSoil Survey*

Seismicity

The *Bucks County Hazard Mitigation Plan* states:

> *All structures and infrastructure in Bucks County are equally at risk of experiencing an earthquake. However, in a mild earthquake of the magnitude typically experienced in Pennsylvania, no structural damage is anticipated. In other cases, damages are expected to be limited, and examples of anticipated damages are broken dishes and windows and toppled file cabinets.*
>
> *However, for earthquakes, the available history covers a period of less than 300 years, which is a relatively short period of time for an examination of earthquakes. Large earthquakes may only affect a location every several centuries or millennia. Environmental impacts of earthquakes can be numerous, widespread and devastating, particularly if indirect impacts are considered. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. These secondary events could also result in disruptions to natural ecosystems, poor water quality, damage to vegetation, and the release of toxic materials and sewage. Impacts to infrastructure could include train derailments, pipeline failures, and utility interruptions. A very large earthquake affecting Bucks County might cause structural damage in dilapidated structures or structures that do not meet current building codes. Thus, the impact of an earthquake might range from negligible to catastrophic.*
>
> *Structures identified as potentially at risk of damage due to an earthquake are older structures. All existing buildings have the potential to experience an earthquake. Given no history of damage in Bucks County due to earthquake, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry.*[19]

[19] https://www.buckscounty.gov/DocumentCenter/View/5328/1-Bucks-County-2021-HMP-Final-Master Accessed 7 November 2023.

With respect to soils and seismicity, the following observations can be made:

- There has been deflection of the north-south beam between the living room and kitchen, and the deflection has been sufficient to prevent movement of the sliding wood grille (Figures 2.35 and 2.36). This suggests that the combined dead load of the 1982 third build roof assembly and the 1942 first build roof assembly and concrete tiles may be substantial. If so, the lateral load capacity of the wall framing to resist lateral seismic loads of the roof assembly should be investigated.
- File cabinets have been placed in the 1954 second build room; this may result in heavy live loads on the floor structure.

Recommendations for Soils and Seismicity
Recommendations concerning the site-related risks at the Nakashima Family House include:

Immediate Implementation
- Refer to the section of this *CAP Report* on Source Moisture Control regarding subsurface soil moisture.
- Engage a structural engineer with experience in historic buildings to:
  1. Investigate the apparent deflection of the beam between the living room and kitchen and evaluate the risk of structural damage to the House in a seismic event due to the combined mass of the first and third build roof assemblies and the shear capacity of the wood-framed exterior walls and the crawl space piers.
  2. Evaluate the Garage for risk of damage in a seismic event.
  3. Determine if the propane tanks for the emergency generator should be secured to prevent overturning in a seismic event;
  4. Determine adequacy of the live load capacity of the floor framing and piers of the 1954 second build for fully loaded file cabinets.

Near Term Implementation
- Implement the recommendations of the structural engineer.

Continuing Implementation
- Minimize site-scale dust generation, particularly landscape maintenance and vehicular traffic on the gravel drive. Use landscape management techniques for mowing and leaf-litter that minimize airborne microbiota and particulates. Avoid use of leaf-blowers or grass-cutting without bags or bins.

Fig. 2.35 Deflected ceiling beam at Living Room/Kitchen
Photo credit: Michael C. Henry October 2023

Fig. 2.36 Wood dowel has pushed through rail for grille
Photo credit: Michael C. Henry October 2023

SOURCE MOISTURE CONTROL

Control of building moisture at the point of origin is essential to:

- Manage the relative humidity of the interior environment;
- Manage the moisture content of building materials and assemblies for long-term preservation of the building fabric; and,
- Provide an interior environment that is conducive to the long-term preventive conservation of the collections.

Source control of atmospheric water vapor is addressed by recommendations under Building Envelope section of this *CAP Report*; the present section addresses source control of bulk or liquid moisture.

The benefits of source control of bulk moisture in managing interior relative humidity become apparent if one considers how long it takes to dry spilled water by evaporation alone. The wetting (or spillage) occurs in a relatively brief time compared to the drying by evaporation, especially in the Mixed-Humid climate zone where evaporation can be very slow. Thus, if one can strategically reduce the amount of liquid water available to wet the building materials, then the amount of dehumidification necessary to remove the water by atmospheric drying can be minimized.

Source moisture control at the Nakashima Family House and the Garage is critical to preservation of the exterior and interior building fabric and observations include:

- A tree at the northeast corner of the House can shade the building and reduce air movement, reducing atmospheric drying of the envelope. Litter from the tree can block the gutter (Figure 2.37).
- On the south edge of the main roof, there is a short section of gutter above the rear deck, but the rest of the south edge lacks a gutter, this is a particular problem at the east end where water will splash onto wall surfaces and unpainted window trim (Figure 2.38).
- The House has hung gutters along the north edge of the main roof and along the north edge of the entry roof. The north edge of the roof at the 1982 west extension (Figure 2.39) lacks a gutter and this results in rain splashing on the wall and stains the finish.
- The hung gutter on the south edge of the 1954 second build may be set too close to the eave, and this may be causing damage to the soffit if the gutter is overfilled (Figure 2.40).
- The Garage is not protected by gutters and rain runoff from the roof has splashed onto and stained the west wall of the Garage (Figure 2.41). Damage to the sill plate, wall framing, and exterior finish material may have occurred.
- A drain on the pavement along the north side of the House can intercept stormwater runoff from the driveway and overflow from the House gutter, but the capacity of the drain is unknown, and the discharge point was not observed.
- Ivy is abundant at the east end of the House, suggesting high soil moisture (Figures 2.42 and 2.43). The root system of the ivy poses risk to the wood trim, the wall panels and underside of the floor assembly.
- The south wall of a linear crawl space parallel to the north wall of the 1946 first build exhibits dry and wet “tide lines” from rising damp, suggesting high soil moisture content (Figure 2.44).

Source moisture control improvements for the Nakashima Family House and the Garage are a high priority in order to protect the interior and exterior historic fabric of these important buildings in this National Historic Landmark.

The National Park Service Preservation Brief 39, *Holding the Line: Preventing Unwanted Moisture in Historic Buildings*[20] provides excellent guidance on dealing with moisture problems, but the advice of an Architect or Engineer should be sought before implementing major changes.

Recommendations for Source Moisture Control
The recommendations for source moisture control at the Nakashima Family House and the Garage are:

Immediate Implementation

- Engage an Architect to evaluate the size and capacity of the existing gutters and for new gutters on the Garage and on the south side of the House. Drainage capacity must account for the increased precipitation intensities and durations resulting from climate change. There may be strong resistance to this change, but most building conservators and agencies recognize the importance of source moisture control and recognize that buildings without gutters will eventually self-destruct.
- Install additional gutters on the Garage and on south side of the House and upgrade existing gutters as recommended by the Architect.

Ongoing Implementation

- Clear gutters every three months and clear and flush the subgrade drains at least once per year. Confirm that drains flow freely by observing the discharge point of the drain.
- Trim overhanging trees around the house to prevent gutter clogging.
- Remove ivy growth from the walls and open crawl spaces.
- During heavy rains, observe and photograph any water splashing and run-off patterns. These photographs can be used to inform maintenance of gutter systems, such as eliminating sags or low points where overflowing occurs.

Fig. 2.37 Tree overhanging roof & gutter at northeast corner
Photo credit: Michael C. Henry October 2023

Fig. 2.38 Water from south slope of roof cascades on walls
Photo credit: Michael C. Henry October 2023

[20] https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm

Fig. 2.39 Lack of gutter on north side of 1982 third build
Photo credit: Michael C. Henry October 2023

Fig. 2.40 Gutter on 1954 second build may damage soffit
Photo credit: Michael C. Henry October 2023

Fig. 2.41 Water damage to Garage wall
Photo credit: Michael C. Henry October 2023

Fig. 2.42 Past ivy growth suggests abundant soil moisture
Photo credit: Michael C. Henry October 2023

Fig. 2.43 Abundant plant growth under 1954 second build
Photo credit: Michael C. Henry October 2023

Fig. 2.44 Past and active rising damp on CMU in crawl space
Photo credit: Michael C. Henry October 2023

EXISTING ENVIRONMENTAL MANAGEMENT AND MONITORING

George Nakashima's experience with Antonin Raymond during the 1930s in the design and construction of Golconde (1942), an ashram dormitory in Pondicherry, India, probably influenced his approach to environmental management of the Nakashima Family House.[21]

The 1946 first build of the Nakashima Family House includes the following bioclimatic architectural features, many of which were occupant-adjusted as needed for comfort:

- Orientation of the long axis of the house in the east-west direction;
- Reduced exposure to winter winds by setting the north elevation below the crest of the hill;
- Minimized window area on the north elevation and maximizing use of masonry construction for the walls;
- Maximized window area on the south elevation for solar heating in winter (Figure 2.45);
- Reduced solar heat gain in summer with occupant-operated *shoji* panels and wood grilles at the windows; and,
- Highly efficient occupant-operated cross ventilation by minimizing building width in the south-north direction and minimizing fixed interior partitions that would impede air flow in that direction (Figure 2.46).

Although comparative data on environmental performance are not available, it is likely that 1954 second build and the 1982 third build on the original environmental management strategy has been to somewhat reduce effectiveness of solar gain and cross ventilation. These reductions have probably been offset by the third build roof over the first build roof which has reduced heat gain in the summer and heat loss in winter.

The January 1950 issue of *art & architecture* magazine reported that the House was heated by "a combination system of a circulating fireplace, oil, and United States Rubber radiant heating panels." The March 1952 issue of *House and Home* reported that there "is not central heating system in the house; Nakashima couldn't afford one. At one end is a fireplace, and at the other end between the two bedrooms, is a small floor-sunk kerosene space heater." At some point, an oil-fired hot water boiler was added to the house.

At present, the house is heated by the fireplace and by an oil-fired boiler in the Heating House which supplies hot water to a fin-tube baseboard in the living room and by wall-mounted fan coil units in other spaces (Figure 2.47). Each fan coil unit is controlled by an older thermostat in the same room as the fan coil unit (Figure 2.48). The boiler is controlled by a digital thermostat located in the hall and an exterior temperature sensor (Figure 2.49). The fan coil unit thermostats are not tied to the boiler thermostat; as a consequence, a room thermostat may energize the fan, but if the boiler thermostat does not sense low temperature, the boiler will not be energized and the water in the fan coil units will be cold.

The House has a small window-mounted air conditioner in the living room (Figure 2.50) but this is not sufficient to cool or dehumidify the entire house. As a result, occupant-operation of windows and doors is necessary on hot days in order to establish natural ventilation.

In June 2023, the NFP initiated a program to monitor environmental conditions in the House with two dataloggers, one in the Parents' Bedroom of the first build and one in the 1954 addition. In November 2023, two more loggers were installed, one in Mira's Bedroom/Office and one in the Dining Room. Twelve months of data will be available beginning in June 2024. At that time, Michael Henry will analyze the data and prepare an *Environmental Monitoring Report* funded by grants from the National Trust for Historic Preservation Favrot Fund and a Keystone Preservation Planning Grant from the Pennsylvania Historical & Museum Commission.

[21] https://nakashimafoundation.org/project/golconde-exhibit-opening/

The *Environmental Monitoring Report* will inform:

- Temperature and relative humidity conditions to which the collections are exposed.
- Relationship of the interior and exterior conditions, from which an understanding of building envelope performance can be derived.
- Effects of occupancy and visitation on the interior environment.
- Suggested strategies for improving performance of the mechanical system, the building envelope, and the operation of the building by occupants.

Preliminary Recommendations for Environmental Management and Monitoring
Until the *Environmental Monitoring Report* is available, the preliminary recommendations for improving environmental management at the Nakashima Family House are:

Immediate Implementation

- Take care in the monitoring program to assure continuity and consistency in the monitoring data, downloading/management of data, and deployment of dataloggers. Technical Note 7, *Environmental Monitoring and Diagnostics for Museums*, by Michael C. Henry, PE, RA, for the Getty Conservation Institute (Appendix D) provides additional guidance in this regard.
- Check the dataloggers annually to comparatively confirm performance accuracy.

Fig. 2.45 Fenestration for passive solar heating, first build
Photo credit: Ezra Stoller No date

Fig. 2.46 Operable doors & windows provided ventilation
Photo credit: Ezra Stoller No date

Fig. 2.47 Hot water fan coil unit in Parents' Bedroom
Photo credit: Michael C. Henry October 2023

Fig. 2.48 Thermostat for fan coil unit in Parents' Bedroom
Photo credit: Michael C. Henry October 2023

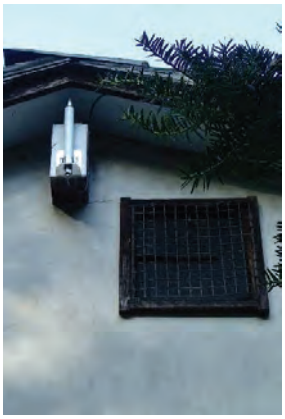

Fig. 2.49 Main thermostat in hall, outside temperature sensor
Photo credit: Michael Henry (L) Wendy Jessup (R) October 2023

Fig. 2.50 A/C unit in window above fireplace
Photo credit: Michael C. Henry October 2023

BUILDING ENVELOPE AND HYGROTHERMAL PERFORMANCE

The building envelope of a building is the first line of defense against the exterior elements of thermal energy, moisture, pollutants, and light. In serving this purpose, the building envelope is also subjected to these elements, which are factors in various deterioration mechanisms.

The building envelope moderates the effects of climate on the interior and is critical in maintaining an acceptable interior environment for conservation of the contents. The performance of the building envelope presents a practical constraint on the differences in temperature and atmospheric moisture that can be economically maintained between the exterior climate and the interior environment.

In the Mixed-Humid Zone 4A climate, the hygrothermal performance of a building envelope must be able to limit bidirectional moisture vapor migration (inside to outside in winter and outside to inside in summer) and to limit bidirectional thermal energy transfer (inside to outside in winter and outside to inside in summer). In order to maintain interior conditions for collections longevity, the thermal and moisture vapor gains and losses through the envelope must be reduced by active mechanical systems, and operation of these systems is directly related to energy consumption. Maintaining acceptable interior environmental conditions for relative humidity is an important issue for collections longevity, especially for books and works on paper.

Observations regarding the building envelope of the House are:

- The operable window sash and doors do not have weather-stripping lack weather-stripping to reduce infiltration of air and moisture vapor.
- The exterior wall assemblies of the House may vary among the three builds; it is likely that all wall assemblies lack vapor control and may have marginal thermal performance compared to today's residential construction.
- The configuration and details of the first and third build roof assemblies could not be observed.
- A linear crawl space was constructed parallel to the north wall of the 1946 first build; subsequently, the crawl space of the 1946 first and 1982 third builds was completely enclosed (Figure 2.51) except under the Parents' Bedroom where it is partially open on the south side (Figure 2.52). The crawl space of the 1954 second build is partially enclosed, and the remainder is open on the south side.
- The enclosed crawl space has a degraded vapor retarder (Figure 2.51).

- The floor assemblies may vary by build. The underside of all floor assemblies has been coated with spray polyurethane foam (SPF) insulation (Figure 2.53) in open and closed crawl spaces. SPF has been applied to the sidewalls of the linear crawl space that runs along the north wall of the first build (Figure 2.54). Polystyrene board insulation may have been used in conjunction with SPF insulation under the 1954 second build (Figure 2.55).

Observations regarding the building envelope of the Garage are:
- The sectional overhead door and the swinging doors and operable window sash lack weather-stripping to reduce infiltration of air and moisture vapor.
- The walls and ceiling of the automobile bay have been retrofitted with rigid unfaced foam insulation panels (Figure 2.56). The garage floor is insulated, and the insulation is protected with a plywood deck. Insulation for the adjoining room could not be observed.

A detailed evaluation of the hygrothermal performance of the envelopes of the Nakashima Family House and the Garage is beyond the scope of this CAP Report; however, some basic observations of potential performance issues can be made:
- The House was originally designed to provide non-mechanical solar heating through south-facing windows in winter and natural ventilation through open windows and doors in summer. The Garage does not appear to have been heated originally, but the plumbing for the laundry equipment would have required freeze protection.
- The exterior wall assemblies of the House may vary among the three builds; it is likely that all wall assemblies lack vapor control and have low thermal performance compared to today's residential construction.
- If the House is not heated in winter, artwork mounted on poorly insulated walls will be at risk of damaging microclimates developing between the back of the artwork and a cold exterior wall. This is because the cooler temperature of the space between the two surfaces will elevate relative humidity to the point of moisture saturation and/or microorganism activity.
- Furniture set close to poorly insulated walls is at risk of damaging microclimates developing between the back of the furniture and a cold exterior wall since the cooler temperature of the space between the two surfaces will elevate relative humidity to the point of moisture saturation and/or microorganism activity.

Recommendations for Building Envelope and Hygrothermal Performance
Recommended actions for the envelope of the Nakashima Family House and the Garage are:

Immediate Implementation
- Refer to the section of this report pertaining to preliminary assessment of environmental performance.

Near-Term Implementation
- Implement the recommendations of the *Environmental Monitoring Report* when available.

Fig. 2.51 Partial enclosure of crawl space under 1954 build
Photo credit: Michael C. Henry October 2023

Fig. 2.52 Partial enclosure of crawl space, Parents' bedroom
Photo credit: Michael C. Henry October 2023

Fig. 2.53 SPF insulation & vapor barrier under 1946 build
Photo credit: Michael C. Henry October 2023

Fig 2.54 SPF insulation in linear crawl space along north wall
Photo credit: Michael C. Henry October 2023

Fig. 2.55 SPF & polystyrene insulation under 1954 second build
Photo credit: Michael C. Henry October 2023

Fig. 2.56 Insulated interior of auto bay in the Garage
Photo credit: Michael C. Henry October 2023

PRELIMINARY ASSESSMENT OF POTENTIAL ENVIRONMENTAL PERFORMANCE

The most current advice for building environments for collections is found in Chapter 24, *Museums, Galleries, Libraries and Archives* in the *2022 ASHRAE Applications Handbook* published by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). ASHRAE A24 provides the most current methodology for determining environmental criteria for collections while balancing the performance of the building envelope and the thermal and moisture loads presented by the exterior climate. The 2019 version of this chapter is a substantial rewrite of the earlier versions and is the work of an international team of conservation scientists, architects and engineers, and collections conservators.

ASHRAE Applications Chapter 24 contains three tables (Appendix E) which are used to determine the class of environmental control that is realistically achievable for different combinations of building envelope and climate, and the benefits of each class of environmental control for preservation of the collections:

- Table 13A describes the different classes of environmental control for collections, the operating parameters for temperature and relative humidity for each class and the benefits and risks to collections provided by each class.
- Table 12 describes the types and minimum levels of building envelope performance with examples of building features for each type.
- Table 11 indicates the classes of interior environmental control, the climate zones and the building envelope performance factors that are necessary to maintain that class of control for a given climate zone.

For an existing building, determination of the realistic and achievable class of environmental control begins with qualitative assessment of the building envelope performance using Table 12. Based on those results and the climate zone in which the building is situated, Table 11 is used to determine the realistic and achievable class of environmental control that is possible, given the climatic context and the performance limits on the envelope.

Based on the outcome of the above, an engineer then proceeds with identification of necessary envelope improvements, as well as the type of mechanical system best suited for energy-efficient operation within the required operating parameters for temperature and relative humidity.

Based on observations of the Nakashima Family House for this *CAP Report*, and referencing ASHRAE Table 12, the hygrothermal performance of Nakashima Family House envelope can be characterized as:

- *Moderated liquid water loads* moisture entry though the north masonry wall;
- *Somewhat moderated thermal flows* due to the thin, minimally insulated wood-framed wall assemblies and wood-framed roof assemblies;
- *Unmoderated water vapor flows* due to the apparent lack of vapor control in the wall and roof assemblies and the potential for vapor infiltration at operable windows and doors; and,
- *Moderated stack effect* due to the single-story configuration of the House.

The Nakashima Family House is in climate zone 4A Mixed-Humid, and based on the above building envelope performance characteristics, ASHRAE Table 11 indicates that it is realistic and achievable to maintain Type C interior environmental control at the House. ASHRAE Type C has maximum and minimum limits for relative humidity and temperature but does not limit the range of short term (24 hour) fluctuations in either variable. ASHRAE Table 13A states the collections benefits and risks for Class C as:

> *Mold germination and growth, and rapid corrosion avoided.*
> *Tiny risk of mechanical damage to many artifacts and most books; moderate risk to most paintings, most photographs, some artifacts, some books; high risk to high-vulnerability artifacts.*

Even greater care is needed than provided in [Class] B when handling objects made with flexible paints and plastics that become brittle when cold, such as paintings on canvas.
Chemically unstable objects deteriorate significantly within decades at 68°F, twice as fast each 9°F higher. Conversely, cool winter season can extend their life.

For the Nakashima Family House, the target operating parameters for Type C Control would be:

ASHRAE A24 Type C control criteria applied to the Nakashima Family House				
Table 13A Control Class	Relative Humidity (primary control)		Temperature (secondary to RH)	
C	Not less than 25% RH	Generally below 65% and not higher than 75% RH (dehumidification req'd)	55°F when RH approaches 25% or less	Ambient or higher to keep RH below 75%

Maintaining these limits will require some improvements to the building envelope and the present mechanical system; recommendations for these improvements will be made in the 2024 *Environmental Monitoring Report.*

Preliminary Recommendations for Potential Environmental Performance
Until the monitoring project is complete, preliminary recommendations for target environmental criteria for Nakashima Family House are:

Immediate Implementation
- To minimize damage to the historic building envelope and to minimize damage to the collections, operate the interior environment within the ASHRAE A24 Class C environmental criteria, as modified for the NFH. This will provide a balance between conservation of collections and conservation of the historic building envelope for the near term.
- For the 2023-2024 winter maintain the main thermostat and the thermostats for the fan coil units at 65°F.
- Do not make changes to the heating system or environmental management in the House during the 2023-2024 environmental monitoring study without consulting Michael C. Henry.
- Expect that ASHRAE Class C conditions will not be ideal for some environmentally sensitive collections as discussed in Part 3 of this *CAP Report*.

Near-Term Implementation
- Expect to implement additional improvements to the environmental management of the Nakashima Family House when the *Environmental Monitoring Report* is prepared in 2024.
- Engage a collections conservator and an engineer to prepare a *Collections Storage Feasibility Study*. The Study should assess the storage space needs of the collections in the House and assess the feasibility of converting the Garage and/or the west bay of New Lumber Storage Building into ASHRAE Class A/B collections storage.
- Implement the recommendations of the *Collections Storage Feasibility Study*.

EMERGENCY POWER GENERATION

The Nakashima Family House is served by a Kohler 20-RSB stand-by generator. The 18kW generator and two 120-gallon (96 lb.) propane fuel supply tanks are located on the south side of the Main Lumber Storage Building (Figures 2.57 and 2.59) and the emergency transfer switch is located in the Garage on the south wall of the west room. The generator case is not locked, and the tanks and generator are not secured from vandals by a fence. At full load, the fuel supply is estimated to last approximately 52 hours. The fuel supply must be maintained by fuel deliveries during extended power outages.

Recommendations for Emergency Power Generation
Recommendations for emergency power generation for the Nakashima Family House are:[22]

Continuous Implementation
- Contract for routine testing maintenance of the generator.

Fig. 2.57 Emergency Generator
Photo credit: Michael C. Henry October 2023

Fig. 2.59 Fuel Supply for Emergency Generator
Photo credit: Michael C. Henry October 2023

WIRELESS AND INTERNET COMMUNICATIONS

Modern high-speed data communications and wireless voice and data communications are essential to protect the buildings and collections, especially in a post-storm or emergency event. Modern fire detection and security systems, as well as most HVAC systems and emergency generators utilize wireless communications or high-speed internet access for alarm notifications and for remote monitoring of operation. Typical of rural areas, the location of the Nakashima Family House presents challenges limits reliable access to wireless voice or data and the bandwidth and reliability of high-speed internet access. This is likely to be resolved and Federal and State initiatives are implemented to expand coverage to rural areas.

Recommendations for Wireless and High-Speed Internet Communications
Recommendations for wireless and high-speed internet communications for the Nakashima Family House are:

Continuous Implementation
- Request that the Information Technology specialist who currently assists the Nakashima site inform the NFP when service upgrades are available and implement the necessary system improvements.

[22] See Soils and Seismicity section for comments regarding seismic restraints on the fuel storage tanks.

FIRE PREVENTION, DETECTION & PROTECTION [23]

Fire prevention, detection and protection at the Nakashima Family House consists of the following:

- Portable fire extinguishers deployed in the building; and,
- Automatic fire detection system consisting of smoke detectors and a Fire Alarm Control Panel in a closet in the vestibule.

Observations of fire risk, fire prevention, detection and protection at the Nakashima Family House include:

- The limited scope of the fire detection system in the House and the Garage. Detectors are not deployed in the underfloor and crawl spaces of the House or in the space between the first and second roof assemblies of the House.
- The condition of the electrical wiring and circuitry at the House and the Garage are indeterminate and suspect and may pose a risk of fire.
- Spray Polyurethane Foam (SPF) insulation has been applied to the floor assembly under the House (Figure 2.53). Some of the electrical wiring may be embedded in the spray foam insulation (Figure 2.54). SPF will burn rapidly if exposed to flame originating in a nearby material, such as wood or electrical wiring.
- Containers of gasoline for landscape maintenance equipment are stored in the open where they can be easily accessed by vandals or arsonists.
- Entry into the Site and to the House and the Garage may be difficult for large fire-fighting apparatus, especially in winter conditions or when the soil is saturated with rain. A water shuttle will have to be established to supply water to the apparatus for firefighting.

The possible presence of asbestos containing materials and the known presence of spray foam insulation may complicate post-fire triage and recovery of the collections due hazardous materials. The collections and building may require specialized conservation protocols, which are beyond the scope of this *CAP Report*. Additionally, the reaction of fire-degraded ACM and SPF materials with the collections materials is unknown.

The Nakashima Woodworker Site is served by the all-volunteer New Hope Eagle Fire Company located at 46 North Sugan Road in New Hope.[24] The company's primary fire-fighting apparatus includes three engines, a tanker, a brush truck (TAC), a tower truck, and six specialized response and command vehicles. Fire-fighters are dispatched by Bucks County 911. There are three routes available between the New Hope Eagle Fire Company and the Nakashima Woodworker Site, ranging from 3.1 to 4.2 miles with travel times in low traffic from 8 to 10 minutes. Response times of the large fire apparatus on narrow or crowded roads will be longer especially during weather events, with fallen trees or flooded roads.

The Midway Volunteer Fire Company[25] at 5772 York Road (US 202) in Lahaska may provide mutual support to the New Hope Eagle Fire Company. There are three routes of travel from Lahaska to the Site, ranging from 4.8 to 5.6 miles.

The location of the House and Garage and the lack of vehicular access around the House will present challenges for firefighting operations. The load capacity of the soil may limit the placement of fire apparatus, and long exterior hose lays into the site and around the building may be required. The narrow width of Aquetong Road may result in traffic congestion and delayed access to the site by the Fire Department as well as delays in water deliveries needed to replenish the on-board water capacity of the fire apparatus on site.

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[23] Evaluation of life safety issues is outside the scope of this *CAP Report*.
[24] https://www.nhefco.org/
[25] https://www.midwayvfc.com/

Fire prevention efforts at the Nakashima Family House can be informed by several relevant fire protection publications from the National Fire Protection Association (NFPA) including:[26]

- *NFPA 10 Standard for Portable Fire Extinguishers (2018)*;
- *NFPA 909 Code for the Protection of Cultural Resource Properties - Museums, Libraries, and Places of Worship (2021)*;
- *NFPA 914 Code for Fire Protection of Historic Structures (2023)*; and,
- *NFPA 241 Standard for Safeguarding Construction, Alteration and Demolition Operations (2022).*

Recommendations for Improved Fire Detection and Protection
Recommendations for improved fire detection and protection for the House are:

Immediate Implementation

- Engage a licensed electrician to document and evaluate the condition of the electrical system and wiring of the House and the Garage. The assessment should include an infrared thermal survey of electrical devices and distribution equipment to identify potential overloaded circuits. Resolve any problems.

Immediate, then Continuing Implementation

- Do not store fuels or flammable fluids on site where they can be accessed by vandals or arsonists.
- Train all new and temporary staff, volunteers, and contractors in the requirements, procedures, and prohibitions for fire prevention at the House and Garage.
- Annually, train staff and volunteers in fire prevention and the use of the fire extinguishers.
- Annually conduct a joint meeting held with the New Hope Eagle Fire Company and the Midway Volunteer Fire Company and review the firefighting plans for the Nakashima Family House and the Garage, as well as the Nakashima Woodworker Site in general. Topics should include site access, apparatus deployment, fire-fighting water supply, and special fire-fighting considerations of a historic structure and collections, including salvage and recovery of contents. Establish procedures for access to the site by Foundation staff during and after a fire event.
- Require that all contractors and maintenance personnel incorporate fire prevention in their specific activities in and around the House and the Garage. All interior "hot work," such as welding, brazing, and soldering should be prohibited. Refer to *NFPA 241* for preventive measures during construction and maintenance activities.

Near-Term Implementation

- Engage a Professional Fire Protection Engineer with experience with historic buildings used as museums to assess the effectiveness of the present fire detection system.[27] If necessary, fund and contract for design and installation of improvements or changes.

[26] These and other NFPA publications can be purchased at https://catalog.nfpa.org/.
[27] Nick Artim (firesafe@gmavt.net) at Heritage Protection Group (https://www.hpg-vt.com/) is well-qualified to address this issue.

SECURITY & INTRUSION DETECTION

This section addresses security measures for the House and Garage and the immediate site; Part 3 addresses security for individual objects in the House.

Security, access control and intrusion detection at the Nakashima Family House involve a number of factors that need to be addressed for effective deterrence, detection, and documentation. These factors include:

- The passing of Kevin Nakashima in 2020 resulted in the south parcel of the site lacking a full-time resident/occupant.
- The house and several other buildings in the Complex cannot be observed from Aquetong Road.
- The site can be easily accessed, especially after working hours.
- The House and the Garage have several points of entry/access.
- The emergency generator, fuel supply and emergency transfer switch are not secured from vandals.

The House and Garage have residential-quality locks at the doors. Many windows have latches, but some windows with sliding sash cannot be secured in the closed position. The doors to the enclosed portions of the crawl space under the house are not locked and the doors to the interior of the Heating Building are not locked.

The Nakashima Woodworker Complex is in the jurisdiction of the Solebury Township Police Department, located at 3092 Sugan Road, Solebury, Pennsylvania. Law enforcement is dispatched by Bucks County 911. There are three routes available between the Police Department and the Nakashima Woodworker Site, ranging from 5.9 to 7.1 miles with l travel times in low traffic from 12 to 14 minutes. Response times during weather events, with fallen trees or flooded roads, will be delayed.

The Nakashima Foundation for Peace does not have a *Disaster Preparedness & Emergency Response Plan*.

Recommendations for Improved Security and Intrusion Detection
Recommendations for improved security and intrusion detection for the Nakashima Family House are:

Immediate Implementation

- Engage a security consultant with museum experience (not a security system contractor/installer) to survey the house, garage, and emergency power supply, meet with the staff and develop a realistic security plan for the buildings at the site.
- Incorporate the security plan into NFP's *Disaster Preparedness & Emergency Response Plan* to address security needs during and after a disruptive event.
- Install locks to secure access to doors to the House crawlspaces, the Garage, and the Heating House.
- Install pins or latching devices to secure sliding window sash.

Near-Term Implementation

- Implement the procedural aspects of the security plan.
- Fund and implement installation of a site-wide security system, incorporating the recommendations of the security plan for detection and access control.

On-Going Implementation

- Annually train staff and volunteers in appropriate aspects of the security plan.
- Test all security system sensors and alarms every month and immediately resolve any problems.

End of Part 2 – The Building

PART 3: THE COLLECTIONS

INTRODUCTION

The Nakashima Foundation for Peace (NFP) was founded in 1980 by George Nakashima with the mission to:
…maintain the architecture and the collection of furniture George Nakashima designed and built on his New Hope, Pennsylvania property. To study, uphold, and perpetuate the great spiritual traditions he embraced and integrated into his work, especially that of Sri Aurobindo, Zen Buddhism, and Christian monasticism. To build Altars of Peace and send them to all parts of the world as ecumenical seeds of Peace planted for all humankind.[28]

This Collections Assessment for Preservation (CAP) focuses on the George Nakashima House (the House) [29] and its contents, which were gifted to the NFP in 2021 after the death of the last occupant of the House, George's son Kevin.

According to the National Historic Landmark Nomination, the House is situated on a south-facing ridge of the George Nakashima Woodworkers Complex (the Complex) located in Bucks Conty, Pennsylvania. George Nakashima began building the House in 1946 as a residence for his family. In 1954, he build a small addition on the south side of the House to create another bedroom; in 1982, the living room was expanded by three feet to the south.

The House was continuously occupied by the Nakashima family for 75 years and contains materials made by, given to, or acquired by family members over the years. These materials include built-in and free standing furniture designed and constructed by George Nakashima; paintings, photographs, and artwork created by family members; works of art given to the family by Ben Shahn and other notable 20th-century artists; clothing worn by George, his wife Marion, and son, Kevin; personal effects including books and toys used by the family; domestic tools and equipment; and an extensive archive of family papers. Although inventories are in progress, the full extent of the collection is unknown.

By its nature, a CAP assessment provides an overview to the conservation conditions of a collection and provides recommendations for general improvements in its care and preservation. A CAP assessment is not, and cannot be, an item-by-item condition assessment of the objects. Instead, an assessment can provide technical support and guidance for efforts already begun by an organization's staff in collections care as well as recommendations and strategies for making systematic improvements to the care of the collections.

This CAP assessment report has been developed collaboratively by the assessment team through:
- Review of available documentation provided by the Nakashima Foundation for Peace.
- Observation of the existing conditions during the site visit.
- Discussions of issues with Nakashima Foundation for Peace staff and trustees; and,
- Collaborative discussion and analysis with the Building Assessor, Michael C. Henry, via telephone and video conference.

Part 1 of this CAP report provides an overview to institutional strengths and the overarching issues faced by the Nakashima Foundation for Peace in preservation of the House and its collections. Part 2 addresses issues associated with the Nakashima Family House identified by the building assessor, Michael C. Henry, PE of Michael C. Henry. LLC.

[28] https://nakashimafoundation.org/mission-statement/
[29] For consistency, building names and terminology are those used in the National Historic Landmark Nomination application.

Part 3 of this CAP report focuses on the collection, beginning with the need to identify and define the collection. Subsequent sections of Part 3 address:

- Collections vulnerabilities
- Environment
- Materials Exhibited in the Nakashima Family House
- Collections Storage
- Emergency Preparedness Planning and Response
- Collections Stewardship and Preservation Planning; and,
- Staffing for Collections Stewardship.

For each of these topics, general guidance is presented, followed by observations specific to the collections in the Nakashima Family House, and then recommendations for immediate, near-term, mid-term, long-term, and ongoing implementation. These recommendations are based upon a holistic approach to the preservation of collections within the context of the historic building; many of these recommendations repeat or expand upon recommendations included in Part 2, the Building Assessment.

COLLECTIONS DEFINITION

The *Code of Ethics for Collections and Professional Practices for Collections Professionals* was collaboratively developed by the Association of Registrars and Collections Specialists (ARCS) and the Collections Stewardship Professional Network of the American Alliance of Museums (CS-AAM). Endorsed in 2021 as part of the American Alliance of Museums' (AAM) Framework for Museum Excellence, this document provides ethical guidance for the staff of cultural institutions in stewardship of collections.

In the above-referenced document, cultural institution is defined as an organization that:
Includes, but is not limited to, public and private aquaria, archives, botanical gardens, galleries, historic properties, historical societies, libraries, museums, zoos, and all other entities engaged in the care, collection, dissemination, interpretation, and preservation of natural and cultural heritage and access to knowledge. [30]

By this definition, the Nakashima Foundation for Peace is a cultural institution. As a nascent and evolving collections stewardship organization, the Nakashima Foundation for Peace is encouraged to use guidance promulgated by the American Alliance of Museums (AAM) for collections stewardship. See Collections Stewardship: Policies and Procedures.

Definition of the Collections
At the moment there is a tremendous amount of material in the George Nakashima House, some of which has direct and strong association with the House, and some of which has strong personal and private association with family members. For this reason, the CAP assessment team suggests creation of two categories of collections: the "House Collection" and the "Family Collection".

The materials directly associated with the physical experience of the House ("House Collection") are clearly candidates for accessioning and interpretation made accessible to the public and scholars. Materials that have strong personal and private association with family members ("Family Collection") are candidates for restricted access until it is appropriate to release them for access by scholars and interpretation.

[30] https://www.aam-us.org/wp-content/uploads/2021/03/Code_Ethics_Collections_Professionals_2021_02_24.pdf

Examples of the "House Collection" include:

- **The House,** the built-in and movable furniture, finishes, the Mira Nakashima mural on the closet door, light fixtures and door hardware.
- **Records pertaining to construction of the House**.
- **Artwork acquired by George and Marion Nakashima** and likely to have been displayed in the House.
- **Objects acquired by George and Marion during their travels** and likely to have been displayed in the House.
- **Photographs of the House and the family in the House** that have been published or communicate important information about the appearance of the interior and exterior of the House over time**.**

Material in the "House Collection" that is essential for interpretation of the House may remain in the House. Non-essential materials of the "House Collection" should be stored in a building with preservation conditions appropriate to the environmental vulnerabilities of the materials. See Collections Storage.

Examples of the "Family Collection" include:

- **Personal materials directly associated with the Nakashima family**: garments and accessories; personal interest materials unrelated to the art and architecture of the House.
- **The Family Archives:** personal correspondence, health and financial records, family photographs.

Material in the "Family Collection" should be relocated from the House to a building with preservation conditions appropriate to the environmental vulnerabilities of the materials. See Collections Storage.

Both collections must be separately documented and cataloged. If both collections are stored in the same space, the two collections should be physically separated by separate security and access measures.

Once the collection has been defined, the Nakashima Foundation for Peace is encouraged to develop a clearly defined and articulated *Scope of Collection Statement.* A *Scope of Collection Statement* describes what is in the collection and why, and how the collection supports the mission of the organization; thereby establishing an intellectual framework for the organization that establishes periods of interpretation, subject matter, significance, and interpretive themes. A *Scope of Collection Statement* will also identify collection strengths and weaknesses, as well as limitations, e.g., what is not collected or what may be missing and is desired for rounding out the collection. A clearly defined *Scope* can also define the standards of care required for each portion of the collection so that financial resources are expended responsibly and where they are most needed.

Over time and as research is completed, the *Scope* can be revised and updated. Additional information and examples of *Scope of Collection Statements* can be found in Appendix F.

The inventory of the contents of the House currently underway should help to inform development of the *Scope of Collection Statement*.

Recommended actions for the definition of the Nakashima Family House collections are:

- Develop a *Scope of Collections Statement* for the collections.

COLLECTIONS VULNERABILITIES

The Canadian Conservation Institute identifies ten agents of deterioration that affect museum collections materials; these are listed in rough order of importance according to their potential for damage:[31]

- Direct physical forces.
- Thieves and vandals.
- Fire.
- Water.
- Pests.
- Pollutants.
- Light, ultraviolet, and infrared radiation.
- Incorrect temperature.
- Incorrect relative humidity; and,
- Custodial Neglect and Disassociation.

The collections of the Nakashima Family House are vulnerable to one or more of these agents to varying degrees. Certain objects may be affected by inherent vice, where materials suffer from natural deterioration due to their composition or from their method of manufacture.

Table 3.1 provides a general overview to the Nakashima Family House collection vulnerabilities.

[31] The Canadian Conservation Institute website (https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html) provides excellent information about each of these agents, their interaction and options for detecting and treating the damage that they cause.

Table 3.1 Nakashima Family House Collections Potential Vulnerabilities to the 10 Agents

● : high vulnerability ◑ : medium vulnerability ○ : vulnerable : negligeable vulnerability

Collection Types (quantities)	Higher Risk ← Direct physical Forces	Thieves & Vandals	Fire	Water	Pests	Pollutants & Contaminants	Light, UV & IR Radiation	Incorrect Temperature	Incorrect Relative Humidity	Custodial Neglect & Disassociation → Lower Risk
Arms and armor/weapons (1-100)	◑	●	●	●	○ D	◑ D	○ D	○ D	◑	●
Baskets (1-100)	◑	●	●	●	●	◑	●	●	●	●
Ceramics/glass (1-100)	●	●	●	●						●
Ethnographic artifacts (1-100)	◑	●	●	●	● D	◑ D	● D	◑ D	●◑	●
Furniture (1-100)	◑	●	●	●	○	○	◑	○	●◑ D	●
Library/Books/Archival materials (101-1000)	●	●	●	●	●	◑ D	●	●	●	●
Metal Objects (1-100)	◑	●	●	●		●			●	●
Paintings (1-100)	◑	●	●	●	○	◑	◑	◑	◑	●
Photographic materials (1-100)	◑	●	●	●	○	◑	●	●	●	●
Sculpture (1-100)	◑	●	●	●	○ D	○ D	○ D	○ D	○ D	●
Textiles and costume (1-100)	◑	◑	●	●	●	●	●	●	●	●
Time based media (film, audio recordings, etc.) (1-100)	◑	●	●	●	○	●	●	●	●	●
Works on Paper (1-100)	◑	●	●	●	●	◑	●	●	●	●
Wood objects (1-100)	◑	●	●	●	◑	◑	◑	◑	●◑	●

D: Depends upon material

While deterioration cannot be completely arrested, it can be slowed through:

- Managing environmental conditions inside a building to eliminate improper levels and extreme fluctuations in relative humidity and temperature.
- Reducing light and radiation damage by:
  - selecting illumination sources that are low in ultraviolet and infrared radiation.
  - using filters to reduce the transmission of these wavelengths from light sources; and
  - limiting intensity and duration of exposure of light-sensitive materials to visible light.
- Reducing the exposure of collections to airborne and contact pollutants by:
  - reducing the entry of external pollutants through building envelopes, and by providing controlled ventilation with filtration.
  - monitoring interior wall surfaces and taking appropriate action when shedding of building fabric and finishes are observed.
  - using vacuum cleaners with HEPA filters for cleaning objects and historic interiors; and,
  - selecting materials for storage and exhibition that do not emit pollutants or react in contact with other materials.
- Providing storage and display techniques that provide support and physical protection for the objects.
- Establishing programs to rotate display of sensitive objects.

Catastrophic damage or loss can be avoided through:

- Security protection and intrusion detection.
- Fire detection and protection.
- Regular building maintenance.
- Preparedness planning for natural and man-made disasters.

Theft and damage from excessive and improper handling can be averted through physical and intellectual controls that include:

- Appropriate housings and storage or exhibit cabinetry.
- Sufficient space for access, handling, and transport.
- Staff training in object handling.
- Professional collections management and curatorial staff.
- Policies and procedures for collections access and use.
- Documentation systems that fully describe the collections holdings and provide location information to improve access and reduce overhandling.

Where object sensitivity is such that even these controls are of limited efficacy, it may be necessary to restrict use or access to an original object and use a reproduction instead.

The Nakashima Family House's collection of artwork, furnishings, books, objects, and family records is a priceless resource. While the individual pieces of artwork and furniture may have monetary value, the assemblage of the materials has intrinsic intangible value to cultural heritage. By itself, the House is an example of George Nakashima's artistic *oeuvre* that illustrates his philosophy of bio-climatic design. As part of the Nakashima Woodworker's Complex, the House and its contents provide insight to the Nakashima family's multigenerational story of resilience, artistic endeavor, and success.

COLLECTIONS ENVIRONMENT

As noted in Part 2, buildings provide the first line of protection for collections materials from exterior ambient conditions (temperature, relative humidity, sunlight, rain, and wind) and some protection against pollutant and vermin entry. Exterior ambient conditions can accelerate the deterioration of buildings. It also can influence the performance of buildings and their systems with respect to moderating the interior conditions that may be desired for the collections.

Relative Humidity and Temperature
Temperature and relative humidity are two of several interrelated environmental factors that can cause significant damage or deterioration to cultural heritage collections. The other factors are light, pollutants, and pests and will be addressed separately.

Control over relative humidity, rather than control of temperature, is usually of greater concern for heritage collections. However, improper temperature, generally temperature that is extremely high, can cause direct and indirect damage to some types of materials. High temperature can melt waxes and soften adhesives and varnishes. Conservation research has documented accelerated chemical decay of cellulosic materials such paper and textiles at temperatures above 68°F, with exponential rate of acceleration for each 9°F higher. Some materials, such as paintings on canvas and plastics, become brittle when cold.

Relative humidity is the percentage of water vapor contained within a specific volume of air at a specific temperature. Warm air can hold more water vapor than cold air. In a closed volume of air (a tightly sealed exhibition case, for example), when the temperature of the air inside rises and falls, the total amount of water vapor in the case will not change, but the relative humidity will change in response to the temperature change. If an object in the case is made of wood or some other hygroscopic material, the object will absorb or desorb water vapor from the air in response to the change in relative humidity in the case, causing a dimensional change in the object.

High relative humidity can accelerate mold, mildew, and bacterial growth on both organic and inorganic materials, and can cause hydrolysis of paper, leather, and other organic materials; moisture vapor also enables corrosion of metals and can solubilize salts in archaeological materials. Too little water vapor can cause desiccation and embrittlement, loss of strength and loss of material integrity in objects made of textiles, paper, wood, leather, and other organic materials.

Fluctuations in temperature and relative humidity create strain-induced stresses in the materials of museum objects; when the stresses are too great for the material, mechanical damage occurs releasing the strain. This is seen in the cracking of wooden objects and delamination of paint films.

George Nakashima built the Nakashima Family House as a home for his family, incorporating bioclimatic design features to provide human comfort. These include orientation of the House, operable windows and doors to provide cross ventilation, and the use of traditional Japanese window coverings, *shoji*, for privacy and solar shading.

At the present time, the House has an oil-fired boiler for heating (installed sometime after 1952), but no central air conditioning or dehumidification. At the time of the site visit, a window air conditioning unit was observed in the Living Room but reportedly was used only when the last occupant resided in the House. Instead, windows and doors are opened to provide cross-ventilation on hot days for occupant comfort.

Part 2 provides preliminary guidance regarding relative humidity and temperature control in the House based upon the anticipated hygrothermal performance of the building envelopes and what can be expected as a reasonable and achievable level of interior environmental management and control without compromising the historic building fabric.

As noted in Part 2, Preliminary Assessment of Potential Environmental Performance, ASHRAE Class C control, adapted for the Nakashima Family House, is recommended, and can be anticipated to provide the following benefits and risks to the collections:

- *Mold germination and growth, and rapid corrosion avoided.*
- *Tiny risk of mechanical damage to many artifacts and most books; moderate risk to most paintings, most photographs, some artifacts, some books; high risk to high-vulnerability artifacts.*
- *Even greater care is needed than provided in [Class] B when handling objects made with flexible paints and plastics that become brittle when cold, such as paintings on canvas.*
- *Chemically unstable objects deteriorate significantly within decades at 68°F, twice as fast each 9°F higher. Conversely, cool winter season can extend their life.*

Table 3.2 lists the collection types identified in the pre-site visit questionnaire, and the risks and benefits to each of these materials from Class C control.

Table 3.2 Risks and Benefits to the Nakashima Family House collections from ASHRAE Class C control

Collection Types (quantities)	**Mold avoided**	**Rapid corrosion avoided**	**Tiny risk of mechanical damage**	**Moderate risk of mechanical damage**	**High Risk to high-vulnerability objects**	**Embrittlement when cold**	**Chemical deterioration at high temperatures**
Arms and armor/weapons (1-100)	✓	✓	✓				
Baskets (1-100)	✓		✓				
Ceramics/glass (1-100)	✓	✓					
Ethnographic artifacts (1-100)	✓		✓				
Furniture (1 – 100)	✓		✓**				
Library/Books/Archival materials (101-1000)	✓			✓			✓
Metal objects (1-100)		✓					
Paintings (1-100)	✓			✓		✓	
Photographic materials (1-100)	✓	✓		✓		✓	✓
Sculpture (1-100)	✓	✓	✓**				
Textiles & costume (1-100)	✓	✓				✓	✓

Collection Types (quantities)	Mold avoided	Rapid corrosion avoided	Tiny risk of mechanical damage	Moderate risk of mechanical damage	High Risk to high-vulnerability objects	Embrittlement when cold	Chemical deterioration at high temperatures
Time based media (film, audio recordings, etc.) (1-100)	✓				✓	✓	✓
Works on Paper (1-100)	✓			✓		✓	✓
Wood objects (1-100)	✓		✓**				

** Because many of the wooden objects have been located in the House, it is anticipated that they have been exposed to extreme seasonal or annual fluctuations in relative humidity and temperature. This exposure has likely caused mechanical strain and in certain cases may have caused damage. Objects that have already experienced maximum mechanical strain can be considered "proofed"; consequently, further environmental fluctuations to the same degree have a very low risk of further damage unless they have been repaired.[32]

Reviewing this alignment of the collections with the Class C benefits/risks is instructive on several counts.

- High-vulnerability materials, such as film and sound recordings and paper-based materials, that are at risk of increased chemical decay should be relocated to cool or cold storage in order to extend their lives.
- Photographic materials displayed in the House should be replaced with reproductions and the originals placed in cool or cold storage for long-term preservation and research purposes. Replacing these materials with reproductions will also protect the originals from additional cumulative and irreversible light damage.
- Most wooden, stone, ceramic, glass, and metal objects should fare well in Class C conditions.
- Although paintings are at moderate risk of mechanical damage from Class C conditions, these risks can be mitigated through careful handling during the winter. Reframing paintings inside of microclimate enclosures can also help to reduce the risk to paintings.

Finally, while mold germination and rapid corrosion is avoided with Class C control, it should be remembered that mold and corrosion can occur in areas with limited air circulation, such as interiors of furniture, inside of closets, and in the space between the wall and the back of a framed object that hangs on an exterior wall.

At the Nakashima Family House, many framed objects are hung on exterior walls and many objects are stored inside of furniture located on uninsulated exterior walls or in closets with limited roof insulation and uninsulated exterior walls. When furniture or framed objects are placed against or hung on the poorly insulated walls, a microclimate can occur, providing conditions conducive to microorganism growth that can result in damage to both the objects on the wall and historic building fabric.

To reduce the creation of microclimate in these locations:

- Install "bumpers" fabricated of polyethylene foam blocks behind the frames of materials hung on exterior walls. The "bumpers" should be placed in each corner of the frame: small, framed items will require blocks with 3/8" thickness; medium frames will require blocks with ½" thickness. This will help to increase the movement of air behind these materials and reduce the potential for mold germination and growth caused by microclimates.

[32] Michalski, S. *The Ideal Climate, Risk Management, the ASHRAE Chapter, Proofed Fluctuations, and Toward a Full Risk Analysis Model.* https://www.getty.edu/conservation/our_projects/science/climate/paper_michalski.pdf

- Relocate the contents of all furniture built-in to exterior walls and all movable furniture installed against exterior walls.

Heating a building to human thermal comfort conditions (68 - 72°F) during winter when dewpoint temperatures fall below 25°F may desiccate building materials and any hygroscopic collection materials it contains. Maintaining lower temperature during the winter will help reduce the risk of desiccation; it also reduces the rate of chemical deterioration to paper-based materials and can slow pest activity.

Fig. 3.1 NFH Kitchen - Cabinetry on exterior walls can foster microclimates and lead to microorganism growth
Photo credit: Wendy C. Jessup October 2023

Fig. 3.2 NFH Living Room - Framed material hanging on exterior wall
Photo credit: Wendy C. Jessup October 2023

In 2019, the Conservation Center for Art & Historic Artifacts (CCAHA) conducted a *Preservation Needs Assessment*[33] of the Nakashima Foundation Collections. Among other recommendations, the *Preservation Needs Assessment* recommended initiation of an environmental monitoring program.

Continuous monitoring of environmental conditions, 24 hours a day, seven days a week, and year-round using automated dataloggers will provide data about the relative humidity and temperature conditions to which collections are exposed. This is critical for understanding the potential environmental risks to the collections and provides information that can inform decisions about improvements.

The NFP purchased and installed two Testo 160 data loggers with funds from the NEH Preservation Assistance for Smaller Organizations grant and installed in June 2023. With support from the Historical & Archival Records Care (HARC) grant program of the Pennsylvania Historical and Museum Commission (PHMC), the NFP purchased and deployed two more Testo 160 data loggers in November 2023.

The National Trust for Historic Preservation Favrot Fund and a Keystone Preservation Planning Grant from the Pennsylvania Historic and Museums Commission have funded preparation of an *Environmental Monitoring Report* for the Nakashima House by building assessor, Michael Henry, as part of the Foundation's overall preservation planning efforts. The *Report*, to be completed in 2024, will include analysis of twelve months of collected environmental monitoring data and suggest strategies for environmental management in the Nakashima Family House.

Recommendations for temperature and relative humidity and environmental monitoring include:

Immediate Implementation

- Follow recommendations made in Part 2 for managing the interior environment.

[33] Funded by the William Penn Foundation.

- Follow recommendations made in Part 2 for the environmental monitoring program.

Near-term implementation
- Relocate archival materials currently stored in the House to a location with environmental management.
- Remove contents from all furniture and place in storage.
- Initiate a program to replace photographic materials and works on paper on display with high-quality reproductions and place the originals in storage.
- Install "bumpers" fabricated of polyethylene foam blocks behind the frames of materials hung on exterior walls. The "bumpers" should be placed in each corner of the frame: small, framed items will require blocks with 3/8" thickness; medium frames will require blocks with ½" thickness. This will help to increase the movement of air behind these materials and reduce the potential for mold germination and growth caused by microclimates.

On-Going
- Lower wintertime temperature in the House according to recommendations found in Part 2.

Illumination and light control
Light is the portion of the electromagnetic spectrum perceptible by the human eye. However, all light sources provide radiation in areas of the spectrum, such as infrared (IR) and ultraviolet (UV), which are not needed for sight. Infrared radiation can heat objects and surfaces, raise the surrounding air temperature, and consequentially lower RH. UV radiation is very energetic and can damage many types of materials. Therefore, to protect collections, these portions of the light spectrum must be eliminated to the extent practical.

Visible light can damage museum objects even when filtered for UV and IR, and this damage is cumulative and permanent. The rate of damage is a function of the intensity and the duration of the exposure and there is no threshold beneath which light damage does not occur. Therefore, it is necessary to limit light intensity and duration of exposure to light-sensitive materials.

For historic house museums, natural light is an important illumination source because it provides ambience associated with the period of occupation. When a house museum is situated in an historic landscape or the landscape is an important part of the overall aesthetic, as with the Nakashima Family House, views through the windows may be a significant part of the visitor experience and interpretation. This may limit the extent to which natural light may be reduced or filtered at the window.

However, natural light is also rich in ultraviolet and infrared radiation, which can cause deterioration to the historic interiors. Consequently, a balance must be sought to accommodate the visitors' needs to see the interiors and maintain contact with the context, while providing protection for light-sensitive objects. Typically, this can be accomplished only through careful manipulation of the visitor's perception and natural light using window coverings (draperies, blinds, and the like), the installation of light reduction and ultraviolet radiation reduction materials, and use of artificial light sources including historical fixtures and sensitively installed modern fixtures. In addition, many sites implement opening and closing protocols so that all artificial illumination sources are turned off and window treatments are closed to exclude natural light when the site is closed to the public. This will help to greatly reduce the total exposure of light sensitive materials.

At the Nakashima Family House, the use of operable traditional Japanese *shoji* window coverings are important components of George Nakashima's aesthetic and bioclimatic design philosophy. The *shoji* filter daylight and create ambiance for the interior and their operation provides views of the surrounding landscape. Daylight is augmented as needed through the use of incandescent lamps in domestic lighting fixtures.

None of the windows have ultraviolet filters. While the *shoji* help to moderate the overall amount of daylight entering the interiors, damagingly high illumination and UV levels were recorded[34] on furnishings located directly beneath south facing windows. Light damage was observed on the furnishings in these locations.

Figs. 3.3(L) and 3.4(R) NFH interior: *shoji* moderating daylight entry through windows on south elevation.
Photo credit: Wendy C. Jessup (L); Gianna Puzzo (R) October 2023

Fig. 3.5 NFH Living Room: light exposure damage to furniture adjacent to south-facing window.
Photo credit: Wendy C. Jessup October 2023

Fig. 3.6 NFH South Bedroom: Light damage to desk and plastic cover on toy vehicle
Photo credit: Wendy C. Jessup October 2023

Fig. 3.7 NFH South Bedroom: ELSEC with high UV radiation readings (610 µW/Lumen)
Photo credit: Wendy C. Jessup October 2023

UV filtering media should be installed on all windows to protect the interiors and objects. UV filters are available in solid acrylic sheet form, applied film, roller shades, and as laminated glass panels.

There are benefits and drawback to each type of filtering media:

- UV filtering film can be difficult to apply, will degrade over time especially if installed on an exterior panel where it is exposed to the weather, and should never be applied to historic glass because it is hard to reverse and inhibits regular cleaning.
- Acrylic panels expand and contract in response to temperature.
- Roller shades can be removed easily, and care must be taken to ensure that they are fully pulled down to cover the window; and,
- Laminated glass panels can be heavy.

[34] UV and illumination levels were recorded using an ELSEC 764 handheld environmental monitoring device.

Seek guidance from a preservation architect in selection of the appropriate application for each of the windows in the Nakashima Family House. As there are many window types, a different solution may be required for each window. Nevertheless, all filters must meet the following performance criteria: *transmission curve normalized at 500 nanometers with less than 11% transmission at 320 and 350 nanometers and less than 50% transmission at 400 nanometers.* Many filters are available that meet this criteria.

Since the Nakashima Family House was designed to allow for cross ventilation through opening doors and windows, full exclusion of UV will be impossible and additional strategies for protecting UV-sensitive materials will need to be employed if a natural ventilation strategy is used in the future. The strategies include:

- Replacing the glazing on all light sensitive materials, such as photographs, drawings, prints, and textiles with UV filtering glazing that meets the above performance criteria.
- Use of replicas for light-sensitive materials and placing the originals in storage.
- Relocation of light-sensitive materials away from operating windows and doors.

However, these strategies are only applicable to movable artwork and furniture. Thus, to reduce total exposure of UV and light exposure, UV filtration on all windows and doors as well as strict adherence to ensuring that all *shoji* panels are closed, and all artificial light sources are extinguished except when staff is working or visitors are in the House is strongly encouraged. Closing or adjusting the *shoji* during peak daylight hours will also help to reduce overall UV and light exposure to sensitive interior materials.

The *Environmental Monitoring Report* may include recommendations for winterization of the House, including blocking of light in the House when it is closed to the public.

As noted in Part 2, Fire Prevention, Detection & Protection, the condition of the electrical wiring and circuitry in the House is indeterminate and suspect and needs to be evaluated.

Observations of light damage and exposure during the site visit included:

- Color shift in family photographs attached to the refrigerator in the kitchen and in framed photographs in the hallway between the kitchen and the bedrooms.
- Fading of wooden furniture and building elements adjacent to the south-facing windows.

Recommendations with respect to protecting the collections from light damage include:

Immediate Implementation:

- Establish opening and closing protocols to protect light sensitive materials from light exposure when the staff is not working in the House and the House is closed to the public.
- Follow recommendations from Part 2 concerning evaluation of the electrical service.

Near-term Implementation:

- Install UV glazing on all light-sensitive framed materials that are adjacent to windows and doors that are operated for cross-ventilation.
- Consult with a preservation architect to develop options for installing UV filtering media on all windows; and,
- Implement selected option(s).

On-going:

- Implement opening and closing protocols to limit exposure of light-sensitive materials when the House is closed to the public.
- Budget for repair and replacement of *shoji*.

Pollutants and Contaminants

Pollutants can cause significant damage to collection objects. These contaminants can be naturally occurring or come from anthropogenic sources and are generally categorized into three groups: airborne pollutants; contact pollutants; and intrinsic pollutants.

Airborne pollutants include particulates, aerosols, and gases that come from external atmospheric sources such as automotive and industrial exhausts, agricultural activities, pollen, and soil erosion and can enter a building through gaps in the building envelope and whenever windows or doors are opened. Airborne pollutants also can come from internal sources, such as materials in exhibit cases and furnishings; housekeeping activities; food preparation; smoking and vaping; deteriorating interior finishes; malfunctioning or improperly maintained mechanical equipment; people; and emissions from the collections objects themselves.

Examples of damage caused by airborne pollutants include the corrosion of metals by acetic acid, sulfur dioxide, hydrogen sulfide, and oxides of nitrogen; and fading of pigments and degradation of organic materials by ozone. In addition to mechanical damage such as abrasion and soiling, organic particulates can become the nutrients for pests, and the substrate for germination of mold. In the presence of elevated moisture, organic particulates may contribute to chemical deterioration of collections materials.

Contact pollutants cause damage through transfer of a pollutant from one object to another at the point of contact. Examples of contact pollutant damage include staining and/or corrosion that can occur when incompatible materials are placed in contact with each other on display or in storage; residues that can be deposited on the collection material as a deterioration by-product generated by unstable housings; skin oils that cause corrosion or stain materials that are handled without appropriate protective gloves; or through residues of cleaning agents or treatment compounds.

Intrinsic pollutants, also called *"secondary pollutants,"* are generated through the deterioration of components of the objects themselves. These materials are inherently unstable, and the compounds generated by their decay can accelerate deterioration processes caused by other pollutants, water vapor, or oxygen. Cellulose nitrate and cellulose acetate film materials are prime examples of unstable objects that can generate intrinsic pollutants, which in turn, can increase the rate of auto-deterioration and/or cause deterioration of other materials nearby.

The Pennsylvania Department of Environmental Protection (DEP) has an extensive air quality monitoring program[35] and conducts ambient air quality monitoring for wide range of pollutants including ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter, including total suspended particulates (TSP), particulate matter with less than 10 micrometers (PM10), sulfates and nitrates, and fine particulates (PM2.5). The location of monitoring sites for Bucks County could not be found on the DEP website[36], however air quality monitoring reports for southeastern Pennsylvania indicates that the concentration of ozone, carbon monoxide, PM2.5, and sulfur dioxide are well below the air quality standards established by the US Environmental Protection Agency (EPA). It can be presumed that the air quality at the Nakashima Family House is also well below the State and EPA standards.

[35] https://www.dep.pa.gov/Business/Air/BAQ/MonitoringTopics/AirQualityIndex/Pages/default.aspx#

[36] The closest monitoring station for the EPA is located in Doylestown, PA, roughly 10 miles southwest of New Hope.

Observations and issues with pollutants and contaminants at the Nakashima Family House include the following:

- The traditional Japanese practice of removing shoes upon entering helps to reduce particulates from entering the House on footgear.
- Most fine art prints appear to have been matted in high-quality archival materials.
- Family photographs and artwork are framed in acidic materials and exhibit mat burn.
- Rehousing of documents and family archives into high-quality archival housings is in process.
- Objects of dissimilar materials are placed on top of each other. Placing books, paper-based materials, metals, and textiles directly on wooden surfaces increases the potential for contact corrosion.
- Particulates from outside sources such as the gravel walkways and driveways, and from landscaping operations (e.g., mowing, leaf blowing), and pollutants from gas-powered machinery and vehicles can enter the House when the windows and doors are opened for ventilation.

Fig. 3.8 NFH – Acidic backboard on photograph of George Nakashima
Photo credit: Wendy C. Jessup October 2023

Fig. 3.9 NFH – Mat burn on Happy Birthday drawing by family member.
Photo credit: Wendy C. Jessup October 2023

Fig. 3.10 NFH – Documents in non-archival housings.
Photo credits: Wendy C. Jessup October 2023

Fig 3.11 NFH – Rehoused documents
Photo credit: Wendy C. Jessup October 2023

Recommendations with respect to protecting the collections from pollutants and contaminants include:

Immediate Implementation:

- Initiate a program to ensure that windows and doors opened for ventilation are closed when landscaping activities are performed in close proximity to the House.

Near-term Implementation:

- Develop a formal *Housekeeping Plan* that provides instructions for cleaning each space in the House. (See Collections Stewardship: Policies and Procedures for more information.)
- Purchase a HEPA filter vacuum for cleaning in the House.

- Initiate a program to place Mylar® as a barrier between all dissimilar materials throughout the House. The Mylar® can be cut to the footprint of each artifact so that it will not be seen by visitors.

Mid-term Implementation
- Complete reframing of the paper-based materials in acid-free materials.

On-going:
- Continue existing protocols to remove shoes upon entering the House.
- Continue rehousing documents into archival materials.
- Set and maintain a schedule for curatorial housekeeping.

Pest Management
Museum collections are at risk from attack by insects, vertebrates (rodents, birds, etc.), or microbiological deterioration from mold or fungi. Pests may enter a building through unsealed entry points in the building envelope or via infested materials that may be brought into the building. Acquired objects, objects on loan, food products, collections processing materials, wood or wood products, and plants may all introduce and support pests. Live plants and fresh flowers can introduce insect pests and support microbiological growth.

Pests seek food, moisture, and nesting locations once they have entered a space, and organic materials are attractive sources. The resulting deterioration can result in extensive and permanent damage or loss of collection objects.

The pre-site visit questionnaire identified mice and clothes moths in the House and that a pest control operator is contracted for services including termite inspections. Although the House has a kitchen, its use for food preparation and consumption has been discontinued.

The following observations associated with pests and pest management were made during the site visit:
- The House has an extreme infestation of clothes moths. Webbing, larval casings and damage was observed on wool and silk garments, hats, and other materials stored in closets.
- Sticky traps baited with clothes moth pheromone are deployed throughout the House.
- Close examination of a pheromone baited sticky trap revealed numerous moths as well as frass (insect excreta) and cast larval skins (exoskeletons that are shed as the larva grows) of some type of carpet beetle that had attacked insects stuck on the trap. The trap also had evidence of mouse chewing. Like clothes moths, carpet beetles are pests of proteinaceous materials.
- Wool rugs in the living room and the south bedroom exhibited evidence of infestation with frass and detached fibers.

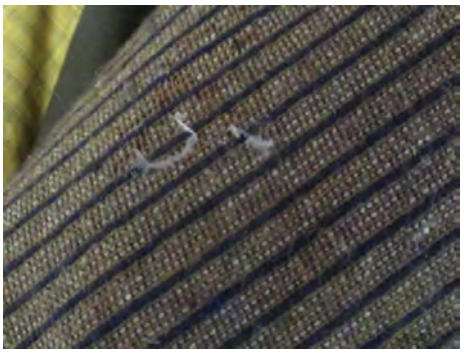

Fig. 3.12 NFH south bedroom: Clothes moth webbing from garment in closet
Photo credit: Wendy C. Jessup October 2023

Fig.3.13 NFH south bedroom: clothes moth webbing and larval casings on wool garment
Photo credit: Wendy C. Jessup October 2023

Fig. 3.14 NFH – Pheromone baited sticky trap with moths. Under magnification, the large brown sections reveal carpet beetle frass and associated cast larval skins. Note rodent chew damage in lower left corner.
Photo credit: Wendy C. Jessup October 2023

Fig. 3.15 NFH – Pheromone baited sticky trap with moths.
Photo credit: Wendy C. Jessup October 2023

Fig. 3.16 NFH Living Room: rug with moth damage
Photo credit: Gianna Puzzo October 2023

Fig.3.13 NFH office bedroom: suspected silverfish damage to Mira Nakashima mural
Photo credit: Wendy C. Jessup October 2023

- Insect damage was observed on the Mira Nakashima mural in the Office Bedroom. The pattern of damage is characteristic of silverfish activity. The mural appears to be painted on some sort of sized cotton. Silverfish feed on starches and attack the adhesives and sizing of wallpapers.
- Dichlorvos strips were observed hanging from the ceiling in the Living Room. Dichlorvos[37], is an organophosphate insecticide marketed to kill flying insects in garages, attics, and sheds as long as they are not occupied by people for more than 4 hours per day. These were removed and disposed of during the site visit.
- Spider webs were observed in closets, at windows, and beneath furniture.

Fig. 3.14 NFH – Dichlorvos strip hanging in the living room
Photo credit: Wendy C. Jessup October 2023

Fig. 3.15 NFH – Spiderweb at top of bedroom closet
Photo credit: Wendy C. Jessup October 2023

- Screens have been installed on many of the windows and doors of the House. All doors and windows operated for ventilation should be fitted with screens.
- In ground termite bait/termite monitoring stations have been deployed around the perimeter of the house.
- Vegetation abuts the exterior of the House providing harborage, nesting, and nutrient sources for a wide range of organisms. The vegetation around the House is likely to contribute to issues associated with source moisture control and building deterioration, which can in turn, increase the potential for generation of mold and other types of damage to the collections inside the building.

Fig. 3.16 NFH Exterior: gravel strip at front of House.
Note: blue termite monitoring/bait station.
Photo credits: Wendy C. Jessup October 2023

Fig. 3.17 NFH Exterior – vegetation growing on House.
Photo credit: Wendy C. Jessup October 2023

[37] Dichlorvos is also called 2,2-dichlorovinyl dimethyl phosphate or DDVP.

Fig. 3.18 NFH Exterior vegetation abutting the House.
Photo credit: Michael C. Henry October 2023

Fig. 3.19 NFH Exterior west panel with woodpecker damage.
Photo credits: Wendy C. Jessup October 2023

- Woodpecker evidence was observed on the west panel of the House exterior. Woodpeckers will often attack wood containing carpenter bee nurseries.

As the George Nakashima Family House is located in a rural area, a background population of insects and vertebrates can be expected. However, the severity of the clothes moth infestation in the House indicates that it has been ongoing for a considerable amount of time. Damage to vulnerable materials in the House will continue until the infestation is addressed.

Addressing the infestation will require a concerted program that combines isolating infested materials, monitoring, housekeeping, elimination of the nutrient sources, and eradication treatment. This effort will take time and may not completely eliminate the problem or keep it from recurring.

Isolate infested materials:
Action needs to be taken to isolate infested materials until they are determined to be included in the collection. Place each infested item inside a tightly sealed plastic bag. Once isolated, the items can be held in the House until they receive treatment. Place bagged items inside of plastic bins that can easily be moved to facilitate housekeeping.

Dispose of items that are either too badly damaged, such as the rugs, or have been determined to be outside the scope of the collection.

Monitor:
Continue monitoring for pests using pheromone traps, regular sticky traps and inspections. Create a floorplan of the House and mark it with locations of the traps. Inspect all traps weekly and document the numbers and types of insects. Replace the traps according to manufacturers' instructions or when completely full. As evidenced by the frass and larval skins noted in Fig. 3.14, carcasses of insects can become nutrient sources for other types of pests.

Inspect all windowsills and light fixtures monthly, document observations, and remove insect carcasses and spiderwebs.

Housekeeping:
Clothes moths are photophobic and prefer dark undisturbed locations such as closets, inside folds of garments, and interstitial building spaces. They feed on proteinaceous organic matter and often attack wool, silk, and fur or cellulosic materials that have been contaminated by food, blood, sweat, or other human effluents. Nutrient