Conservation Management Plan

GROPIUS HOUSE

68 Baker Bridge Road
Lincoln, Massachusetts

Historic New England
Baseline Report: 2016

Table of Contents

Note: Historic New Englandôs Gropius House conservation management plan typically exists as a series of documents. This table of contents identifies the documents that make up the plan by section and not by page number. Each section is paginated separately.

Additional Resources

Gropius House Conservation Management Plan – Executive Summary

The goal of the project was to create a comprehensive conservation management plan (CMP) for the property that includes all three contributing resourcesð house, garage, and landscape. This plan catalogues individual features, outlines the past treatment of these features physically and philosophically, and includes relevant historical and interpretive information to help Historic New England make appropriate management decisions. The CMP was created with support from the Keeping It Modern grant program through the Getty Foundation.

Historic New England believes that the most effective and successful management plans are those that contain all of the important decision-making elements in a single location, and are structured in a manner that matches the organizationôs use of the data for project planning and review. Flexibility is key - unlike traditional bound documents that sit on a bookshelf, the plans must be easy to expand and update, and can begin with as little or as much information as is currently available.

The plan consists of a series of editable documents stored in a specific section of the organizationôs network server. Designated staff will be given read/write access to the digital repository so that the documents can be kept up-to-date as projects take place, conditions change, or new information is learned. When a comprehensive stand-alone report is required, one can be generated by merging the various documents and saving in PDF format. For archival purposes, Historic New England will merge the appropriate documents into a single report at least once every five years.

The Gropius House Conservation Management Plan includes the following sections:

- Brief History of the Gropius Property: Focusing on Walter Gropius and the construction of his home.
- Statements of Significance: An internal Historic New England task force identifies statements of significance for the property in 1996. These were updated by that task force in 2016.
- Vision Statement: An internal task force at Historic New England determines how properties are presented to the public and creates a Vision Statement that sets the interpretive goals and outlining the overall conservation approach. The first statement for the Gropius House was developed in 2000 and was updated by the task force in 2016.
- Historic New England Preservation Philosophy: A short document outlining the traditional philosophical approach taken towards the conservation of the historic properties with notes developed specific to the Conservation Master Plan.
- Ati Johanssonôs Basic Design Philosophy for the Gropius House: a document created by Ati Johansson, Walter Gropiusô daughter, in 2000 to help guide the preservation and maintenance of the interiors and furnishings by providing core design principles.
- Designations: A list of designations that have been awarded the property.
- Restrictions: A listing of restrictions that may be active upon the property.
- Additional Research: Questions that arose during the course of the 2016 Conservation Management Plan project that could not be answered in the time or resources available were identified in this section.

- Maintenance and Repair Approval Plan: A document that identifies the levels of approvals necessary for different preservation and maintenance protocols as identified in the feature catalogue.
- Landscape Maintenance Plan: A single document synthesizing the maintenance needs in the landscape.
- Annual Maintenance Calendar: A simple chart with the basic maintenance protocol identified by month.
- Preservation Priority Plan: A listing of the top projects identified both by outside consultants and Historic New England staff through the course of developing the CMP.
- Catalogue of individual features: The core component of the conservation management plan is a feature-by-feature inventory of the Gropius House containing all the pertinent information Historic New England reviews as part of any planning process. The macro approach will look at the features using the categories identified in the Historic New England standard conditions assessment documents (roof, chimney, cladding, windows). Any feature that has been the subject of study or treatment will be given an additional unique entry (within reason). Each entry will include the following:
    - Name of the feature,
    - Historical images from 1938 and during the interpretive period (if available),
    - Contemporary image,
    - History and construction details (if available). This includes excerpts from building specifications, drawings, and other resources.
    - Character-defining details from the interpretive period,
    - Details on how the vision statement affects the treatment,
    - History of conservation and maintenance practices,
    - Analysis of past conservation protocols (if possible),
    - Recommended maintenance and conservation protocols for future work,
    - Special considerations as appropriate (longer-term cyclical conservation efforts, estimates on material life span, etc.), and
    - Additional information that supports the ongoing care of the features.

Additional Resources: The following additional resources are included with the full version of the report.

- Historic New Englandõs Preservation Philosophy
- Original Plans for the Gropius House from 1938
- Existing Conditions plans developed in 2016
- Historic Designations
- Window and door schedules
- Site conditions assessments
- Tree Assessment
- Environmental monitoring & assessments
- Conservation Report for Glass Block, Acoustic Plaster, and Exterior Siding developed in 2016.

THE GROPIUS HOUSE: A Brief History

The history of the hill where Gropius built his house began long before the arrival of the famous architect. European settlement followed Native American occupation of the region, and agricultural tradition is very strong on the site. Gropius considered the latter characteristic important, and he retained preexisting features such as the traditional stonewalls and apple orchard. However, the interpretive focus for the property is on Gropiusôs interventions. The following is a short summary of Walter Gropiusôs professional life and the construction of his house in Lincoln, Massachusetts.

Walter Gropius founded the Bauhaus School in 1919 in the belief that architecture had become too academic and disconnected from the communities it served. He and his colleagues rejected many long-held conventions of design, such as ornamentation and symmetry. Gropius asserted that ornamentation was superficial and held the architect back from developing new ideas, and that symmetry often forced a building into an impractical form. In contrast, the shapes of Gropiusôs structures were intended to display the rhythmic logic of their designs. He considered the incorporation of new technology important in his work, and argued that it enabled the modern designer to create buildings with a pleasant sense of lightness. He preferred to use standardized materials, because he believed that modern machines provided architects with the opportunity to think less about the burdens of labor and more about what they needed and wanted from a building. The use of machine-made products also brought architects together with craftsmen and industrialists. This was central to Gropiusôs Bauhaus vision, which included the creation of community in a field which he felt had become elitist. While the Bauhaus School was closed in 1928, its legacy had an extraordinary impact on modern architecture of the twentieth century.

By 1937 the dean of Harvardôs School of Design responded to these modern movements by seeking to revitalize architectural teaching at the university. He offered Gropius a faculty position at the School of Design, and Gropius accepted on the condition that he would be allowed to form an architectural practice in the area. The timing was excellent for Gropius and his family, who were living in London as the Nazis rose to power in Germany. In order to get the German governmentôs permission to retrieve his belongings from Berlin, Nazi Minister of Propaganda Joseph Goebbels had to be persuaded that a German presence at Harvard was beneficial for the country. After Goebbels agreed to let Gropius move without negative press, despite his strong dislike for the architect, Gropius brought his Bauhaus furniture to the Boston area along with his wife Ise and his daughter Ati.

While colleagues suggested that Gropius find a home among the historic buildings of areas such as Beacon Hill, he and his family preferred the landscape and history of the countryside and sought to avoid the darkness and narrowness of old buildings. After short-term rentals on Cape Cod and a country lake, one of Gropiusôs architect friends connected him with Helen Storrow, a prominent philanthropist with landholdings in Lincoln, Mass. Mrs. Storrow believed in giving immigrants a chance to display the trends and tastes of their own culture. Mrs. Storrow agreed to finance the construction of a house designed by Gropius for himself and his family. Gropius chose from the areas of her estate the site upon which the Gropius House sits today, which he preferred for its hill with excellent views as well as its proximity to the historic and beautiful Walden Pond. The Gropiuses traveled around New England before the houseôs construction in order to familiarize themselves with the traditional architecture of the region. This research formed the basis for the design of a house that helped bring the Bauhaus style to America while simultaneously reflecting the surrounding areaôs traditions.

Information on the Bauhaus School was taken from Walter Gropiusôs 1923 article ñThe Theory and Organization of the Bauhaus,ò which was first published in German in *Bauhausverlag*. Details concerning Gropiusôs invitation from the School of Design and the development of the Gropius House come from Ise Gropiusôs 1977 work entitled ñGropius House: A History.ò

<u>Gropius House – Statements of Significance</u>

Historic New Englandôs internal interpretation group, the Proactive Preservation, Interpretation, and Planning task force, develops the statements of significance for the properties. This group reviewed and updated the statements of significance in 2016.

<u>Architectural Significance:</u>

- Significant for its association with the architect Walter Gropius (1883-1969) and for presenting an outstanding and influential example of Modern architectural design.
- House was clearly inspired by the principles of the Bauhaus movement that Gropius helped establish. These principles can be summarized as: the incorporation of a sense of volume rather than solidity; the use of regularity as opposed to symmetry; and the achievement of detail through technical perfection, fine proportions, and the intrinsic elegance of materials instead of applied ornament.[1]
- The house was designed for Gropiusôs family using traditional New England materials.

<u>Collections Significance:</u>

- Number of objects: 1670
- Most important collection of Bauhaus furnishings outside of Germany.
- Furniture designed by Marcel Breuer and made for the Gropiusôs in the Bauhaus workshops. Additional furniture by Sori Yanagi, Eero Saarinen, and the hand crafted wooden desk designed by Walter Gropius for his office in the Weimar Bauhaus in 1923. Art by Herbert Bayer, Henry Moore, and Laszlo Moholy-Nagy.
- Gropiusôs intent for the interior was to incorporate the Bauhaus-designed furniture that the Gropius family brought from Germany.

<u>Landscape Significance:</u>

- The landscape was designed by Walter Gropius to function for the welfare of the propertyôs inhabitants. Immediately outside the house, it was organized by interconnecting geometric shapes at various degrees of connection and transparency. The views and the links between the indoor and outdoor spaces were vital.
- The use of pre-made, economical building materials such as the lolly column posts and vernacular plants were representative of Gropiusô Modern ideals.
- The orchard pre-dated Gropiusôs development of the property, and was retained because it was evocative of the New England landscape.
- The property contributes to the Woods End Road National Register Historic District, which is a complex of significant Modern houses.

<u>Archaeological Significance:</u>

- There are three pre-historic sites within a mile of the historic district. With limited known construction having taken place in the area, the probability is high that prehistoric sites exist on the property. There is also high probability that the remnants of 18th-20th century agricultural features could be found.

---

[1] Henry Russell Hitchcock, Jr. and Phillip Johnson, *The International Style*, 1932, 13. As cited by 2001 NHL nomination, 15.

PPIP Vision Statements: Gropius House
Original 2000; reviewed and updated 2016

Historic New Englandôs internal interpretation group, the Proactive Preservation, Interpretation, and Planning task force, develops the vision for how a property will be presented to the public and monitors to ensure that there is an overall consistency to the approach from all the teams within the organization. This group developed a draft vision for the property in 2000. In 2016, the vision statements for the property were updated.

Overall
The Gropius House illustrates the Bauhaus philosophy and the concepts propagated by its owners and builders, Walter and Ise Gropius. The principles of the Bauhaus and those of traditional New England design are balanced throughout the property.

> *Period of presentation:* 1965-1969, before W. Gropiusôs death
> *Zone of interpretation:* The east edge of the driveway (see map), and official property boundaries to the south, north, and west

Setting and Landscape
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.

Building Exterior
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropiusôs interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.

Building Interior
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropiusôs life. Furnishing will be arranged according to documentation, and will illustrate a ñmodern house in operation.ò A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.

Archaeology

The Gropius site has not been studied for sub-surface resources. The close proximity of three prehistoric sites indicates a high probability of prehistoric artifacts within the property. There is also a potential for finds relating to 18th through early 20th century agricultural practices. Any project involving ground disturbance should involve an archeologistớs assessment of the locationớs sensitivity.

Historic New England's Preservation Philosophy

If buildings, landscapes, and objects are to convey their full meaning, it is essential that their authenticity be protected and cherished. The patterns of wear, methods of construction, historic materials, and irregularities of age communicate the uses to which these structures have been put and document the changes made to it over time. Because this physical evidence is valuable, and can be exceedingly fragile, Historic New England believes that the collections in its care must be treated in the most conservative manner possible, whenever possible through stabilization and traditional maintenance rather than restoration and reconstruction.

Terms like preservation, stabilization, restoration, and reconstruction are often loosely used in connection with caring for old buildings, but for professionals these terms define actions with specific and distinct meanings. For organizations that own and manage historic museum structures, for example, responsible conservation demands careful and consistent implementation of specific actions to maintain its collections. Historic New England strives to retain all materials as they were when the property came into museum use. When materials must be replaced, either to safeguard the life of the object or building, or because they are beyond repair, the first priority is to replace them with the same kind of material. If in-kind replacement is impossible, the reasons for making a change must be clearly articulated and a treatment protocol developed. All conservation measures are thoroughly documented.

The full statement of Historic New Englandôs philosophy towards preservation can be found at http://www.historicnewengland.org/preservation/copy_of_preservation-philosophy. In brief, the preservation philosophy, as approved by the Board of Trustees in 2008, is to:

- *Research and document the history, evolution, features, materials, integrity and areas of significance of resources prior to undertaking any repair or conservation work. Research should be considered a continuum that serves to direct the overall management approach for resources, and records Historic New England's contribution to their care and maintenance;*
- *Monitor usage to prevent irreparable loss of historic fabric;*
- *Choose maintenance and conservation treatments that reflect a commitment to retaining and preserving historic material;*
- *Recognize and preserve the design and craftsmanship that has uniquely shaped a resource over time;*
- *Disseminate the experiences and information associated with resources to internal and external audiences; and*
- *Follow or exceed nationally-accepted professional standards and guidelines, as appropriate for each discipline, in order to ensure the longevity of resources and maintain a reputation for innovation and the highest quality of work.*

Some key concepts that have been the core of the preservation philosophy since our founder, William Sumner Appleton, established the organization in 1910. These concepts include documentation, in kind replacement, and respecting change over time. The Gropius House has sometimes challenged some of the more traditional approaches used at the other sites. For example, in an effort to retain paint layers and that history of change in a building, layers of paint were left on the building which inevitably led to a cratered/textured surface that offended no one and conveyed a sense of age. That same sense of age is strongly felt by many to be inappropriate on the Gropius House where clean lines and a clean appearance is valued in keeping with Walter Gropiusô design philosophy. During the course of the 2016 Conservation Management Plan (CMP) project staff focused on some of these areas to make sure management in the future could be simplified.

After discussion in 2016 by Historic New Englandős internal interpretive group, the Proactive Preservation, Interpretation, and Planning task force, it was determined that the many of the difficult decisions had been made, whether on purpose or by accident, in the 1990s. On the exterior, after years of discussion the majority of the facades had to be stripped of paint because of the surfaceős inability to hold paint. A question of retaining paint layers for the historical record had been resolved. Recognizing that the exterior of the house is the first impression for the visitor and to set the stage for the interpretation of not just the Gropius House but a whole style of architecture, the following guidelines were developed for the care of the exterior:

- Minor maintenance of finishes and the materials should occur on a regular basis
- Once evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered

These statements allow for minor maintenance and repairs to continue on the exterior features following methodologies familiar to the staff. The CMP then identifies for many of the features when that moment of replacement might arrive.

The interior conservation of the house follows a more traditional approach for house museums focusing on the retention of original materials.

- A balance must be struck between preserving the original finishes and presenting them in the crisp style that they were designed. There is a cascade effect on collections after restoration of wall finishes; if the walls look perfect, patina on the objects will stand out.
- Overall, however, an effort must be made to keep the interior finishes of the Gropius House in good repair so that the simplicity and clean lines fundamental to their design are maintained.

Plenty of room to maneuver within those statements but the underlying intent of both the interior and the exterior is that these decisions to make drastic change are undertaken in conjunction with the interpretive task force.

Supplementary information on the preservation philosophy can be found in the Additional Resources section.

BAUHAUS DESIGN PHILOSOPHY – ATI GROPIUS JOHANSEN

Ati Gropius Johansen (1926-2014), daughter of Walter and Ise Gropius, was in the Boston area with her parents during the construction of the Gropius House. While her influence on the buildingôs design was minor, she was privy to some of her parentsô processes and requested the addition of the spiral stair that stands out on its front façade. Johansen eventually became a childrenôs book illustrator, and she also spent considerable time teaching American and German students about the Bauhaus movement. For these reasons she was an ideal advisor to the Society for the Preservation of New England Antiquities (SPNEA) from the time it acquired the Gropius House. For almost thirty years Johansen was actively involved in the preservation of the property, defining priorities, providing advice on the appropriateness of conservation work, and more. In 2000 she wrote a formal statement about her fatherôs design philosophy so that her expertise would always be available to Historic New England. While no one source of information can ever dictate the preservation philosophy of a building on its own, the ability to speak directly with a propertyôs former inhabitant is a rare and fascinating opportunity for the staff of a house museum. Thus, the following statement should always be considered in preservation efforts at the Gropius House.

GROPIUS HOUSE
Interiors and Furnishings

BASIC DESIGN PHILOSOPHY: An approach to restoration, maintenance and interpretation.

The interiors, furnishings, artworks and personal collection in the Gropius House each equally reflect a unified visual approach, and illustrate the design principles of the modern movement with which Walter Gropius was identified. These principles expressed originally in the workshops of the Bauhaus, continued to inform the Gropius House in all its living aspects and evolving changes over the years of its occupancy. In fact, Gropius continued the same philosophy in his house as in the Bauhaus. He said, ñthe aim of the Bauhaus was not a style, or a system, not a dogma, or a canon, not a prescription or fashion. It will be alive as long as it does not cling to form but seeks the fluidity of life behind all mutable form.ò

In contrast to style, basic design principles were the underlying and guiding force. Some of these are briefly indicated below.

I. Design solutions (forms) were to be evolved out of problem-solving, and expressive of their function, process, or structure.

II. Material - manmade or organic - was to be recognized for its intrinsic characteristics, and its inherent potentials realized to the maximum.

III. The esthetic criterion was to be: directness and eloquence of design solutions (based on the above principles), and their ñeconomy,ò i.e.: the high ratio of psychic effect to effort.

IV. Contemporary technology and contemporary materials were to be vital components in design for contemporary needs.

V. There was to be a consistent and unifying approach to both the indoor and outdoor ôenvironment,ô applicable equally to functional or art elements.

The Gropius House interiors are a realization of these principles. Ongoing changes during the years of occupancy in furnishings, furniture, art and plant material were made in accordance with the philosophy of Walter Gropius. In the design policy that was followed, contrast and oppositional relationships were used as an important device to achieve its esthetic aims.

These were: Contrasts of materials: natural vs. manmade
organic vs. inorganic

Contrasts of forms: geometric vs. free form
angular vs. curved

	flat vs. round
Contrasts of surfaces and textures:	soft, rough vs. smooth, shiny
Contrasts of spacial arrangements:	symmetric vs. asymmetric dense vs. open complex vs. simple
Contrasts of colors	
Contrasts of light and dark	

To express principle II, these distinct differences were emphasized in the selection, placement and maintenance of all the furnishings.

Some illustrations: The living room

Form contrasts:			
Rectilineal elements:	walls, windows fireplace cabinets etc.	vs.	curved glass wall curved furniture (Brever, Saannen Japanese) objects dôart table-settings, etc.
Surface and texture contrasts:			
	carpets, curtains, fabrics, sheepskin	vs.	chrome, steel, glass, linoleum, formica, smooth leather
Contrasts of materials:			
	Indoor and outdoor plant life	vs.	architecture and furniture
	organic objects dôart (the white coral)	vs.	inorganic (the kite)

The hall and bedrooms illustrate other contrasts as well:

light	vs.	dark surfaces
bright, accent colors	vs.	neutral, black or white
pattern	vs.	blankness

The living room shelf of objects dôart, dressing table and study desk area illustrate in their arrangements contrasts of complexity of detail vs. spatial simplicity.

This total ñenvironmental approachò (Ise Gropius on Walter Gropius) meant that every visual form and relationship in the house had significance and was illustrative of a coherent vision. An understanding of this view is altogether essential not only for the correctness of restoration and maintenance, but essential for the total composite effect that shows the spirit of the house.

-Ati Gropius Johansen, 2000

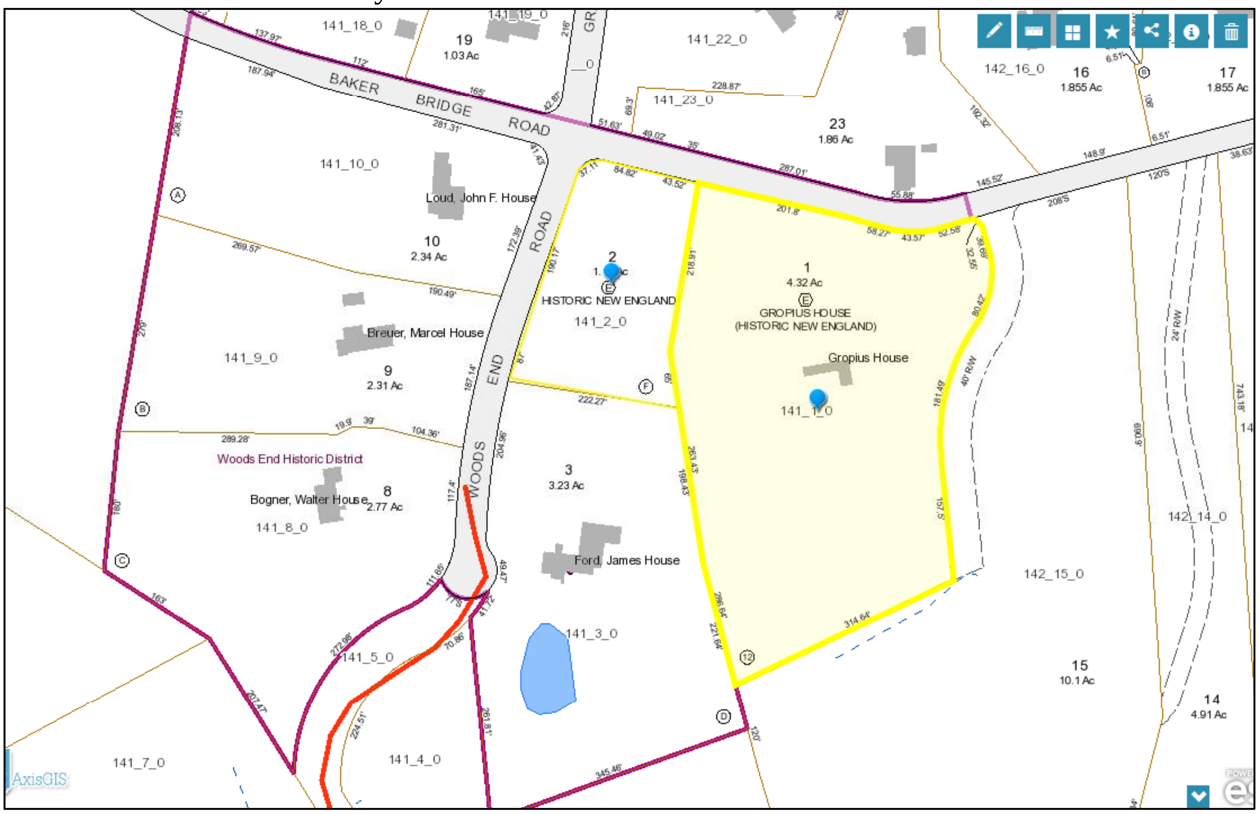
Designations

The following is a list of historic or natural designations for the Gropius House property.

Local

- Baker Bridge Road ï Scenic Road Designation

- Woods End Road Historic District (03/28/1981)
    - State Inventory Number: LIN.13



Woods End Road Historic District in a GIS map on the Town of Lincolnôs website, accessed 10/9/2016. The district is outlined in purple, and the two lots of the Gropius House are highlighted in yellow.

State

- State Inventory Number: LIN.14
    - Significance: Architecture; Art; Invention; Landscape Architecture

National

- Woods End Road National Register Historic District (07/08/1988)

- National Historic Landmark (05/16/2000)
    - Designated as an individual property; ñGropius Houseò
    - A Property that is associated importantly with the lives of persons nationally significant in the history of the United States.
    - A property that embodies the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of

construction, or that represent a significant, distinctive and exceptional entity whose components may lack individual distinction.

- Received Exception 8: Properties that have achieved national significance within the past 50 years
- NHL Themes: IIII. Expressing Cultural Values; 1. Education; 2. Visual Arts; 5. Architecture, Landscape Architecture
- Areas of Significance:
  - Architecture: Modern architecture
  - Landscape Architecture: Modern Landscape Design
- Periods of Significance: 1938-1969

Property Restrictions

Approval for most site and building work may be required locally and/or at the state level. The local historic district has review over exterior elements in the public view while the state holds more encompassing restrictions on the interior and exterior as well as the landscape. Additionally, the land is bordering on wetlands and is on a scenic road and so work within the wetlands buffer or along the stonewalls may require local review. Due to the potential for archaeological resources and the preservation restriction held by the state historic preservation office, any excavation work will require archaeological review. Additional excavation restrictions are associated with the state environmental protection because of a previous leak of an underground oil storage tank.

Woods End Road Local Historic District

The Gropius House is within a local historic district. A Certificate of Appropriateness (or Non-Applicability) must be secured from the Lincoln Historic District for any work.

- *If the project falls within a Historic District, you will be required to file an application with the Historic District Commission for most exterior alterations of a building or other man-made structures visible from a 'public way" or for the demolition of a building or structure within the district.*[1]

Massachusetts Historic Commission Preservation Restriction

Massachusetts Historic Commission has held a preservation restriction on the Gropius House in perpetuity since March 31, 1986. The restriction requires Historic New England to:

1) assume the cost of maintenance so as to preserve the architectural and historical integrity of the features, materials, appearance, workmanship, and environment;
2) maintain the landscaped environment consistent with the historical character of the building;
3) agree that the Commission may inspect the premises; and
4) make no alterations unless a) they are clearly of minor nature and do not affect the architectural and historical values of the site, b) the Commission has reviewed plans and specifications submitted by the Grantor and determined that they will not seriously impair the architectural and historical values of the site, c) required by casualty or other emergency promptly reported to the Commission.[2]

Although not specifically called out in the above statement, archaeological resources are protected as part of the restriction and any project that requires excavation will require state approvals.

Massachusetts Department of Environmental Protection

As a result of remediation activities associated with a leaking underground oil tank removed from the property in 2003, the DEP holds an Activity and Use Limitation (AUL) on the property. The extent of the AUL restricts excavations greater than 10ô deep and removal of the concrete floor in the basement of the house. This AUL is registered with the deed.

[1] Lincoln, MA Land Use Permitting Guide, February 20, 2016
[2] Preservation Restriction dated March 31, 1986

Scenic Roads

Baker Bridge Road is a designated Scenic Road. The Planning Board must review any work on a Scenic Road that impacts stone walls or trees within the streetôs Right Of Way but only if the project involves work is in connection with repair, maintenance, reconstruction or paving of a scenic road. As further clarified, zoning allows for the trimming or cutting of trees and destruction of stonewalls with no permit required as long as there was no road work involved.[3]

Signage

All signs that are not described in Sections 16.2, 16.3 or 16.4 of the Zoning Bylaw require approval by the Planning Board of Lincoln.[4]

16.2 Signs Permitted by Right

(a) One accessory sign for each building used in whole or in part for residential purposes identifying the name(s) of the residential occupants and/or the address of the building, such sign not to exceed an area of 2 square feet.

(b) In R-1, R-2, R-3 or R-4 Districts, one unlit accessory sign per lot advertising a use described in and complying with Section 6.1(f), such sign not to exceed an area of 2 square feet.

(c) <not applicable>

(d) Signs related to community-based events or town-sponsored events at the following intersections:

Sandy Pond Road and Lincoln Road; Ballfield Road and Lincoln Road; Lincoln Road and South Great Road; Bedford Road and Morningside Lane; and Codman Road and Concord Road.

16.3 Signs Requiring a Permit from the Building Inspector

(a) Any sign shown on a site plan approved by the Planning Board pursuant to Section 17 of this By-law.

(b) One temporary accessory sign per lot for a period of not more than 14 days from the effective date of the permit, such sign not to exceed an area of 6 square feet.

16.4 Signs Requiring Approval from the Board of Selectmen and a Permit from the Building Inspector

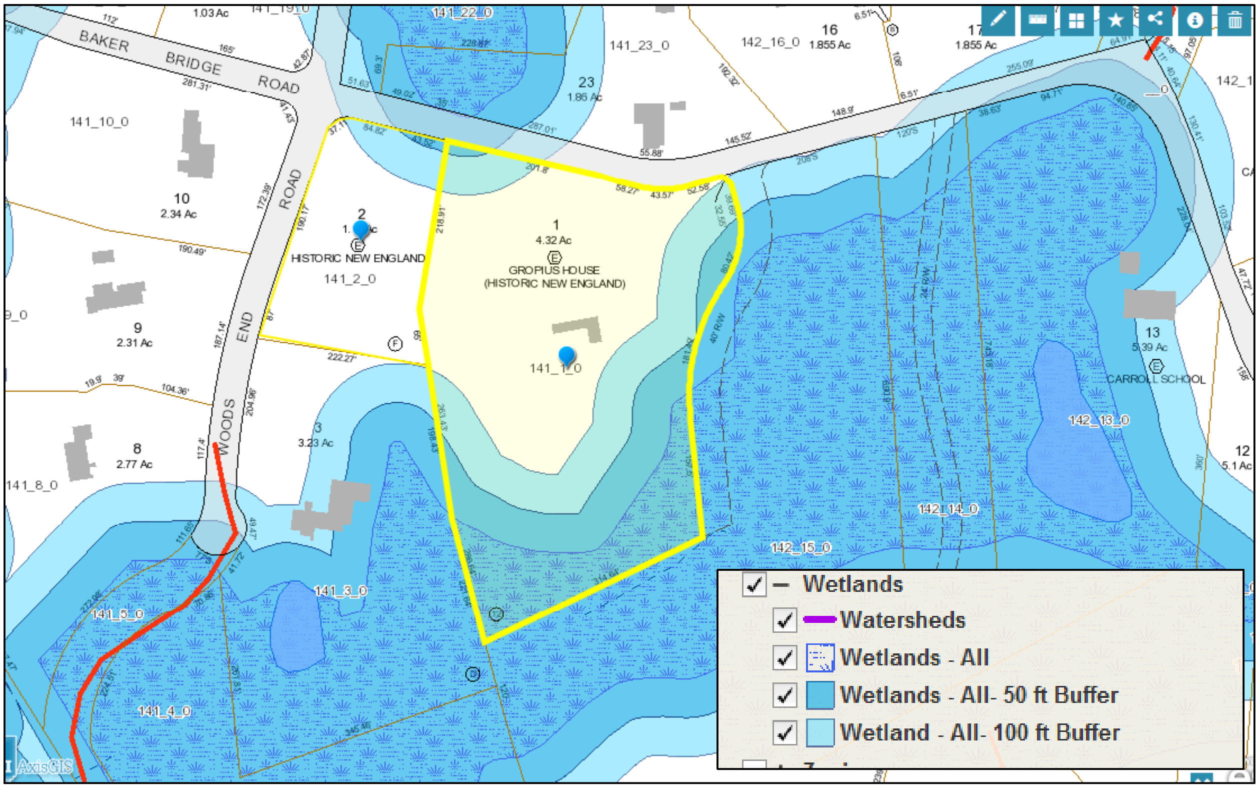
Temporary signs on Town property for a period of not more than 14 days from the effective date of the permit, such signs not to exceed an area of 6 square feet.

A signage permit is recorded from 4/28/2005. This timing is in keeping with the updating of all signs from SPNEA to Historic New England. Local by-laws should be consulted before any new signage is added or existing signage is changed in size or color.

[3] General By-Laws of the Town of Lincoln, March 16, 1959, and thereafter amended, through the March 23,2013 Annual Town Meeting.

[4] Town of Lincoln Zoning By-Law, Last Amendment March 19, 2016

Conservation Commission of Lincoln



Wetlands and buffers, GIS map from the Town of Lincoln's website, accessed 10/9/2016

Lincoln Conservation Commission posted the following guidelines online (accessed 10/9/2016):

- Activities that will remove, fill, dredge, or alter ponds, wetlands or buffer zones are prohibited without a permit from the Conservation Commission. Regulated activities include, but are not limited to: Building Construction; Vegetation Removal; Grading or Excavation; Depositing Yard Waste; Septic System Installation; Discharging Stormwater.
- Regulated resource areas include wetlands and ponds and their associated buffer zones, which extends 100' beyond these protected areas. In addition, riverfront is a regulated resource area that extends 200' from perennial streams of any size.
- The Town's bylaw provides greater protection than State law. The inner 50' of the wetland buffer zone is a no-disturb area. Isolated areas of flooding, including vernal pools, are protected and so are the bodies of water themselves.
- The following is an outline of a typical timeline for filing, and brief descriptions of frequently used permit applications. Each project is unique and we welcome you to visit us in the Conservation Office to discuss the details of your project.

Additional Research

During the creation of the Gropius House Conservation Management Plan (CMP) in 2016 many questions were identified or inconsistencies were noted but time did not allow for all of them to be fully explored. The following are subjects that deserve more attention at a time in the future.

1. A paint analysis completed in 1986 by Sara B. Chase and Kathryn M. Carey suggests that paint composition in the master bedroom shifted to aluminum in its second generation. Chase and Carey did not specify the type of paint used originally, but further study should be carried out in order to determine whether this documentation is evidence of a change from titanium dioxide to aluminum silicate.[1]
2. In the introductory section of her 1987 Gropius House paint analysis, conservator Andrea Gilmore wrote that the paint originally applied to the sash of the second floor bathroom window was oil while the first paint on the windowȇs sill was lead-based. However, in a more detailed description she seems to indicate that the original paint on the sash was lead-based like that of the sill. She also wrote that there was a primer beneath this sash layer that did not contain lead. It is unclear why this discrepancy in the report exists, and research should be conducted for clarification of the issue.[2]
3. A paint analysis undertaken on the exterior of the Gropius House in 1993 resulted in the conclusion that the four oldest layers of exterior paint were tempera. The report acknowledges that this composition is unusual, and future research should look further into the matter.[3]
4. The history and management of the orchard still has some questions associated with it:
    a. The interpretation and management of the orchard would be enhanced by a better understanding of early twentieth-century orchard tree pruning methods.
    b. There is a primary philosophical question about the management of the orchard - is it Historic New Englandȇs role to help preserve Baldwin apple trees or is the primary goal to preserve the concept of the orchard.
    c. There is historical information missing about the management of the orchard and it is tied to the ownership. Additional research is needed into the management as well as research in the Storrow archives.
5. A structural analysis of the roof and load would be helpful for understanding how much snow the flat roof can support.
6. Petrographic and chemical analysis of the historic Portland material that remains of the exterior stair as well as the mortar pointing within the chimney should be included as part of a future project.
7. As of 2016, staff are concerned about the safety of the deck because the boards have been cracking with increasing frequency in recent years. While repairs and modifications to the deck have been carried out several times, the exact layout of the underlying sleepers is unclear. There are also few details available about the widening of the spaces between

[1] See Sara B. Chase and Kathryn M. Carey, *Gropius House Paint Study*, report (Waltham, MA: Society for the Preservation of New England Antiquities, 1986) in the Additional Resources section of this document.
[2] See Andrea M. Gilmore, *Gropius House, Lincoln, Massachusetts: Paint Study, Second Floor - Guest Bathroom*, report (Waltham, MA: Society for the Preservation of New England Antiquities, 1987) in the Additional Resources section of this document.
[3] See *Gropius House Exterior Painting and Paint Analysis: North Elevation Siding,* report (Boston: Society for the Preservation of New England Antiquities, 1993) in the Additional Resources section of this document.

the boards, which was carried out by the Society for the Preservation of New England Antiquities (SPNEA) in 1986. These questions could be answered during the replacement of the feature, which should happen soon. The work would be most cost effective if it took place at the same time as a roof replacement.

8. It should be noted that in 2016 Historic New Englandôs interpretive task force, PPIP, reviewed the options for the glass block and determined that it was very important to match the aesthetic of both sides of the block. Additional research is needed regarding the viability of cutting and re-adhering salvaged blocks so that the patterning matched or to discuss with Owens-Corning the viability of re-establishing the block pattern.
9. The CMP focused on the physical care of the buildings and landscape. The care and treatment of the collections was not a focus but should be for future inclusion in this report.
10. The housekeeping guidelines developed by the collections team and the guide cleaning checklist should be cross-referenced to the maintenance protocols identified in this CMP

Gropius House Maintenance and Repair Plan

The purpose of the maintenance and repair plan is to summarize the maintenance recommendations from the conservation management plan and to identify the level of review required for different repair protocols in one location.

General guidelines for the care of the property:

- The exterior should be kept in good repair.
- Once evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered.
- Interior finishes should be kept in good repair in order to maintain clean aesthetic of house. However, condition of all elements in space should be considered in discussions about treatment options. There is a cascade effect on collections after restoration of wall finishes; if walls look perfect, patina on objects will stand out.
- Treatment decisions for interior finishes will most likely require interpretive review by preservation task force.
- Any work classified as more than maintenance are considered projects and will need to be reviewed and budgeted for as part of a typical planning cycle.

Conservation and preservation efforts have been divided into three categories identifying the levels of review required for exterior work. The three categories are as follows:

- Maintenance Protocol. Basic maintenance activities do not require extensive approvals. All maintenance activities, however, should be approved through the budget, scheduled appropriately with the site staff or any other staff that have an interest, and documented properly.

- Abbreviated Review Process. The abbreviated review process can be used if the repairs are classified as minor, with in kind with no material changes or detail changes identified. The abbreviated review process is outlined in the property care teamÕs guidelines for project management.

- Full Review Process. The full review process will be followed for any major repair project or when any detail changes, changes in material, or changes that affect the interpretation of the site are being suggested. The full review process is outlined in the property care teamÕs guidelines for project management.

Exterior Features

Wooden Elements with Painted Finish: Cladding, Trellises and Other Features

- Maintenance Protocol. Some examples include but are not limited to:
    - Inspect the condition of the paint annually paying specific attention to biological growth.
    - Frequent blooms of biological growth have resulted in need of annual or bi-annual cleaning with D/2 Biological Solution
    - Spot maintenance of failing paint should occur in between major painting projects. Clean areas of cracked or peeling paint with D/2 before rinsing, sanding, and recoating. Scrape if paint has become detached.

- Abbreviated Review Process. Some examples include but are not limited to:
    - Painting projects can follow the abbreviated review process as long as they specify Historic New Englandôs current standard painting protocol. Previous removal of the paint layers has minimized the need to be selective about the preparation process, but the wall and window trim inside the screen porch area should be protected because these areas still retained historic paint layers as of 1995.
    - A minor intervention project such as the use of approved fillers or epoxies for minor cracks or areas of deterioration to wooden surfaces.
    - A medium intervention project where less than 50% of individual wooden element is damaged. In kind splice repairs are pre-approved for areas of minimal damage.

- Full Review Process. Some examples include but are not limited to:
    - Changes to the painting material. Currently the exterior finish is a latex paint and, while these changes have been previously approved, modern latex has the potential to present a different aesthetic appearance over oil. Future consideration may be made about switching from latex to a different type of paint that more accurately reflects the aesthetics of the paint. Additionally, consultants in 2016 recommended using a coating with both mildewstatic pigment such as zinc oxide and mildewcide additive.
    - Stripping or otherwise aggressive removal of paint: There is a point where the evidence of paint layering becomes obvious and visually distracting to the clean aesthetic that should be dominant. The full replacement of paint should be considered when there are a multitude of visible layers. It is expected that around six layers of paint a more aggressive preparation phase should be undertaken to prepare the building for paint. Consultation with the interpretive task force would be advised starting around layer four to determine if the paint layering is not distracting to the eye. Additionally, the wall and window trim inside the screen porch area should be protected because these areas still retained historic paint layers as of 1995.

- Replacement of cladding: Although individual splice repairs are acceptable there is a point where the evidence of repairs and maintenance becomes obvious and visually distracting to the clean aesthetic that should be dominant. The full replacement of materials should be considered when there are a multitude of repairs.

Roofing

- Approved Maintenance Protocol.
    - Inspect the roof system annually looking for areas of potential failure such as blisters, areas of exposed asphalt, ponding, deteriorating or cracking asphalt, damage to the flashing, and evidence of interior leaks.
    - The garage roof should be swept clean twice a year.
    - Inspect roof drains and scuppers and ensure they are clear before any major rain or snow storm.
    - After snow accumulation of 8 inches or more, carefully clear snow off roof. Leave about one inch of snow in order to avoid damaging roof surface.

- Abbreviated Review Process. Some examples include but are not limited to:
    - If minor damage is discovered, work with a roofing contractor on repair of the system elements.

- Full Review Process. Some examples include but are not limited to:
    - Replacement of the roof system and cornices.

Structural Wood Framing

- Approved Maintenance Protocol.
    - Inspect the building annually for signs of structural deterioration such as cracking in plaster or around doors and window frames.

- Abbreviated Review Process. Some examples include but are not limited to:
    - Any project involving the repair of the wood framing will need a full review.

- Full Review Process. Some examples include but are not limited to:
    - Any project involving the repair of the wood framing will need a full review.

Window Frames and Glazing

- Approved Maintenance Protocol.
    - Inspect annually looking for areas of paint loss, glazing loss, or signs of rust staining.
    - Spot maintenance of failing paint should occur in between major painting projects.
    - As long as there is a paint finish, there is no specific maintenance protocol for the putty itself.

- Abbreviated Review Process. Some examples include but are not limited to:
    - Field replacement of glazing including spot treatment of rust on the steel frames

- Full Review Process. Some examples include but are not limited to:
    - Removal of frames for conservation.
    - Replacement of glass.

Specialty Glass

- Approved Maintenance Protocol. Some examples include but are not limited to:
    - Inspect the specialty glass annually looking for new cracks or breaks.
    - Snow should be promptly cleared away from the base of the glass block wall to minimize water penetration into the support system that has resulted in rust jacking in the past.

- Abbreviated Review Process. Some examples include but are not limited to:
    - The use of epoxy to secure broken specialty glass windows.

- Full Review Process. Some examples include but are not limited to:
    - The initial treatment of the glass block system
    - Replacement of any of the specialty glass

Stone Stairs

- Approved Maintenance Protocol.
    - Inspect stairs annually to review conditions.
    - The mortar has proven susceptible to deterioration by salts or products used for melting of snow and ice. These products are not ideal for any historic environment, but using pure sand creates additional issues within house. Whichever product is used, it should be swept off stones as soon as it is no longer performing.

- Abbreviated Review Process. Some examples include but are not limited to:
    - Spot repairs of the mortar.

- Full Review Process. Some examples include but are not limited to:
    - Major repair campaign to repair or conserve the stairs.

Steel Elements including the Spiral Stair and the Lally columns/Support Columns

- Approved Maintenance Protocol.
    - Inspect the paint surface on an annual basis looking for deteriorated paint or signs of rusting.

- Abbreviated Review Process. Some examples include but are not limited to:
    - Integrity of finish must be maintained, as it protects steel from exposure. If bare steel is not treated as quickly as possible, it will start to rust. Wire brush area to remove any oxidization or corrosion, spot-apply a rust converter, and apply finish paint.
    - When the clean look of stairs is marred despite maintenance activities, it is time to discuss a larger project

- Full Review Process. Some examples include but are not limited to:
    - Any project recommending grit blasting of the steel whether in situ.
    - Deconstruction of the stair to facilitate a larger conservation and preservation project.

Screens on Porch

- Approved Maintenance Protocol.
    - Inspect annually for holes and overall condtion.
    - Holes in screens should be patched until they become an aesthetic distraction

- Abbreviated Review Process.
    - No repair protocols that meet this criteria have been identified at this time

- Full Review Process. Some examples include but are not limited to:
    - Full replacement: Although all screens were likely replaced in 2002, any project involving replacement will require full review because of the nature of the intervention because of the means in which the system is attached.

Porch deck

- Approved Maintenance Protocol.
    - Inspect annually for signs of deterioration. Test floor boards specifically looking for signs of weakness.
- Abbreviated Review Process. Some examples include but are not limited to:
    - Minor repairs maybe undertaken to splice new wood in to repair broken deck boards. Care should be taken as to make sure joints in the boards are over deck supports.
- Full Review Process. Some examples include but are not limited to:
    - Major repairs (more than 5 boards) or replacement of entire flooring system.

Stone Paths and Porch Floor

- Approved Maintenance Protocol.
    - Inspect annually for uneven stones. Stones should be level for safety reasons
- Abbreviated Review Process. Some examples include but are not limited to:
    - Resetting of less than 5 stones.
- Full Review Process. Some examples include but are not limited to:
    - Resetting of more than 5 stones.

Stone Walls

- Approved Maintenance Protocol.
    - In spring, walk rubble stone walls and replace singleton stones that have been knocked off. Try to position stones on top of wall so that they fit in place.
    - If more than three stones have fallen in a specific location a mason may be required.
    - Walk the formal walls annually as well and look for signs of dislodged stones and deteriorated mortar.
    - Spot pointing of walls in discrete locations to address minor mortar loss or to secure capstones.

- Abbreviated Review Process. Some examples include but are not limited to:
  - Minor Fieldstone Wall Repair Project: When no more than two sections of walls or 40 linear feet are being repaired a project should be developed with a qualified mason.
  - Minor Formal Stone Wall Repair Project: When less than 40 square feet of wall is being pointed.

- Full Review Process. Some examples include but are not limited to:
  - Major Fieldstone Wall Repair Project: When more than two sections of walls or more than 40 linear feet are being repaired.
  - Major Formal Stone Wall Repair Project: When more than 40 square feet of wall is being pointed or any section of the wall is being rebuilt.

Trees and Woody Shrubs

- Approved Maintenance Protocol.
  - Inspect annually for overall condition and after major storms for damage.
  - Maintenance pruning

- Abbreviated Review Process. Some examples include but are not limited to:
  - Hazard pruning
  - Treatment protocols being established for the first time

- Full Review Process. Some examples include but are not limited to:
  - Major pruning for rejuvenation of a woody shrub.
  - Removal or planting of a tree or woody shrub.

Driveway

- Approved Maintenance Protocol.
  - Filling potholes
  - Staff regrading driveway as part of maintenance protocol

- Abbreviated Review Process. Some examples include but are not limited to:
  - Using outside contractors to provide material and grade driveway

- Full Review Process. Some examples include but are not limited to:
  - Changing driveway material or color of material
  - Removal or replacement of the edging material.

Mechanical, Electrical, Plumbing (MEPs)

Electrical

- Approved Maintenance Protocols
  - Test all exterior lighting annually and change lightbulbs as necessary.
  - Lightbulbs may be replaced by site staff or property care staff.
  - Lightbulbs are to be replaced ñin-kindò, matching the existing style and wattage.
  - Service calls for faulty outlets or fixtures.
- Abbreviated Review Process. Some examples include but are not limited to:
  - Electrical assessment and survey
  - Rewiring of a light fixture
  - Change in lightbulb type (e.g., change from incandescent to fluorescent or LED) is to be reviewed by Historic New Englandôs interpretive task force.
- Full Review Process. Some examples include but are not limited to:
  - Removal of electrical components
  - Replacement of a light fixture

Plumbing

- Approved Maintenance Protocols
  - Inspection and cleaning of main septic drain line should be performed every other year to clear any tree roots from the pipe.
  - Septic tank pumping shall be periodically scheduled so as not to exceed one pump every three years.
  - Inspect active water lines on a weekly basis to ensure there are no leaks in the system. If a leak is discovered, turn off related valve to stop leaking and contain leak with the use of absorption pads or buckets. The plumber listed on the emergency call sheet should be contacted and property care notified.
  - Service calls for leaks.
- Abbreviated Review Process. Some examples include but are not limited to:
  - Repairs of existing features
- Full Review Process. Some examples include but are not limited to:
  - Replacement of fixtures or faulty piping
  - Replacement of the septic field

HVAC

- Approved Maintenance Protocols
  - Filters should be replaced on a semi-annual basis by property care staff.
  - Temperature settings are to be set according to the season. Summer air conditioning will be set no lower than 75oF; winter heating will be set no higher than 65oF in the museum and 68oF in the office space. Programmable thermostats are to be set to allow for temperature setbacks (80oF and 58oF respectively) during non-open hours.
  - Data loggers tracking temperature and relative humidity should be collected and processed bi-annually, once in January and once in July
  - The gas fired boiler is to be inspected annually in compliance with insurance requirements. This inspection is scheduled by the insurance company.

- The gas meter is to be inspected as necessary by the utility supplier.
- The landscape should be kept clear around the outdoor condensing unit.
- Prior to the use of the AC in the spring, the outdoor condensing unit should be cleaned of gravel that may have been pushed off the driveway due to plowing activities.
- Emergency service

- Abbreviated Review Process. Some examples include but are not limited to:
    - In kind replacement of equipment
- Full Review Process. Some examples include but are not limited to:
    - Replacement of a system or system component

Communications

- Approved Maintenance Protocols
    - Maintenance to existing communications services
    - Maintenance to existing security services
- Abbreviated Review Process. Some examples include but are not limited to:
    - Installation of new equipment or systems with no damage proposed to historic fabric
- Full Review Process. Some examples include but are not limited to:
    - New services requiring additional trenching for conduit access
    - New services requiring penetrations to the historic fabric

Interior

Assume that any work beyond the designated maintenance protocols could have a major effect on the historic finishes and the interpretation of the site and will require the full review process.

Acoustical Plaster

- Approved Maintenance Protocols.
  - Once the walls have been treated with desired whitewash application, maintenance requirements should be minimal
  - Avoid rubbing or abrading surface in order to remove any spot staining, as this will likely remove applied limewash and possibly the substrate and results of such a cleaning attempt are not likely to be visibly noticeable.
  - Areas that require cleaning should be monitored over time

Chimneys and Fireplace

- Approved Maintenance Protocols.
  - Both chimneys should be regularly inspected:
    - Monitor chimney for water ingress or signs of dampness
    - Debris falling to hearth may be sign of interior issue
    - Open flue damper of fireplace chimney yearly in order to check for any fallen debris
    - Inspect finishes for signs of degradation that may be caused by underlying issues such as moisture penetration
  - The chimney stack used by the furnace should be inspected once a year by a trade professional for soundness, freedom from deposits, and correct clearances. Cleaning, maintenance, and repairs shall be done if necessary.

Cork Floor

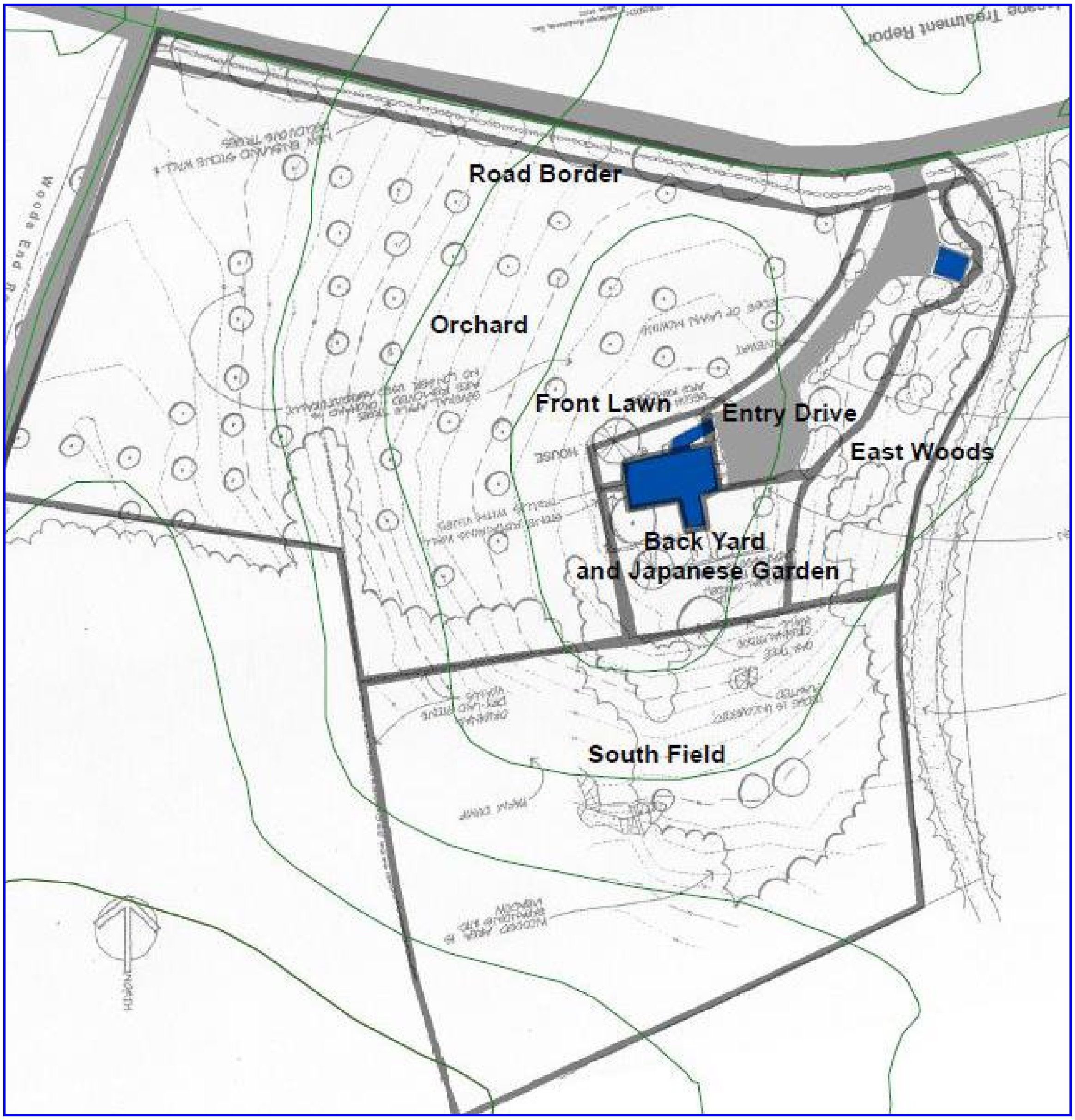
- Approved Maintenance Protocols.
  - When cleaning, use mild detergent with damp mop
  - Do not flood as excess water causes damage
  - Clean daily with dry or damp mop, occasionally using a liquid solvent wax
  - For major cleaning on Standard Cork Tile, use electric buffing with 00 steel wool discs, then apply several thin coats of paste wax, buffing each with lambôs wool pads
  - For major cleaning on Polyurethane Coated Tile, use liquid wax and buffing. Paste is NOT to be used on Polyurethane Coated Tile.
  - To refinish Polyurethane Tile, use a power floor machine with 00 steel wool discs and apply urethane as directed on container labels.
  - Avoid abrasive, alkaline or cheap cleaners
  - Keep surface free of grit, sand and cinders
  - Use an entrance mat to prevent the floor from getting dirty and wet. Do not allow a soaking mat to sit on the cork for extended periods of time.

<u>Door Hardware</u>

- <u>Approved Maintenance Protocols.</u>
    - Annually tighten set screws in doorknobs and ensure hinges are secured tight to frames.
    - Locksmith work to fix poorly functioning lock hardware.

Gropius Landscape Maintenance Plan
The purpose of the maintenance plan is to summarize the conservation management plan recommendations into a simple landscape maintenance plan for the site. The numbering system for the trees used within corresponds to the 2009 tree inventory.

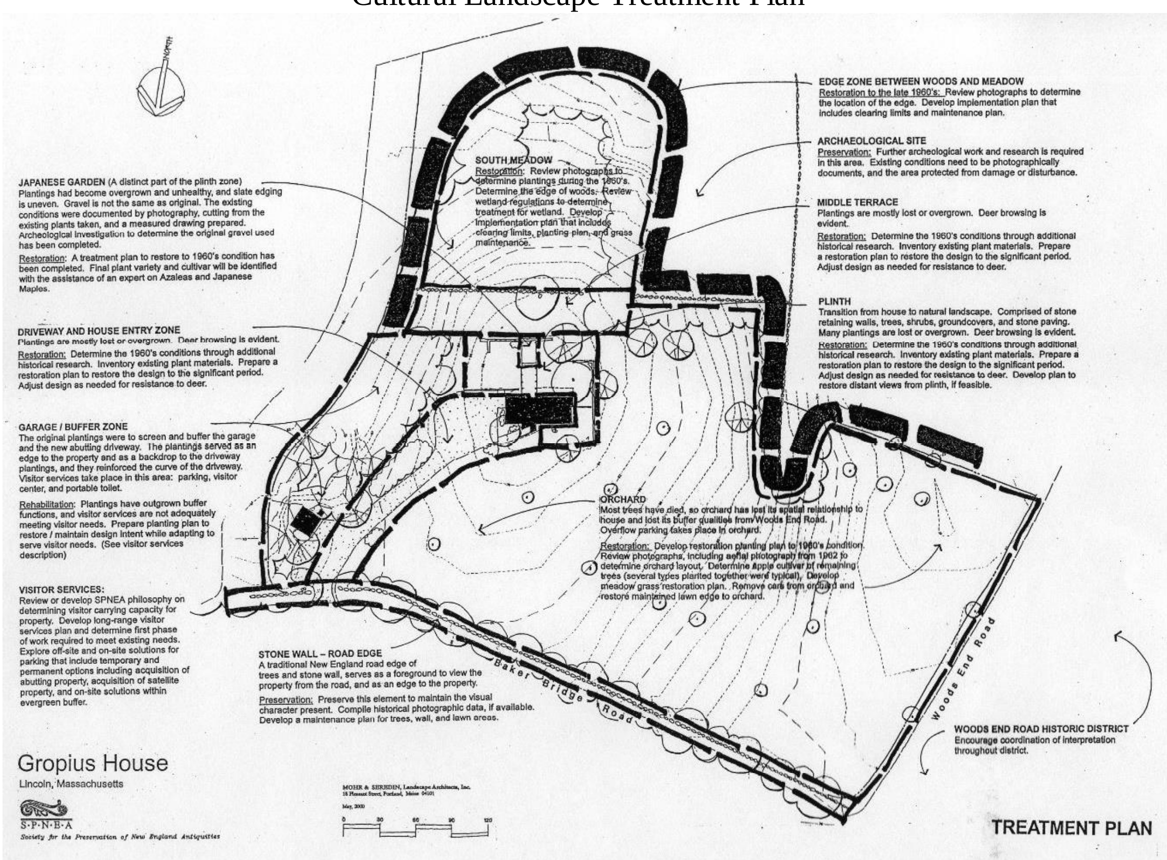
The Gropius House property is split into management zones to make the identification of the areas easier. The below zones were identified in 2009 and closely match the 2001 Cultural Landscape Report which also identified the zones. A complete listing of the two zone names is on the following page.



Management Zones

Maintenance Plan Name	Cultural Landscape Name
Orchard	Zone 1 ï Orchard
Back Yard and Japanese Garden	Zone 2 ï Japanese Garden
South Field	Zone 3 ï South Meadow
Entry Drive	Zone 4 ï Driveway and House Entry
Entry Drive and East Woods	Zone 5 ï Garage / Buffer Zone
Front Yard and Back Yard and Japanese Garden	Zone 6 ï Plinth
Back Yard and Japanese Garden	Zone 7 ï Middle Terrace
No zone (beyond South Field)	Zone 8 ï Woodland / Meadow Edge
Road Border	Zone 9 ï Stone Wall ï Road Edge
No Zone	Zone 10 ï Archaeological Site
No Zone	Zone 11 ï Visitor Services
No Zone	Zone 12 ï Woods End Road Historic District

Cultural Landscape Treatment Plan



Mohr & Seredin Landscape Architects, Inc., *Cultural Landscape Report*, 2001

Entry Drive

Driveway, 1963
Historic New England Archives, Binder of Slides

The Gropius House landscape was designed as a series of outdoor ñroomsò that reflect the architecture of the house. The driveway and other systems of circulation provide a means of traveling between these spaces. They are the ñhallwaysò of the landscape, guiding inhabitants or visitors through the site in a logical manner.

Lawn Care/Mowing/Field and Brush Management

- Mow a 10ô-wide strip weekly along the edge of the drive at a height of 3ò
- See mowing map in the appendix.

Herbaceous Plants/Garden Beds

N/A

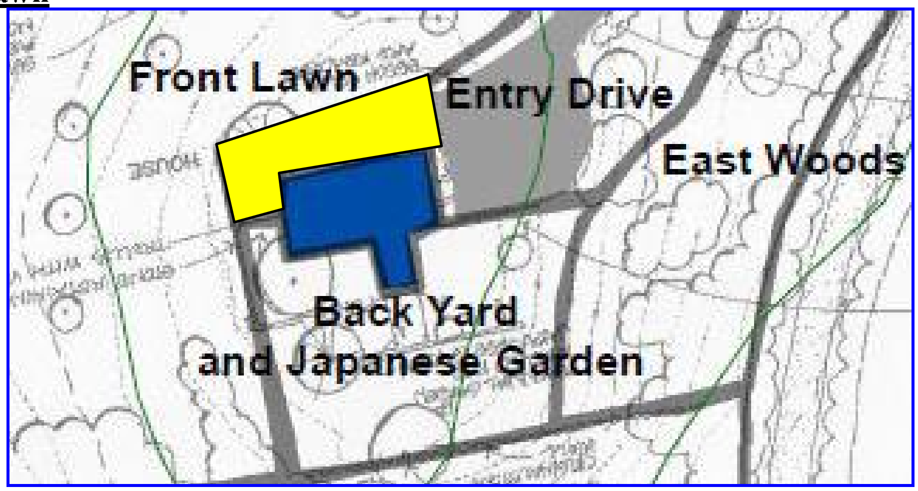
Woody Plants/Trees

- Junipers (#12) encroach into driveway. Keep pruned back but with natural shapes.
- Keep hemlocks (#17 and #18) pruned over garage and drive. Monitor for wooly adelgid.
- Monitor trees (#13 through #25) over visitor center. Pines are cabled and should be reviewed every couple years for continued stability.
- Keep Zelkova (#1) pruned away from house. It is too stout and rubs house, while original elm towered over building. Continue the maintenance protocol however the Zelkova should *not* be replaced and can be removed if it threatens building.

Hardscape/Structures

- Visitor center (garage) frequently becomes covered with vines and poison ivy. Cut back several times a year. Do not pull off vines as it may ruin or damage the paint and/or wood.
- The landscape should be kept clear around the outdoor condensing unit.
- Prior to the use of the AC in the spring, the outdoor condensing unit should be cleaned of gravel that may have been pushed off the driveway due to plowing activities.
- The front walk has a tendency to become uneven. Do not repair without consulting preservation manager. Do not add new stones, and keep existing ones in same orientation and location. Grass should be between the stones, but it has been difficult to establish in this area.
- Driveway Notes
    - The driveway takes a beating from plowing. It is also at a steep grade and will wash out during heavy rain. Use crusher-run base for wash out repairs. Top layer should be a ½ inch washed pea-stone. Match existing color.
    - Due to general erosion and the inevitable winter plow work, driveway should be regraded annually (ideally in April). Regrading will re-establish drive at level consistent with metal edging, establish appropriate coverage of oil inspection port in driveway, and fill assorted ruts and potholes. This work would include area to north of garage (visitor center), which takes the heaviest parking toll and thus tends to generate depressions which result in large puddles. Raking of stone pushed into adjacent grass areas by plows should be done at this time as well.
    - Driveway should have a center crown
    - Potholes should be filled and hand-tamped as they develop
    - Driveway has a metal edge that is not historic, but provides a clean edge between lawn and drive. Edge should be maintained, but discussion should take place before replacement. Do not remove edge without consulting preservation manager. Try to straighten in place if possible.
    - An oil test well cover is located in the drive. It has been dislodged by the plow in the past.

Front Lawn



Lawn Care/Mowing/Field and Brush Management

- Mow weekly to height of 3ò
- All areas around the house foundation, poles, or the spiral stairs should be hand trimmed. These features are at or near grade and a string trimmer will damage historic material.
- See mowing map above

Herbaceous Plants/Garden Beds

- Daylily bed in front of glass block wall should be maintained and thinned as needed. Deadhead during summer and cut back in fall.
- Agave should be maintained and thinned as needed. Cut back spike when it passes. Clean out leaves and keep neat.

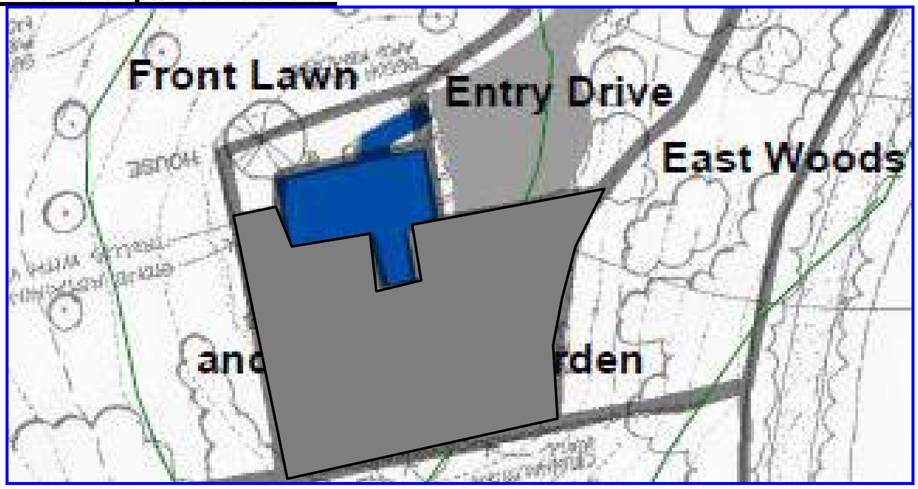
Woody Plants/Trees

- Keep pine (#2) pruned away from house
- Bed under pine fills with poison ivy and bittersweet

Hardscape/ Structures

- Report any damage to sculpture, walls, or spiral stairs to preservation manager.

<u>Back Yard and Japanese Garden</u>



Lawn Care/Mowing/Field and Brush Management

- Mow weekly to height of 3ò
- See mowing map for detail

Herbaceous Plants/Garden Beds

- Roses should be reestablished on both trellises. While historic material is no longer extant, the fact that roses were robust enough to block view through trellises was important aspect of Gropiusôs original design. Preference will be given to fast-growing climbing roses with a deep red or pinkish color. They can then be cut or staked back when maintenance on trellis is required.
- Trumpet vine should be cut back periodically to prevent damage to house
- There are several perennial beds in lawn areas around rock outcroppings. These should be maintained and thinned as needed.

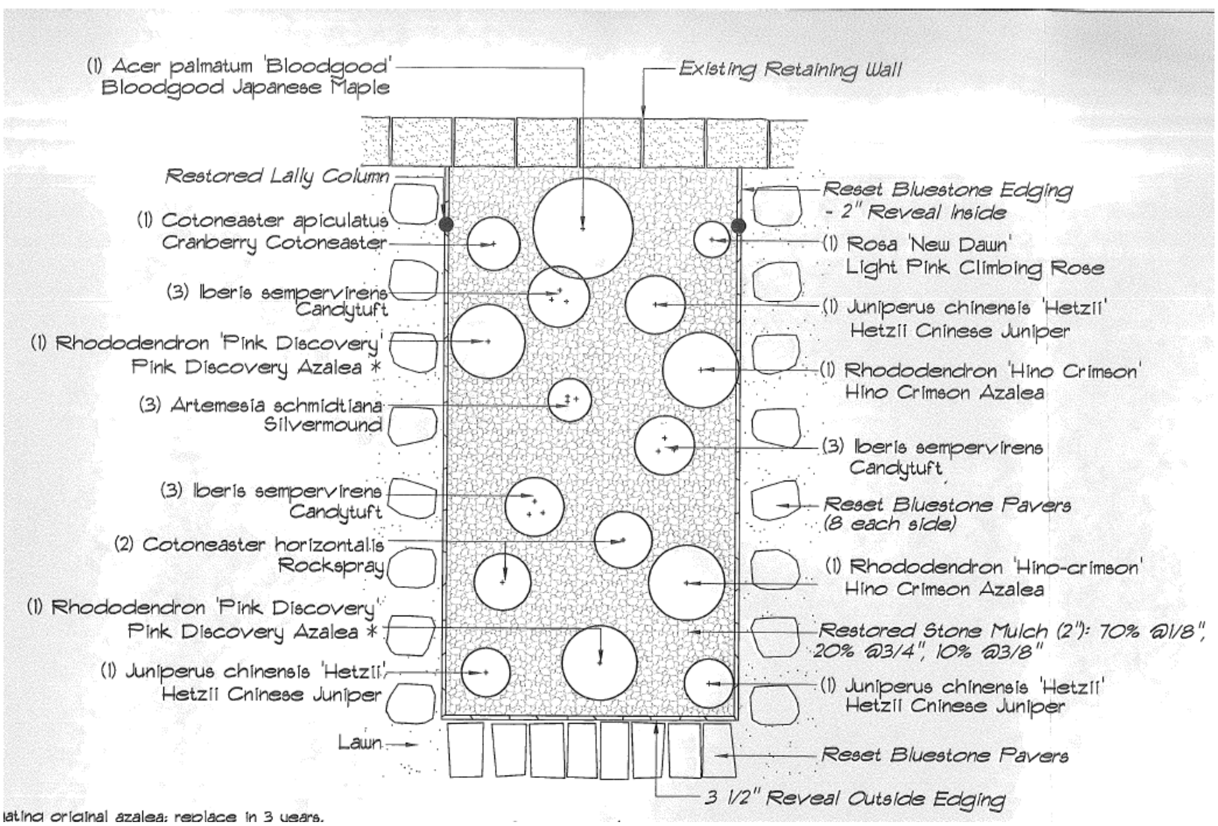
<u>Japanese Garden</u>

- Plantings in Japanese Garden should match exact placement and type as planting plan
- Overall appearance of garden should emphasize a low horizontal profile
- Japanese maple is a focal point of garden and should be pruned to maintain a low profile as well as a degree of transparency
- Shrubs will require pruning to keep horizontal profile and to maintain harmonious effect among shrubs and herbaceous plants maintained[1]
- All plants in Japanese Garden are replacements from 2001 or later, so material can be replaced if plants suffer from poor health or if pruning is not achieving expected visual character

[1] *Japanese Garden Record of Treatment, Summer 2001*, report (Portland, ME: Mohr & Seredin, Landscape Architects, Inc., 2001), 4.

Japanese Garden Maintenance[2]

- Hino-Crimson Azalea: Prune to maintain low profile but allow to spread horizontally
- Rhododendron ôPink Discoveryö: Prune to maintain low profile but allow to spread horizontally
- *Acer palmatum* ôBloodgoodö: Requires careful pruning every year to keep low horizontal profile and openness through tree
- Rosa ôNew Dawnö: Keep tied to lally column for support; prune and fertilize in spring
- Cotoneaster *apiculatus*: Prune to keep plant at 3ô ï 4ô spread
- Cotoneaster *horizontalis*: Prune to 3ô height
- *Juniperous chinensis* ôhetziö: Prune every year as necessary to maintain a height of 3ô
- *Iberis sumpervirens* ôCandytuftö: Shear back hard after flowering to encourage bushy growth
- *Artemesia schmidtiana*: Cut back hard for late summer refoliation.



[2] All maintenance recommendations for the plant material came from the *Japanese Garden record of Treatment, Summer 2001*, 5.

Japanese garden, 1958
Historic New England Archives, Binder of Slides

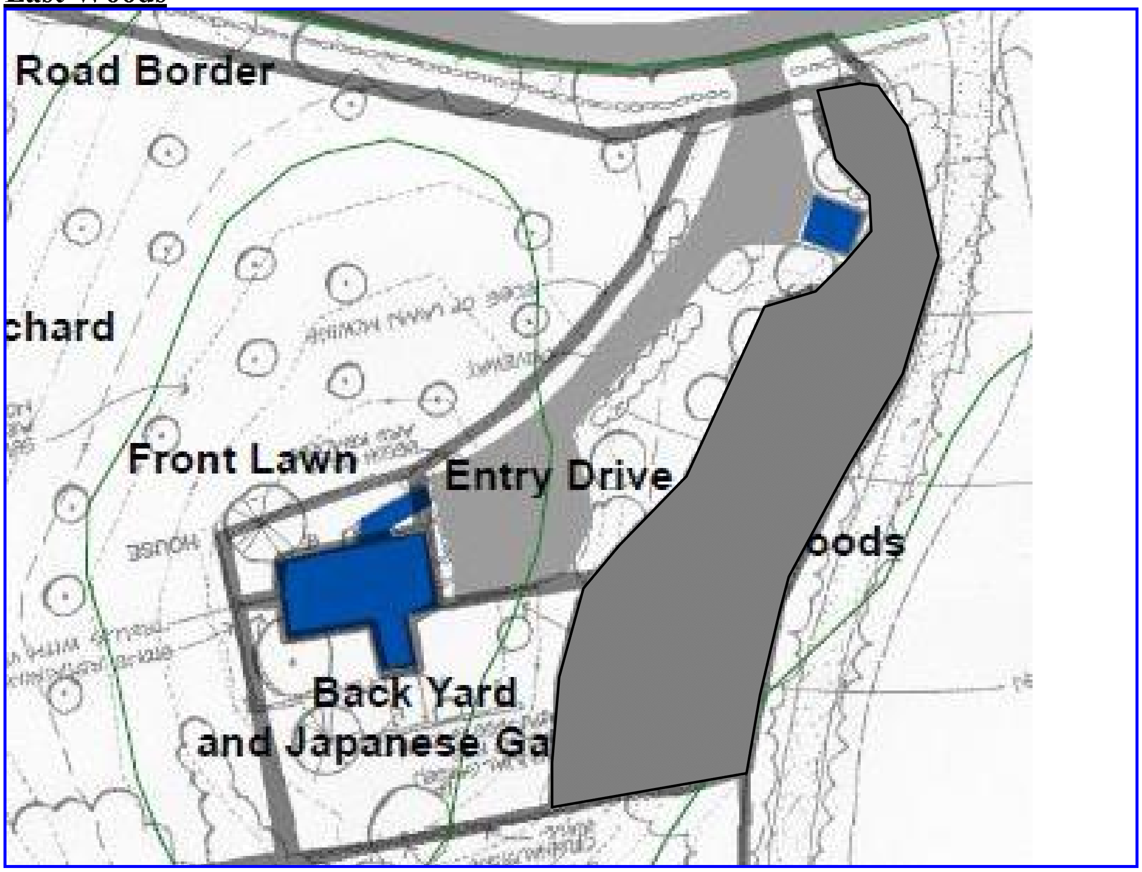
Woody Plants/Trees

- Oak tree (#3) adjacent to house should be pruned and inspected every other year by professional arborist. Needs to be pruned away from the house but kept close. The tree is historic and important to interpretation of the landscape and house.
- Pine (#3) is cabled and should be maintained and inspected in conjunction with the adjacent oak
- Oak tree (#5) and ornamental trees (#6, #7 and #8) along old stone wall are all historic and should be maintained
- Keep bittersweet out of trees and woody shrubs

Hardscape/Structures

- The stone path/patio on the south side of the living room is bound by flagstones set vertically to provide a stable boundary against which the horizontally bedded flagstones have been set. The vertical stones should be inspected annually to ensure that they have not subsided thus allowing the horizontal flagstones to ñcreepò towards the building.
- The flagstone paths should be top dressed at least annually (April) to minimize trip hazards.
- Do not repair without consulting preservation manager. Do not add new stones. Keep stones in existing orientation and location.

East Woods



Lawn Care/Mowing/Field and Brush Management

N/A

Herbaceous Plants/Garden beds

- Garlic mustard must be pulled. Neighbors complain because garlic is an invasive species. Town of Lincoln has developed high community interest in attempting to halt continued spread. Volunteers throughout Lincoln consistently encourage Historic New England to actively participate by removing it in spring before it goes to seed.

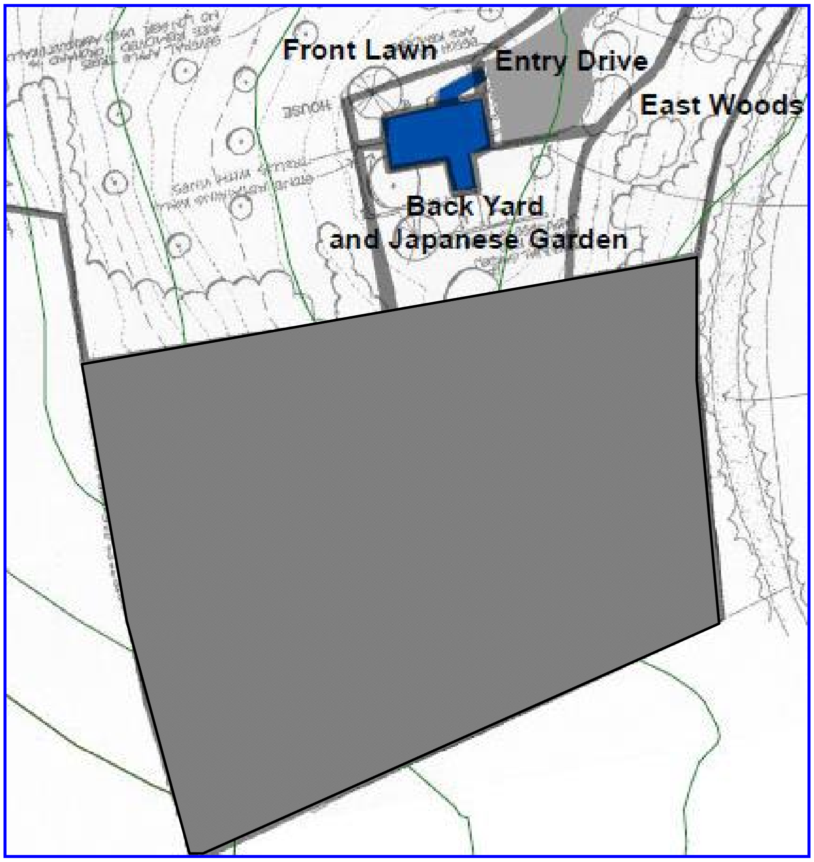
Woody Plants/Trees

- Bittersweet grows up and on all of the trees. Winter is a good time to go in and cut back the vines.

Hardscape/Structures

N/A

South Field



Lawn Care/Mowing/Field and Brush Management

- Let grass grow and brush mow it once per year, sometime between August and October. August 1 represents end of grassland-breeding bird season, but waiting until later in year allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies. Key is to avoid letting the woody growth take over field.
- Do not let woody growth take over the area. Make sure the woodland edge is pushed back every 2-3 years.
- Old pines should be standing in field. Clear beyond pine trees at least 10 feet past edge of canopy.

Herbaceous Plants/Garden Beds

- There are several perennial beds in south field around rock outcroppings and along stone wall. These should be maintained and thinned as needed.

Woody Plants/Trees

- Old pines (#s 72 & 73) should be standing in field. Clear beyond pine trees at least 10 feet past edge of canopy.
- Keep bittersweet out of trees and woody shrubs

Hardscape/Structures

N/A

Orchard and Road Border

Lawn care/Mowing/Field and Brush Management

- Let orchard grass grow and brush mow it once per year, sometime between August and October. August 1 represents end of grassland-breeding bird season, but waiting until later in the year allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies. Key is to avoid letting the woody growth take over field.
- String trim with caution around apple trees after mowing
- Mow a 10ôpath 3ò high from garage down to Woods End Road at same time as maintenance of path around meadow, adjacent to the stone wall along Baker Bridge Road.
- Mow a 10ôpath along Woods End Road for extent of property line, creating clean edge
- String trim along stone wall on a weekly basis
- Remove volunteer woody shrubs and trees from stone wall on an annual basis

Herbaceous Plants/Garden beds

- Garlic mustard here should be pulled/mowed before it goes to seed. Garlic mustard is point of emphasis with Lincoln Conservation Commission and community, which includes some Historic New England members

Woody Plants/Trees

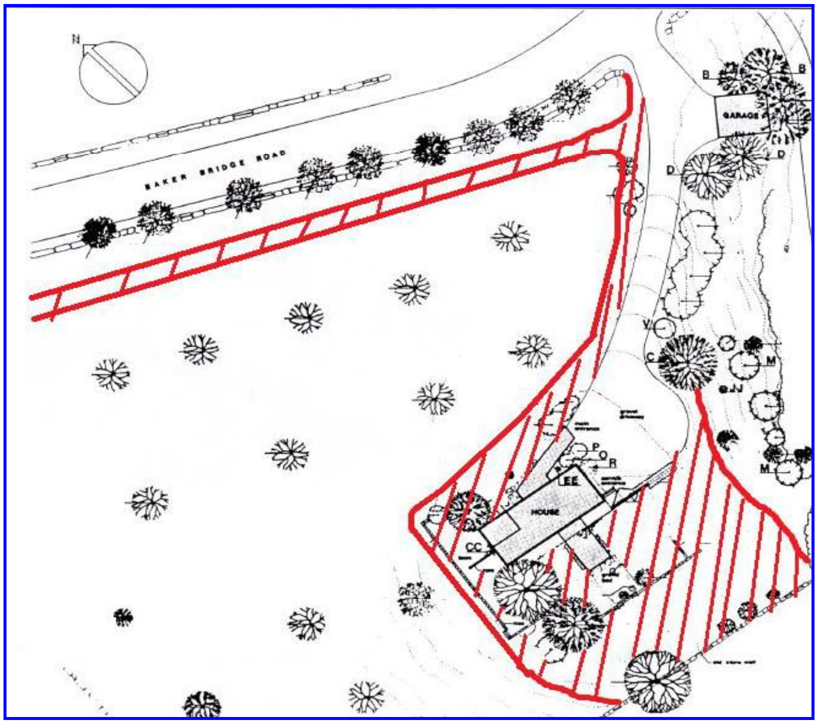
- Orchard should be restored to 1960s grid appearance. Gaps in grid do not necessarily need to be filled.
- Trees should be pruned and maintained, but apple production is not the goal. More research needs to be conducted on proper pruning methods for early twentieth-century orchards so they can be put into practice on site.
- Monitor trees for tent caterpillar and cedar apple rust
- Wrap bases of young trees before winter to guard against vole damage

Hardscape/Structures

- Keep both sides of wall along Baker Bridge Road clear of brush, vines and volunteer growth
- Replace small dislodged stones to wall. Report major wall damage to preservation manager

Mowing Maintenance Plan

The following is a summary of the mowing needs for the Gropius property. Mow areas highlighted below in red to a height of 3ò each week, including path down orchard.



Entry Drive and Orchard Path

- Mow a 10ô wide strip along the edge of the drive weekly at a height of 3ò
- Mow a 10ô path from garage down to Woods End Road at same time as maintenance of path around meadow, adjacent to the stone wall along Baker Bridge Road
- Mow a 10ô path along Woods End Road for extent of property line, creating clean edge
- String-trim along stone wall weekly

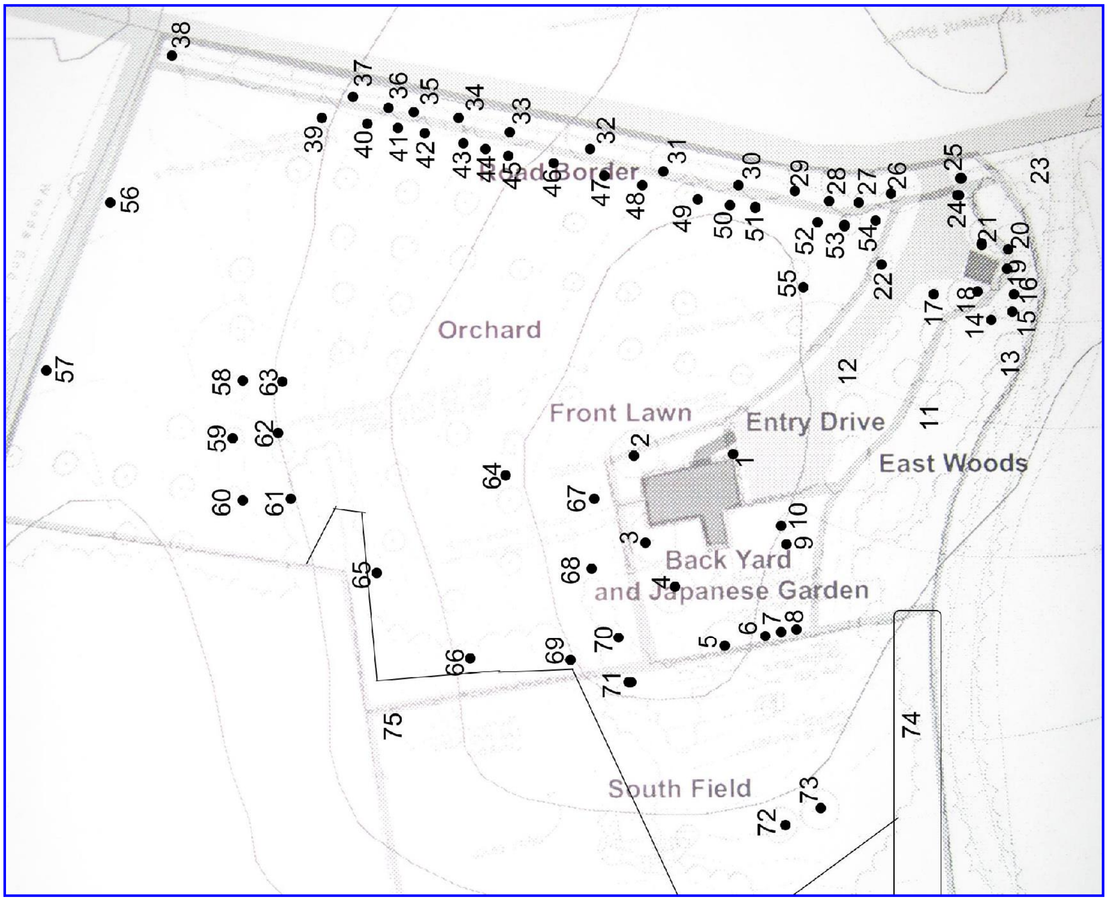
Front Lawn; Backyard and Japanese Garden

- Mow to a height of 3ò
- Hand-trim rather than string-trim near house, poles, and spiral stairs. These features are at or near grade and trimmer will damage historic material.

Orchard and South Field

- Let orchard grass grow and brush mow it once per year, sometime between August and October. August 1 represents end of grassland-breeding bird season, but waiting until later in the year allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies. Key is to avoid letting the woody growth take over field.
- String trim with caution around apple trees after mowing

Woody Plants and Shrubs Maintenance Plan
The following is a summary of information on the woody plants and shrubs. References to trees should utilize the nomenclature developed in the 2009 Tree Inventory.



- Pruning and other maintenance should be performed by certified arborist in consultation with Historic New England staff. See also Historic New England White Papers on Arborcare.
- Work should first focus on trees surrounding structures and formal areas of the property in order to address hazards to public, historic buildings, and the landscape. Work can then extend to property lines.
- Trees within rights-of-way along Baker Bridge Road have been periodically, and poorly, maintained by utility companies. Pruning of hazardous or unsightly trees in right of way should be discussed with preservation manager. Some trees have also been removed, which affects the views to and from the north.
- References to trees should use numbering system developed in the 2009 Tree Inventory

Entry Drive

- Junipers (#12) encroach into driveway. Keep pruned back but with natural shapes.
- Keep hemlocks (#17 and #18) pruned over garage and drive. Monitor for wooly adelgid.

- Monitor trees (#13 through #25) over visitor center. Pines are cabled and should be reviewed every couple years for continued stability.
- Keep Zelkova (#1) pruned away from house. Original tree was an elm and Zelkova was an inappropriate replacement. It is too stout and rubs house, while original elm towered over building. Work with arborist to find classic, vase-shaped elm. Zelkova should *not* be replaced and can be removed if it threatens building.

Front Yard

- Keep pine (#2) pruned away from the house
- Bed under pine fills with poison ivy and bittersweet

Back Yard and Japanese Garden

- Oak tree (#3) adjacent to house should be pruned and inspected every other year by professional arborist. Needs to be pruned away from the house but kept close. The tree is historic and important to interpretation of the landscape and house.
- Pine (#3) is cabled and should be maintained and inspected in conjunction with the adjacent oak
- Oak tree (#5) and ornamental trees (#6, #7 and #8) along old stone wall are all historic and should be maintained
- Keep bittersweet out of trees and woody shrubs

South Field

- Old pines (#s 72 & 73) should be standing in field. Clear beyond pine trees at least 10 feet past edge of canopy.
- Keep bittersweet out of trees and woody shrubs

Orchard

- Orchard should be restored to 1960s grid appearance. Gaps in grid do not necessarily need to be filled.
- Trees should be pruned and maintained, but apple production is not important. More research needs to be conducted on proper pruning methods for early twentieth-century orchards so they can be put into practice on site.
- Monitor trees for tent caterpillar and cedar apple rust
- Wrap bases of young trees before winter to guard against vole damage

Snow Removal Plan

The following is a summary of the snow removal guidelines for Gropius House.

- Stake drive edges before ground freezes. Stakes should be installed inside metal edge.
- Four-foot buffer should be staked at top of the drive and at wall connected to rose trellis. In the past, the plow pushed against wall and damaged it. This should also be communicated to contractor so they can avoid damage to the feature.
- An oil test well cover is located in the driveway. It has been dislodged by plow in past.
- Avoid use of ice melt on stairs. Clear them and use sand. Mortar is fragile and ice melt destroys it. Sweep stairs of sand when it is no longer needed.
- Snow should be promptly cleared away from the base of the glass block wall to minimize water penetration into the support system that has resulted in rust jacking in the past.

Annual Maintenance and Inspection Calendar

Note that routine spot inspections should be done after storms.

January	February	March
☐ Collect and process data loggers ☐ Semi-annual pest control	☐ Framing, stair, screens, deck and specialty glass inspection	☐ Inspect stone paths, walkways and stone walls; remediate as necessary
April	**May**	**June**
☐ Replace filter for air handler ☐ Sweep off and inspect visitor center roof ☐ Repair masonry rear entry stairs (if needed) ☐ Clean out gravel from condenser ☐ Regrade driveway; remove gravel from grassy areas	☐ Tighten doorknobs and hinges ☐ Wash exterior cladding ☐ Test all exterior lighting; remediate as necessary ☐ Verify summer thermostat programming ☐ Inspect and tighten deck screens ☐ Start seasonal mowing	☐ Inspect window glazing; remediate as necessary
July	**August**	**September**
☐ Collect and process data loggers ☐ Semi-annual pest control	☐ Inspect gutters, roof drains and roofs; remediate as necessary	☐ Inspect and clean boiler chimney; inspect fireplace chimney
October	**November**	**December**
☐ Replace filter for air handler ☐ HVAC inspection, cleaning, service ☐ Verify winter thermostat programming ☐ Complete seasonal mowing	☐ Sweep off visitor center roof ☐ Install plow stakes	☐ Verify winter thermostat programming

Preservation Priority Plan

The following priorities were developed for the Gropius House based on the intensive study that took place over the course of 2016 as part of the Conservation Management Plan. Historic New England will use this plan to prioritize the physical conservation and preservation efforts at the Gropius House.

1. Trellis repairs
   a. *Repair west trellis*
   b. *Repair east trellis*
   c. *Rejuvenate/Plant roses on trellises*
2. Electrical survey
   a. *Label all circuits; document locations and circuits on site plan*
   b. *Verify all bulbs work as expected*
   c. *Document bulb locations, types and access requirements*
3. Hazard pruning around Visitor Center / Garage
   a. *Includes hemlock management*
4. Replace first floor cork flooring
5. Prep, prime, paint all exterior cladding (house and garage)
6. Repair screens on rear porch
7. Modify dining room light fixture to accept Edison base bulb
8. Finalize glass block replacement plan
   a. *Source salvage material?*
   b. *Experiment with cutting perpendicular block?*
9. Apply limewash to fireplace alcove in living room as proof of concept
10. Implement annual cladding washing
11. Repair ceiling in maidôs room
12. Finalize and implement orchard management / restoration plan

GROPIUS HOUSE OVERALL EXTERIOR

Property Name: Gropius
Structure: Gropius House
Feature: Overall Exterior
Original Material: Concrete, steel, lally columns, stucco (or plaster), redwood, iron, canvas, copper, tar, gravel, fir, brass, building paper, felt, asphalt, lead, steel screens with copper, bronze netting, bluestone, Owens-Illinois ñInsuluxò 11 ¾ò x 11 ¾ò glass blocks #407, Libbey-Owens-Ford Glass Company ñLouvrexò fluted glass, ribbed glass also likely manufactured by the Libbey-Owens-Ford Glass Company, ¼ò plate glass, and ¼ò ñpullò glass

RS ID #270318, 2016

Original Color: White with gray trim
1965-1969 Material: Concrete, flagstone, steel, lally columns, stucco (or plaster),[1] redwood, iron, canvas, copper, tar, gravel, fir, brass, building paper, felt, asphalt, lead, steel screens with copper bronze netting,[2] bluestone, Owens-Illinois ñInsuluxò 11 ¾ò x 11 ¾ò glass blocks #407, Libbey-Owens-Ford Glass Company ñLouvrexò fluted glass, Ribbed glass also likely manufactured by the Libbey-Owens-Ford Glass Company, ¼ò plate glass, and ¼ò ñpullò glass
1965-1969 Color: White (matching Benjamin Moore #967, ñCloud Whiteò), gray (matching Benjamin Moore #1624, ñWestcott Navyò), and pink (matching Benjamin Moore #1282, ñTippy Toesò)

---

[1] In ñGropius House: A History,ò Ise Gropius writes that the vermiculite plaster ceiling was replaced with cement plaster. While she did not specify the year that this took place, the work was likely finished shortly after Gropius declared the California Stucco material unfit for outdoor use in 1957. See Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 14 and Walter Gropius to Carl M. Stiles, April 18, 1957, The Architects' Collaborative, Cambridge, Massachusetts.
[2] Some of the screens were replaced with aluminum during the Gropiusôtime because the copper turned green with age. However, this change does not seem to have occurred by the interpretive period. See Gropius, ñGropius House,ò 10.

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[3]

Maintenance and Repair Protocols:
The exterior should be kept in good repair. Minor maintenance should occur on a regular basis. When evidence of work becomes obvious, the replacement of finishes and materials should be considered in order to maintain the clean lines of the houseôs original design.

See Chimneys and Fireplace, Exterior Stairs, Garage (Visitor Center), Roof Deck, Screen Porch, Siding, Specialty Glass, Structural Framing, Windows, and Roofs, Gutters, and Downspouts sections for further information on maintenance of the Gropius House exterior features.

Original Construction and Evolution:
The Gropius House was framed with yellow pine and Douglas fir framing lumber, and large openings in the framing were spanned by steel ñI sectionò beams with fir nailing strips.[4] The building was clad in 7/8ò by 3 ¾ò shiplap redwood vertical wooden siding with 45° bevel detail on both of its edges, and the siding was primed on both sides and then painted with linseed-oil based paint tinted with white lead.[5] The house was topped with a built-up Barrett Specification Roof, Type AA, and a bris-soleil was installed on the south façade.[6]

Standard Cotswold-type picture and ribbon windows manufactured by Hopeôs Windows were set in steel frames, which were in turn painted with a heavy shop coat of red lead and raw linseed oil paint and topped with a coat of gray metal paint.[7] The surrounds and sills were wood, and the glazing putty was made of ñpure linseed oil and pure whiting with an addition of 5% litharge.ò[8] ¼ò polished plate glass was used for the large picture windows in the living and dining rooms, while ¼ò ñpullò glass was used elsewhere.[9] Several types of

---

[3] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[4] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 31 and 32. Gropius, ñGropius House,ò 14.
[5] Gropius and Breuer, ñSpecifications,ò 35 and 44.
[6] Gropius, ñGropius House,ò 5.
[7] Gropius and Breuer, ñSpecifications,ò 21, 24 and 23. The specifications list Bri-Mar steel guard and Dereka metal paint as potential coating brands. All historic slides and more modern photographs show that the frames and wooden surrounds were painted the same shade of gray, but in a letter to a painter dated to 1956 Gropius writes that he ñshould like to keep the white paint [on the rusty window frames], as gray would not fit so wellò (Walter Gropius to David A. Price, October 09, 1956, Massachusetts).
[8] Ibid., 21 and 48.
[9] Gropius, ñGropius House,ò 15. The term ñpull glassò is used by Ise Gropius in her history of the house. Its exact meaning is unclear, but it probably refers to a type of glass that was less expensive than the polished

specialty glass were also used, including the Libbey-Owens-Ford Glass Companyôs ñribbedò variety and their fluted ñLouvrexò glass.[10] The former was oriented horizontally in the pantry, and the latter was horizontal in the first floor bathrooms and vertical in the entrance hall.[11] In addition, Owens-Illinoisô ñInsuluxò #407 11 ¾ò x 11 ¾ò glass blocks were formed into walls between the study and dining rooms and at the front entry ell.[12] They were set in Portland cement with expansion joints at jambs and heads and metal reinforcements in the larger mortar joints.[13]

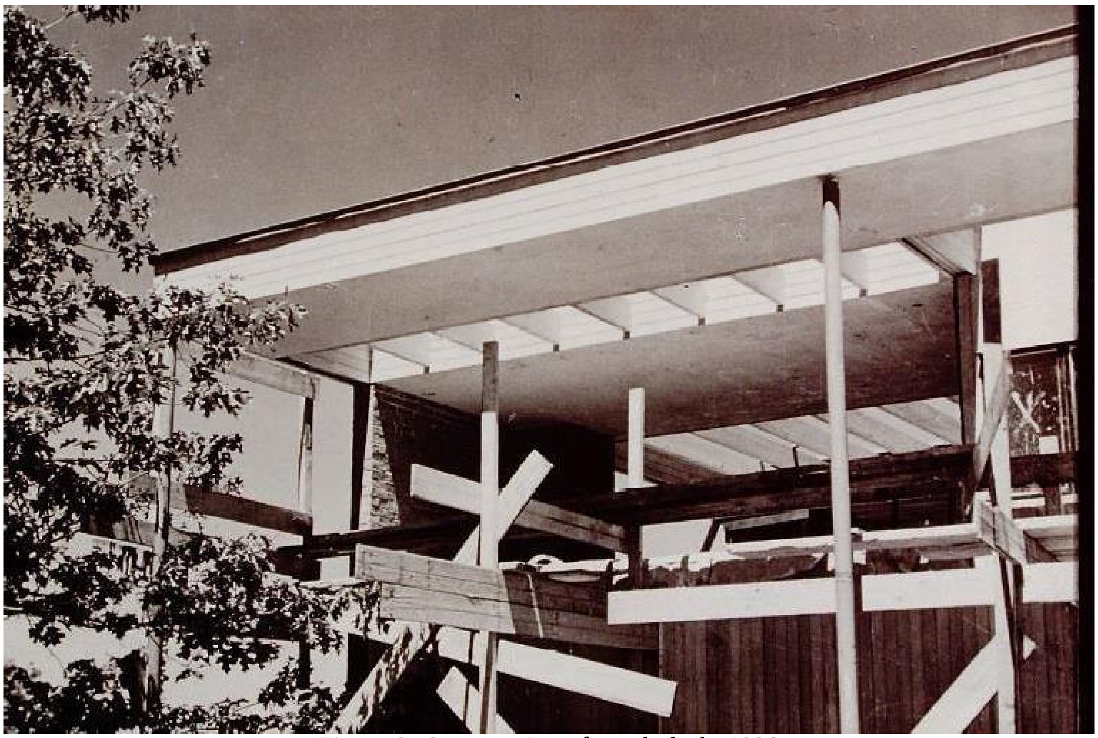


Figure 2: Construction of porch deck, 1938
Historic New England Archives, Binder of Slides

A screen porch extended from the south façade into the garden. Its screens were made of copper-bearing galvanized steel, and had electrically welded corners as well as 16-mesh, rustless copper netting.[14] The ceiling was finished with vermiculite plaster manufactured by the California Stucco Company, and it was held up by steel lally columns.[15] On the floor, bluestone slabs were set in 1 inch of concrete.[16] A marquee projecting asymmetrically from the front door towards the driveway was also supported by lally columns, and its original

plate glass. Libby Owens Ford ñAò Double Strength Glass or ñAò Quality Pennvernon Window Glass are both listed in the specifications (Gropius and Breuer, ñSpecifications,ò 48), and may be the brands of the ñpullò glass that Ise refers to.

[10] *Conservation Plan: Architectural Glass and Acoustical Plaster*, report, Property Care, Historic New England, Report, Gropius House: Lincoln, MA (New York, NY: Jablonski Building Conservation, 2016), 1.

[11] Ibid., 3.

[12] Ibid., 1.

[13] Ibid., 9.

[14] Gropius and Breuer, ñSpecifications,ò 21.

[15] Gropius, ñGropius House,ò 14.

[16] Gropius and Breuer, ñSpecifications,ò 18.

ceiling finish was likely stucco.[17] Gropius created a second outdoor living area in the roof deck, which was enclosed by the house at the north and east and open to the air at its south and west sides *(Figure 2)*.[18] Galvanized iron rails were soldered to the parapet flashing in these open areas.[19] The deckôs wearing surface was 1ò Trinidad Asphalt, and it was partially roofed with widely spaced wooden boards.[20] A steel spiral staircase manufactured by Duvinage Spiral Stair Company provided access to the porch deck from the north façade.[21] Another staircase, made of reinforced concrete and ñfinished with irregularly cut flagstone set in mortar and groutedò, was located at the east entrance by the kitchen.[22]

Other details of the buildingôs exterior include steel mesh reinforcing at concrete and slab outside the vestibule, and a 2ô x 2ô x 1ò metal grille set flush in the stone floor by the front steps.[23] R.I.W. Marine Cement and G.F. Dampproofing Coating were specified by Gropius as possible damp-proofing materials for application on the bottom of all the outside surfaces of the areaways and foundation walls, up to 2ò below their finished grade.[24]

Few major projects were carried out on the exterior of the building between its construction and the interpretive period, but there were several significant alterations. One of these was Gropiusôs decision to repaint the north wall of the roof deck pink due to the dazzling effect the original white color had on sunny days *(Figure 3)*.[25] Another was the replacement of the screen porch ceiling with a new material, as Gropius found that the original was easily damaged by water and therefore inappropriate for outdoor use.[26] The marquee ceiling finish was also likely replaced during this period for the same reason.[27]

[17] Gropius, ñGropius House,ò 14. ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[18] Gropius, ñGropius House,ò 11.
[19] Gropius and Breuer, ñSpecifications,ò 21.
[20] Ibid., 32. Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 25.
[21] Gropius and Breuer, ñSpecifications,ò 23.
[22] Gropius, ñGropius House,ò 14.
[23] Gropius and Breuer, ñSpecifications,ò 14 and 24.
[24] Ibid., 16.
[25] Walter Gropius, ñHow it Came to the Pink Color on the Porche Wall,ò (Waltham, MA: Historic New England Property Care Files).
[26] Walter Gropius to California Stucco Products of New England, Inc., July 11, 1955, Cambridge, Massachusetts.
[27] Walter Gropius to Carl M. Stiles, September 1, 1959, Massachusetts.

Figure 3: Pink wall of roof deck, 2002
RS ID #57076

Character-Defining Traits in the Interpretive Period:
The exterior of the Gropius House was designed to fit in with its traditional New England surroundings while simultaneously reflecting Bauhaus principles. This is the reason that it is framed in wood, which surprised those who believed all modern architecture to be constructed of concrete and metal.[28] The white wooden siding and screen porch also mimicked features that the Gropiuses had seen on older houses around their new home, yet with distinct differences.[29] For example, rather than placing the porch at the buildingҫs front façade after the example of most New England houses, Gropius extended it into the back garden *(Figure 4)*.[30] His wife Ise wrote that he made this decision because front porches had become less pleasant after the invention of cars, which created constant noise and exhaust in the street.[31] The new location also allowed light to stream into the living room through large, unobstructed front windows.[32]

[28] "Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset," *Boston Evening Transcript*, January 07, 1938.
[29] James Ford and Katherine Morrow Ford, The Modern House in America (New York, NY: Architectural Book Pub., 1940), 41. Gropius, ñGropius House,ò 6.
[30] Ibid.
[31] Ibid.
[32] Ibid.

Figure 4: South façade, 1966
Historic New England Archives, Binder of Slides

In addition, the pink color chosen for the siding on the north wall of the roof deck was identified by Bauhaus artists as the best background for their work at exhibitions.[33] This nod to modern architecture stood out next to the more traditional white color, which in turn contrasted with the general shape of the building. Gropius believed that roof design was a more significant consideration for modern architects due to the increase in air travel, so he installed a flat roof on his house in order to facilitate its use as an additional living space.[34] In this way the roof deck was formed. The modern style of the house was also enhanced by the marquee, which extended east at an angle from the front door to the driveway. Bauhaus buildings did not conform to any type of symmetry, but instead were meant to develop organically as need demanded.[35] In this case, the marquee provided a connection between the driveway and the entrance of the house *(Figure 5)*.[36]

[33] Gropius, ñPink Color.ò
[34] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 274.
[35] Ise Gropius (lecture, Massachusetts, 1939), 17.
[36] Anthony, ñThe Massachusetts Home,ò 21-22.

Figure 5: Gropius House from the north, circa 1973-74
Historic New England Archives, Binder of Slides

The windows also reflected typical aspects of Bauhaus design. Gropiusôs installation of large, polished plate glass windows allowed inhabitants of the house to enjoy views of the outdoors that he had framed intentionally.[37] More generally, the connection between the landscape and the interior was an aspect of design that Gropius considered important.[38] The ribs and flutes of the specialty glass also accentuated the linear style of the building, while the glass block walls created the sense of ñvolume without solidityò that was highly valued within the Bauhaus movement.[39] However, none of this glass was custom made.[40] Instead, it made up some of the numerous features within the house that Gropius used to prove the worth of stock materials.[41]

Functionalism guided the design of the Gropius House exterior, in addition to that of many other Bauhaus buildings.[42] Gropius avoided the use of ornamentation of any kind, and installed only features that had a purpose. For example, the spiral staircase on the north façade allowed his daughter Ati and her friends to enter her room without disrupting her parents or the maid in other parts of the house.[43] Gropius believed that flat roofs were less likely to require repairs because they did not need gutters and were not constantly buffeted

[37] Gropius, ñGropius House,ò 4.
[38] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[39] Jablonski, *Conservation Plan*, 4 and 5.
[40] Ibid., 1.
[41] Gropius, ñGropius House,ò 5.
[42] Gropius, ñSmall House,ò 270.
[43] Gropius, ñGropius House,ò 11.

by wind, so he considered them a practical choice *(Figure 6)*.[44] In addition, Ise Gropius wrote that the large windows in the living and dining rooms prevented the dazzling contrast created by windows against dark walls.[45] The light they emitted instead created a ñpleasantò atmosphere that was considered practical in itself for the sheer psychological satisfaction it provided.[46]

History of Conservation and Maintenance Practices:
The history of work on the exterior of the building is contained in the individual feature sections of this document.

Figure 6: Screen Porch Roof testing, 1996
Historic New England, Property Care Binders

Interventions
The history of work on the exterior of the building is contained in the individual feature sections of this document.

[44] Gropius, ñSmall House,ò 274.
[45] Gropius, ñGropius House,ò 9.
[46] Ibid. Anthony, ñThe Massachusetts Home,ò 25.

BIBLIOGRAPHY

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

Conservation Plan: Architectural Glass and Acoustical Plaster. Report. Property Care, Historic New England. Report. Gropius House: Lincoln, MA. New York, NY: Jablonski Building Conservation, 2016.

Ford, James, and Katherine Morrow Ford. *The Modern House in America*. New York, NY: Architectural Book Pub., 1940.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Ise. Lecture, Massachusetts, 1939.

Gropius, Walter. ñHow it Came to the Pink Color on the Porch Wall.ò Waltham, MA: Historic New England Property Care Files.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

Gropius to Carl M. Stiles. February 8, 1957. The Architects' Collaborative, Cambridge, Massachusetts.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.Walter

"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from Lynne M. Spencer. April 8, 1983. Massachusetts.

"Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset." *Boston Evening Transcript*, January 07, 1938.

Walter Gropius to California Stucco Products of New England, Inc. July 11, 1955. Cambridge, Massachusetts.

Walter Gropius to Carl M. Stiles. September 1, 1959. Massachusetts.

Walter Gropius to David A. Price. October 09, 1956. Massachusetts.

GROPIUS HOUSE EXTERIOR SIDING

Property Name: Gropius
Structure: Gropius House
Feature: Exterior siding
Original Material: Redwood
Original Color: White
1965-1969 Material: Redwood
1965-1969 Color: Benjamin Moore ñCloud Whiteò #967, based on 1995 paint analysis

RS ID #281044, 2016

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. This should be the continued upkeep approach and a patina of age or deterioration should be minimized.[1]

The Gropius House is clad in 7/8ò by 3 ¾ò shiplap redwood vertical wooden siding with 45° bevel detail on both of its edges. While Gropiusôs own purchase of an antifungal solution indicates that the paint covering of the siding may not have been in perfect condition even during the interpretive period, his attempts to return the feature to its original condition suggest that thorough maintenance ought to be carried out upon it frequently.[2] This means that the siding should be kept clean, crisp and well painted, and that if individual wooden members cannot be brought back to this condition they should be replaced. The removal of mold from the siding is thus a major priority.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] *Conservation Plan: Exterior Wood Siding, Gropius House, Lincoln, MA*, report, Property Care, Historic New England, Report, Gropius House: Lincoln, MA (New York, NY: Jablonski Building Conservation, Inc., 2016), 20.

Maintenance and Repair Protocols:
The exterior should be kept in good repair. Minor maintenance should occur on a regular basis. The exterior finishes have been prone to rapid biological growth. Studies completed in 2016 indicate that this growth responds only to vigorous cleaning. When evidence of work becomes obvious, the replacement of finishes and materials should be considered in order to maintain the clean lines of the houseȇs original design.

<u>Paint:</u>
Material notes: Current paint color used on the exterior is (or is matched to) Benjamin Moore ñCloud Whiteò (967, Classic Color Collection), as identified by paint analysis in 1995. The south face of the north wall on the second floor deck is pink. This color has been analyzed and matched to Benjamin Moore ñTippy Toesò (1282). Paint color should be replaced in kind.

- Maintenance protocols:
  - Inspect the condition of the paint annually paying specific attention to biological growth.
  - Frequent blooms of biological growth have resulted in need of annual or bi-annual cleaning with D/2 Biological Solution[3]
  - Diluted bleach may only be used where there is no runoff (screen porch), as it is effective but dangerous to vegetation and masonry[4]
  - Spot maintenance of failing paint should occur in between major painting projects. Clean areas of cracked or peeling paint with D/2 before rinsing, sanding, and recoating.[5] Scrape if paint has become detached.[6]
- Repair protocol
  - The standard specification for painting can continue to be used, emphasizing brush application for the final coat.
  - Paint materials have shifted from oil to latex, and while these changes have currently been approved modern latex has the potential to present a different aesthetic appearance over oil. Future consideration may be made about switching from latex to a different type of paint that more accurately reflects the aesthetics of the paint.
  - Choose a coating with both mildewstatic pigment such as zinc oxide and mildewcide additive.[7] Avoid products containing titanium dioxide and aftermarket mildewcide additives, as they will not inhibit growth and they are physically and aesthetically poor.[8] Select high-quality, semi- or high-gloss coatings because they have smoother surfaces. Higher quality paints generally contain no food for biological growth.[9]
  - Previous removal of the paint layers has minimized the need to be selective about the preparation process, but the wall and window trim inside the

[3] Jablonski, *Conservation Plan*, 20.
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] Ibid.

screen porch area should be protected because these areas still retained historic paint layers as of 1995.[10]

- There is a point where the evidence of paint layering becomes obvious and visually distracting to the clean aesthetic that should be dominant. The full replacement of paint should be considered when there are a multitude of visible layers. It is expected that around six layers of paint a more aggressive preparation phase should be undertaken to prepare the building for paint. Consultation with the interpretive task force would be advised starting around layer four to determine if the paint layering is not distracting to the eye.

Cladding:

Material notes: The Gropius House is clad in 7/8ò by 3 ¾ò shiplap redwood vertical wooden siding with 45° bevel detail on both of its edges. Material replacement, when necessary, should be in-kind, matching species, dimensions and detailing.

- Maintenance protocol
  - Maintain the paint finish. As long as there is a solid paint finish, there is no specific maintenance protocol for the wood itself.
- Repair protocol:
  - Minor intervention: use of filler or epoxy for minor cracks or areas of deterioration
  - Medium intervention: Defined as less than 50% loss of individual siding board and no damage to the substrate. In kind splice repairs are approved for areas of minimal damage. This involves splicing new material to original using 45° bevel cuts. New material to be fastened to substrate using 6d box nails (smooth head, hot dipped galvanized).
  - Major intervention: Defined as more than 50% loss of individual siding board and no damage behind the cladding. Complete replacement in kind should be considered.
  - Note: If there is damage to the substrate or framing, 100% removal of select siding boards may be required; those boards should be removed carefully so as to avoid full replacement.
  - Note: Although individual splice repairs are acceptable there is a point where the evidence of repairs and maintenance becomes obvious and visually distracting to the clean aesthetic that should be dominant. The full replacement of materials should be considered when there are a multitude of repairs.

[10] "Gropius House Painting," Linda Willett to J. Nylander, R. Nylander, T. Cederholm, D. Bowers, B. Pfeiffer, P. Gittleman, and C. Mayes, June 14, 1995, Massachusetts.

Original Construction and Evolution:
During its construction in 1938, the Gropius House was clad in 7/8ò by 3 ¾ò shiplap redwood vertical wooden siding with 45° bevel detail on both of its edges.[11] The siding was primed on both sides and then painted with linseed-oil based paint tinted with white lead.[12]

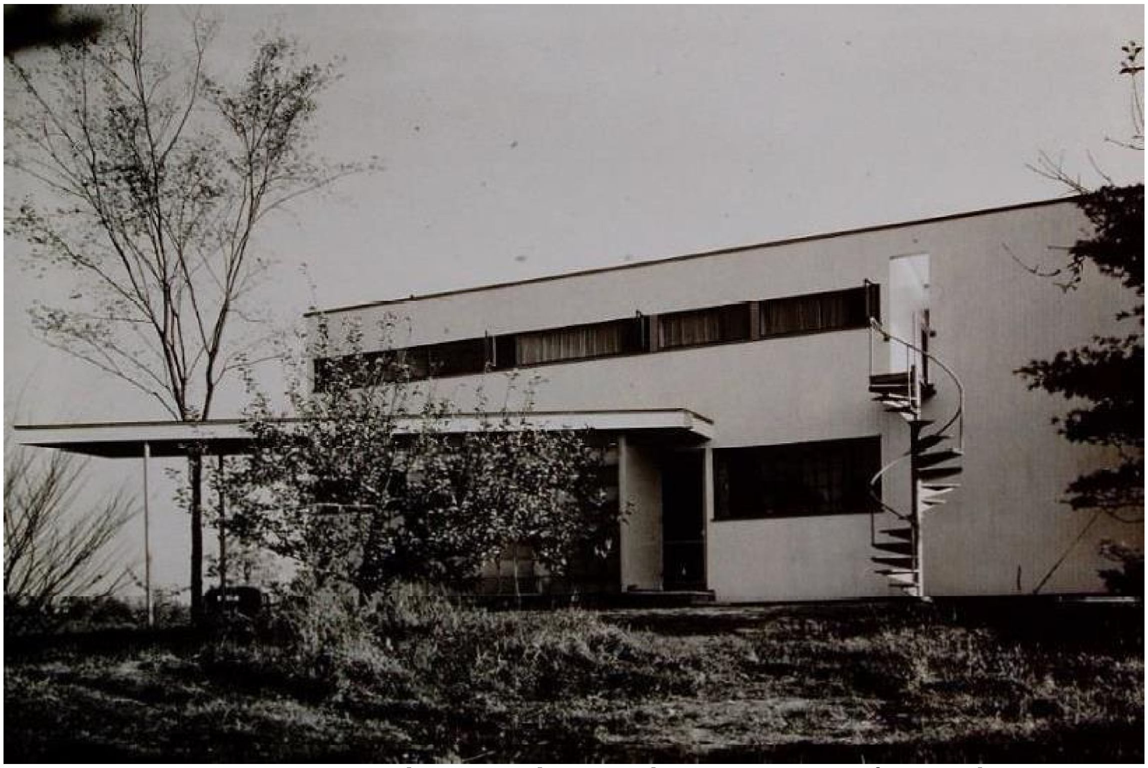


Figure 2: Gropius Residence, Lincoln, Massachusetts, 1938: View from North
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
Invoices for products likely to have been used on the siding in the 1960s suggest that Gropius was attempting to retain the featureôs original character-defining crispness during the houseôs interpretive period (1965-1969).[13] The color of the vertical siding is a major element of the clean Bauhaus style, and it also contributes to the houseôs personification of ñthe sober, clear, straightforward New England spirit.ò[14] According to a history of the building written by Gropiusôs wife Ise, the wooden cladding was intended to marry a resource typically used in New England vernacular buildings with Gropiusôs Bauhaus architectural design.[15] The color was Gropiusôs attempt to fit his home ñinto the order of

[11] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 35.
[12] Gropius and Breuer, *Specifications*, 44.
[13] Jablonski, Conservation Plan, 4.
[14] Gropius, ñGropius House: A History,ò 20.
[15] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 3. While wood was a typical material used in traditional New England architecture, the specific species of redwood was not.

white Colonial houses in the vicinity without imitating themò.[16] In order to maintain this aspect of the buildingôs significance, the siding was again painted with linseed-oil based paint tinted with white lead in 1960.[17] Ise wrote in 1977 that this repainting ought to take place once every four years.[18] Also in 1960, Gropius purchased a cleaning product called Retardol that was likely used as an additive to the paint being applied to the siding. The main ingredient in Retardol is pentachlorophenol, which is a fungicide.[19] This further highlights the importance of the houseôs stark white color. The only area of the siding that is not white is the north wall of the porch deck, which was painted ñBauhaus pinkò in 1949.[20] The Gropiuses changed the color because the white was dazzlingly bright on sunny days.[21] German painter Lyonel Feininger supervised the work.[22]

Figure 3: Gropius House from the west, 1968
Historic New England Archives, Binder of Slides

[16] James Ford and Katherine Morrow Ford, The Modern House in America (New York, NY: Architectural Book Pub., 1940), 41.
[17] Allan A. Kennedy & Son Invoice (Waltham, MA: Historic New England Property Care Files, 1960).
[18] Gropius, ñGropius House,ò 20.
[19] Jablonski, Conservation Plan, 4.
[20] Walter Gropius, ñHow it came to the pink color on the porche wall,ò (Cambridge, MA: Walter Gropius, Architect F.A.I.A.).
[21] Ibid.
[22] Ibid.

History of Conservation and Maintenance Practices:
According to microscope analyses undertaken in 1993 and 1995, every coat of paint on the siding has been white.[23] In his letters Gropius expressed an intention to repaint the house in the springs of 1946, 1949, and 1956, but there is no evidence to prove that this work actually happened.[24] Another possible exterior painting date is 1966.[25] The years that Walter or Ise Gropius certainly did have the house repainted include 1955, 1960, 1971, and 1979.[26]

The four oldest layers were tempera paints with zinc, which is a mildew retardant.[27] The layers had survived relatively intact by the time of investigation, but caused major adhesion issues in the paints that followed. The Retardol applied in 1960s caused the redwood to soften, negatively impacting adhesion.[28] The clapboards were scraped and sanded in 1982, and mildew was washed from their surfaces.[29] They were then painted with one coat of oil primer and one coat of oil gloss Pratt & Lambert paint.[30]

The siding was analyzed and repainted again in 1986, but this layer began to peel and bubble within the year.[31] In 1987 peeling paint was noted specifically on the east façade and at the roof deck.[32] The following year a section of wood was reported missing from the area under the downspout near the porch door.[33] Despite a further coat of paint in 1990, the condition of the finish was still poor in 1992 when it underwent further analysis by Hancock Paint and Varnish. The company hypothesized that the peeling was being caused by moisture, which in turn came about due to the lack of a vapor barrier under the first floor, inadequate ventilation, buildup of old paint, and the fact that the house was closed during the winter.[34] They recommended the cleaning, scraping, sanding and priming of the siding, along with the installation of a moisture barrier and a dehumidifier.[35]

---

[23] *Gropius House Exterior Painting and Paint Analysis: North Elevation Siding,* report (Boston: Society for the Preservation of New England Antiquities, 1993), 1. Doreen Alessi, *Gropius Exterior Paint Color Analysis*, report (Boston: Society for the Preservation of New England Antiquities, 1995). The latter is more specific in its description of the paint layers. The earliest colors were slightly yellow off-whites, and the later ones were described as creamy whites.
[24] Howard E. Custance to Walter Gropius, September 27, 1949, Custance Brothers, Inc., Lexington, Massachusetts.
[25] Walter Gropius to Nicolas Olivio, September 22, 1966, Massachusetts.
[26] Walter Gropius to David Price, Jr., April 20, 1955, Massachusetts. Walter Gropius to John H. Kennedy, August 08, 1960, Massachusetts. ñHouse of Walter Gropius: Yearly Expensesò (Boston: Historic New England Archives, 1971). Jerome T. Belcastro Painting & Paperhanging Invoice (Waltham, MA: Historic New England Property Care Files, 1979).
[27] *Paint Analysis*, report, 1.
[28] Ibid., 1 and 2.
[29] Richard H. DuPont Invoice (Waltham, MA: Historic New England Property Care Files, 1982).
[30] Ibid.
[31] Society for the Preservation of New England AntiquitiesôConservation Center Invoice (Waltham, MA: Historic New England Property Care Files, 1986). Peter Connolly Invoice (Waltham, MA: Historic New England Property Care Files, 1986).
[32] ñExterior,ò (Waltham, MA: Historic New England Property Care Files, 1987).
[33] "Gropius House," Ellen to Gay Wagner, April 26, 1988, Massachusetts.
[34] "Gropius House," Sal J. Giglio to Pat Ronan, April 20, 1992, Hancock Paint & Varnish Company, Norwell, Massachusetts.
[35] Ibid.

More analytical work in 1993 found that water blisters and discoloring in the lead-based and modern paints that followed the tempera layers caused adhesion issues, and improper cleaning of dirt and biological growth between paint layers exacerbated these problems.[36] Several different methods of repainting were carried out on the siding in test patches, and only the finish applied to a space completely scraped of older paint and primer lasted into 1994.[37]

Figure 4: Siding condition, 1996
Historic New England, Property Care Binders

In 1996 several approaches to removal of paint layers were tested, and the siding on the east elevation and under the sash extending to the front door was removed for chemical stripping.[38] Its surfaces were then prepared for paint with a wash and light sanding.[39] Finally, it was painted with two coats of primer and two coats of finish paint and reinstalled in 1997.[40] In 1998 the siding around the north windows, above the porch, the marquee, the main roofs, and beneath second story porch deck had to be removed for window and roof repairs, so they were stripped and repainted as well.[41] The same process was carried out on

---

[36] *Paint Analysis*, report, 1.
[37] Fred O'Connor to Frank Thompson, June 12, 1994, Massachusetts.
[38] *Gropius House: Exterior Paint Project 1996*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1996), 1 and 3.
[39] Ibid., 3.
[40] *Gropius House Siding Painting*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1997).
[41] ñSpecifications, Division 6: Wood, Finish Carpentryò (Waltham, MA: Historic New England Property Care Files, 1998), 1.

the west elevation siding during window repairs in 2001, but with the addition of a consolidant referred to as ñSpecial Sauceò that includes boiled linseed oil, a known mold medium.[42]

Figures 5 and 6: Exterior paint is stripped, 1998
Historic New England, Property Care Binders

In 2007 the siding was cleaned with D/2 solution in an attempt to kill accumulating biological growth, but the problem returned only a month later.[43] The next year an antifungal treatment was used. In 2014 the exterior was cleaned using Zinsser JOMAX®, but mold growth was evident by the end of the year on all washed surfaces.[44] The pink wall and white walls of the deck were washed and repainted. The mold growth of the pink wall has been less visible since 2014, but the white walls clearly showed a return of the mold by the end of 2014. In 2016 a conservation plan for the preservation of the siding was completed by Jablonski Building Conservation, Inc. (JBC), and included the results of new test patches for methods of removing biological growth *(Figure 7)*.[45] While the cleaning solutions mostly did work, the siding was moldy again six months later. The only areas that remained clean are likely to have been primed with a product containing zinc.

[42] ñSpecifications, Division 6: Wood, Finish Carpentryò (Waltham, MA: Historic New England Property Care Files, 2001), 1.
[43] ñExterior Cleaning and Trellis Paint,ò Historic New England Property Care Electronic Database of Historical Projects, 2008.
[44] Goodhue Painting Invoice (Waltham, MA: Historic New England Property Care Files, 2008).
[45] Jablonski, Conservation Plan, 14-19.

Figure 7: Ed Fitzgerald of JBC tests cleaning solutions for the siding, 2015
RS ID #265422

Interventions

2016: Interim conservation plan for the siding completed by Jablonski Building Conservation, Inc. (JBC), including the testing of different ways to kill the biological growth

2014: Siding cleaned (Zinsser JOMAX®). Pink wall repainted; white wall inside screen porch repainted.

2008: Antifungal solution applied to siding

2007: Siding is cleaned with D/2 solution in order to kill biological growth causing discoloration of its surface. Growth returns within a month.

2001: Siding on west and south elevations removed, stripped, repainted, and reinstalled

1998: Siding around north windows, above porch, marquee, and main roofs, and beneath second story porch deck had to be removed during window and roof repair. Removed siding was stripped, painted, and reinstalled.

1997: Primer applied to all surfaces and siding reinstalled

1996: Siding on east elevation and under sash extending to front door removed, stripped, and repainted. Tests carried out on north elevation for paint coatings removal techniques.

1995: Paint analysis carried out

1994: After one year, all test patches applied in 1993 had failed except the one applied on a surface completely scraped of old paint layers.

1993: Paint analysis carried out, including repainting in test patches. Single layer of latex applied to siding as temporary cosmetic solution to peeling.
1992: Paint still peeling. Analysis of moisture problems carried out; recommendations made.
1990: Siding repainted
1989: Paint still blistering on east wall
1988: Exterior paint still blistering and peeling. Siding repainted. Wood under downspout near porch door missing.
1987: Paint peeling and bubbling on east façade and porch deck
1986: Siding repainted. Paint analysis carried out on exterior.
1982: Siding repainted
1979: Siding repainted
1971: Siding scraped, sanded, and primed. Finish paint applied to body and trim.
1966: Letter from Gropius references exterior paintwork that had been badly executed, which suggests that the house had been repainted that spring.
1960: The house is repainted. Retardol (fungicide) is purchased by Gropius and probably applied to siding as a paint additive.
1956: Gropius expresses his intention to have the house exterior repainted in the spring
1955: Loose paint scraped and touched up; siding painted with two coats of lead and oil point. Based on description, it seems possible that this was the delayed completion of the work proposed in 1949.
1949: Proposal for scraping and touching up areas with loose paint, and for painting entire exterior with two coats of lead and oil paint. No evidence to confirm that the work was carried out.
1946: In a letter, Gropius expresses his intention to have the house exterior repainted in the spring

BIBLIOGRAPHY

Alessi, Doreen. *Gropius Exterior Paint Color Analysis*. Report. Boston: Society for the Preservation of New England Antiquities, 1995.

Allan A. Kennedy & Son Invoice. Waltham, MA: Historic New England Property Care Files, 1960.

Conservation Plan: Exterior Wood Siding, Gropius House, Lincoln, MA. Report. Property Care, Historic New England. Report, Gropius House: Lincoln, MA. New York, NY: Jablonski Building Conservation, Inc., 2016.

ñExterior.ò Waltham, MA: Historic New England Property Care Files, 1987.

ñExterior Cleaning and Trellis Paint.ò Historic New England Property Care Electronic Database of Historical Projects. 2008.

Ford, James, and Katherine Morrow Ford. *The Modern House in America*. New York, NY: Architectural Book Pub., 1940.

Fred O'Connor to Frank Thompson. June 12, 1994. Massachusetts.

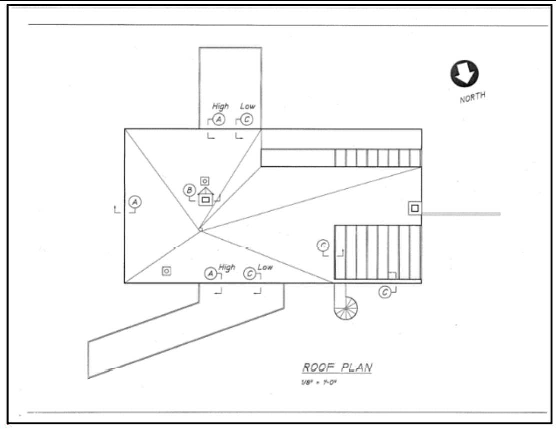
Goodhue Painting Invoice. Waltham, MA: Historic New England Property Care Files. 2008.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. ñHow it came to the pink color on the porch wall.ò Cambridge, MA: Walter Gropius, Architect F.A.I.A.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
"Gropius House." Ellen to Gay Wagner. April 26, 1988. Massachusetts.
"Gropius House." Sal J. Giglio to Pat Ronan. April 20, 1992. Hancock Paint & Varnish Company, Norwell, Massachusetts.
Gropius House: Exterior Paint Project 1996. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1996.
Gropius House Exterior Painting and Paint Analysis: North Elevation Siding. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1993.
"Gropius Painting." Linda Willett to J. Nylander, R. Nylander, T. Cederholm, D. Bowers, B. Pfeiffer, P. Gittleman, and C. Mayes. June 14, 1995. Massachusetts.
Gropius House Siding Painting. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1997.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñHouse of Walter Gropius: Yearly Expenses.ò Boston: Historic New England Archives, 1971.
Howard E. Custance to Walter Gropius. September 27, 1949. Custance Brothers, Inc., Lexington, Massachusetts.
Conservation Plan: Exterior Wood Siding, Gropius House, Lincoln, MA. New York: Jablonski Building Conservation, Inc., 2016.
Jerome T. Belcastro Painting & Paperhanging Invoice. Waltham, MA: Historic New England Property Care Files, 1979.
Peter Connolly Invoice. Waltham, MA: Historic New England Property Care Files, 1986.
Richard H. DuPont Invoice. Waltham, MA: Historic New England Property Care Files, 1982.
Society for the Preservation of New England Antiquitiesô Conservation Center Invoice. Waltham, MA: Historic New England Property Care Files, 1986.
ñSpecifications, Division 6: Wood, Finish Carpentry.ò Waltham, MA: Historic New England Property Care Files, 1998.
ñSpecifications, Division 6: Wood, Finish Carpentry.ò Waltham, MA: Historic New England Property Care Files, 2001.
Walter Gropius to David Price, Jr. April 20, 1955. Massachusetts.
Walter Gropius to John H. Kennedy. August 08, 1960. Massachusetts.
Walter Gropius to Nicolas Olivio. September 22, 1966. Massachusetts.

Gropius House Roofs, Gutters, and Downspouts

Property Name: Gropius
Structure: Gropius House
Feature: Roofs, Gutters, and Downspouts
Original Material: Copper, tar, and gravel (also fir, iron, brass, building paper, felt, asphalt, and lead)
Original Color: Gray
1965-1969 Material: Copper, tar, and gravel (also fir, iron, brass, building paper, felt, asphalt, and lead)
1965-1969 Color: Gray



Roof plan, Simpson, Gumpertz, and Heger, 1990s

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

The form of the flat roof must be retained in any future preservation efforts at the Gropius House, as Gropius believed it to be representative of roofs in the future. The flashing, surface, and structure should be kept in good repair in order to protect the rest of the house and its collections.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
The built up asphalt roof of the Gropius House appears to have been troublesome from the start. The archival record is filled with references to roof repairs or fixing troublesome details. In light of these deficiencies, there have been two detail changes to the roof since the house was acquired by Historic New England (see Appendix A for an analysis of the detail changes from the last roofing project). These repairs, the most recent in 1998, appear to have been effective and do not appear to change the overall aesthetic of the building and so any roof work should be in-kind matching the details of the main roof.

- Maintenance Protocols
  - Inspect the roof system annually looking for areas of potential failure such as blisters, areas of exposed asphalt, ponding, deteriorating or cracking asphalt, damage to the flashing, and evidence of interior leaks.
  - Inspect roof drains and scuppers and ensure they are clear before any major rain or snow storm.
  - After snow accumulation of 8 inches or more, carefully clear snow off roof. Leave about one inch of snow in order to avoid damaging roof surface.
  - Note: a structural analysis of the roof and load would be helpful for understanding how much snow the roof can handle.
- Repair Protocols
  - If minor damage is discovered, work with a roofing contractor on repair of the system elements.
  - Since new roof material is not visible, it would be acceptable to complete any future replacements in keeping with Gropiusôs Bauhaus principles by upgrading to next generation of built up flat roof
  - The functionality of ñnewò cornice and flashing material appears to be a successful detail change however this should be assessed again at the time of the next roof replacement.

Original Construction and Evolution:
The specifications for the Gropius House call for a flat Barrett Specification Roof, Type AA.[2] Two-inch blocking ñof normalò thickness was used to create a slight incline in the center of the roof, where a twenty-ounce copper tube was attached to a conductor pipe with either a brass ferrule or caulking ring.[3] The drain was fitted with a ñno. 14 gauge wireò, a pan, and a loosely-set ñbasket typeò strainer.[4] The sheet metal was soft sixteen-ounce copper, coated in lead at areas where staining was likely.[5] Those over twelve inches wide were fastened by two-inch by three-inch cleats and secured to the roof with copper, flat-headed nails, while smaller sheets were fastened by nails alone.[6] The edges of all sheets were tinned on both sides with heavy soldering coppers.[7] Where surfaces were flashed, they were first covered with building paper weighing at least six pounds per eight square

---

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 32.
[3] Ibid., 34 and 28.
[4] Ibid., 28.
[5] Ibid., 25.
[6] Ibid., 26 and 27.
[7] Ibid., 27.

feet.[8] The flashing itself was copper, and it was secured to all intersections and openings of roof surfaces with one-inch to one-and-a-quarter-inch by one-eighth-inch brass edge strips and twelve-inch brass screws.[9] It was then ñheavily coatedò with pitch and covered with two layers of felt.[10] The wearing surface was one-inch Trinidad asphalt topped with tar and gravel, and a gravel stop projected four inches onto the roof.[11] A brise soleil was installed on the south façade to help regulate the climate of the house by preventing stagnant heat from sitting under the cantilevered roof on hot days.[12] It was constructed like a grill to allow fresh air to reach the windows of the second floor.[13]

Many repairs to the roof were carried out between the construction of the house and the interpretive period, particularly above the porch and the marquee. However, they were of a practical nature and did not fundamentally change the feature. There is no evidence that any of the materials used in these early repairs were different from those originally specified, but it is possible that there is simply no record of such changes.

Figure 2: Construction of the Gropius House, circa 1937-38
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:

[8] Ibid., 25.
[9] Ibid., 26 and 28.
[10] Ibid., 26.
[11] Ibid., 32 and 28.
[12] Ise Gropius (lecture, Massachusetts, 1939), 19.
[13] Ibid.

Despite warnings from his builder that a flat roof would not be sound during New Englandôs snowy winters, Gropius insisted upon the style that he claimed had ñsuperseded the old tiled or slated sloping roofò as early as 1931 *(Figure 3)*.[14] For Gropius its advantages were related to Bauhaus principles of functionalism, which said that ñthe nature of a building should determine the technical means to be applied, and the latter, in turn, determine the shape of a buildingò.[15] The flat roof allowed attic rooms to be a more practical shape and provided more useful space on top of the house.[16] Gropius argued that ñthe existence of modern air routes confronts the builders of dwelling houses with the new demand to give proper attention to the birdôs-eye view aspect of the buildingsò, and that rooftop gardens were a feature of the future.[17] The flat roof of the Gropius House created no wind resistance, and would therefore theoretically require fewer repairs.[18] It also required no gutters.[19] Instead, it slanted slightly towards a drain at its center, where snow would melt from the heat of the house.[20] An overhang was designed with climate in mind; it was ñcalculated to exclude the sun entirely in the rooms from May to Septemberò.[21] In these ways the form of the roof was determined by practicality, consistent with Bauhaus principles.

Figure 3: North façade, including the flat marquee roof, 1965

[14] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 5. Gropius, ñSmall House,ò 273.
[15] Gropius, ñSmall House,ò 270.
[16] Ibid., 274.
[17] Ibid.
[18] Ibid.
[19] Ibid.
[20] Gropius, ñGropius House,ò 5.
[21] Ibid., 8.

Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
According to a 1946 letter, the areas over the porch, marquee, and southern overhang had been leaking since 1942.[22] Gropius wrote that the water was coming in through the seams, and that the problem was especially bad during colder weather.[23] Repairs to the flashing above the porch and marquee were included on a 1945 to-do list, and in 1947 felt-stripping and flashing repairs were carried out.[24] The exact areas in which this work was done are somewhat uncertain, but based on Gropiusôs complaints they are likely to have been spots over the marquee, porch and overhang.

Figure 4: South façade, 1944
Historic New England Archives, Binder of Slides

A new drain pipe must have been included in the 1947 work as well, because Gropius wrote to the Barrett Company the following year to say that a pipe had not been installed tightly enough.[25] Tar was able to drip though, and the mouth of the drain was too high.[26] Gropius wrote again several times in 1949 and 1950 to remind the company of the unresolved problems with the marquee and porch roofs.[27] He wrote another similar letter in

[22] Walter Gropius to The Barrett Company, June 13, 1946, Massachusetts.
[23] Ibid.
[24] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945). H. L. Foote to Walter Gropius, April 26, 1947, The Barrett Division, Malden, Massachusetts.
[25] Walter Gropius to Thomas Mullane & Sons, December 18, 1948, Massachusetts.
[26] Ibid.
[27] Walter Gropius to Thomas Mullane & Sons, February 15, 1949, Massachusetts. Walter Gropius to H. L. Foote, June 15, 1949, Massachusetts. Walter Gropius to The Barrett Division, May 22, 1950, Massachusetts.

1955, this time including ñone spot over the main roofò within his list of damaged areas.[28] However, it is unclear whether these problems were new or if the ones reported between 1948 and 1950 had simply never been repaired. The issues were finally addressed in 1955, but they quickly returned. The new surface of the porch roof was ñone tar blister after anotherò, and by December 1956 water was penetrating into the porch ceiling.[29] The problem was finally remedied in 1957, when it was found to stem from the flashing rather than the roof itself.[30]

In 1967 a roof leak was repaired and flashing and roofing were installed, but no details about this work are available.[31] Two years later an engineering firm inspected the porch roof and expressed intentions of installing an interior drain there to prevent water from accumulating.[32] They also proposed the addition of insulation in order to raise the interior level of the roof and facilitate draining, in the case that the interior drain was not feasible.[33] A 1970 invoice from the contractor hired by the engineers suggests that either the drain or the extra insulation were installed, but it is unclear what their work actually entailed.[34]

Many roof repairs were undertaken throughout the 1970s. After drainage was improved on the porch, another project included the re-soldering of broken joints, re-nailing of loose elements, cementing and membraning of the nailing, and re-graveling of open areas including the main roof.[35] The following year, work involved opening up the roof and re-nailing it with stronghold nails, cementing and membraning the nailing, soldering the strips over broken joints, and re-graveling the cleat in areas of leakage.[36] Soon after, the copper gravel cleat was repaired along with the marquee flashing. Mrs. Gropius also received a proposal for plaster and painting repairs on the overhang of the south elevation, but she was unhappy with the contractorsô high quote and it is unclear whether she went through with the work.[37]

More projects were completed in 1972, including the opening, re-nailing, cementing, membraning, and re-graveling in of a cleat on the left side of the marquee from the drain to

---

Walter Gropius to Mr. Haskell, October 31, 1950, Massachusetts.

[28] Walter Gropius to The Barrett Division, April 21, 1955, Massachusetts.

[29] Walter Gropius to Lawrence Hackett, August 5, 1955, Massachusetts. Walter Gropius to Lawrence Hackett, December 27, 1955, Massachusetts.

[30] L. H. Hackett to Walter Gropius, July 8, 1957, Barrett Division Allied Chemical & Dye Corporation, Malden, Massachusetts.

[31] A. Belanger & Sons, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, October 23, 1967). A. Belanger & Sons, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, September 29, 1967).

[32] "Roof on Porch, Gropius Residence," Werner H. Gumpertz to Ise Gropius, November 7, 1969, Simpson Gumpertz & Heger, Inc., Cambridge, Massachusetts.

[33] Ibid.

[34] A. Belanger & Sons, Inc. Invoice, (Boston, MA: Historic New England Archives, Family Papers, Section IV, March 25, 1970).

[35] Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1970).

[36] Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1971).

[37] Ise Gropius to John, March 17, 1971, Gropius House, Lincoln, Massachusetts.

the first joint of the cornice, as well as the cleaning of two downspouts and conductors.[38] In 1973 there were repairs to leaks in the roof above the master bedroom.[39] Two years later, the solderings on the flashings were repaired from the front corner of the chimney to the rear corner of the right wall.[40] A new copper drain pan was furnished and installed at the same time.[41] The roof over the living room was fixed three times in the spring of 1977, and twice between January and March of 1978.[42] The ñmainò roof was repaired in 1981, but in 1983 the need for more work was noted.[43]

The roof was replaced in 1986 as part of a Massachusetts Historical Commission project carried out by the Society for the Preservation of New England Antiquities (SPNEA).[44] While documents suggest that this work included the flashing, a 1992 analysis found that it had been repaired rather than replaced.[45] The following year a downspout was reported to be cracked at the first-floor level, but no further details were given.[46] By 1991 damaged flashing and clogged gutters were contributing to rain runoff issues.[47] A roof repair was proposed and some work was carried out, but it is unclear what exactly it entailed.[48]

[38] Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, April 17, 1971). Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, December 16, 1971).
[39] Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1973).
[40] Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1975).
[41] Ibid.
[42] C. P. Moody Invoice, (Waltham, MA: Historic New England Property Care Files, 1978).
[43] Gropius House Maintenance Chronology: 1981-1988, (Waltham, MA: Historic New England Property Care Files, 1981). "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from Lynne M. Spencer, April 8, 1983, Massachusetts.
[44] Gilbert & Becker, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1986).
[45] Gregory K. Clancey, *Analysis of Repair and Maintenance Needs at the Walter Gropius House: Lincoln, Massachusetts*, report, Conservation Center, Society for the Preservation of New England Antiquities (1992), 9.
[46] ñExterior,ò (Waltham, MA: Historic New England Property Care Files, 1987).
[47] "Gropius Moisture Intrusion and Plaster Repair Problems," Frank Thompson to Greg Clancy, Tom Decatur, July 29, 1991, Massachusetts. ñSite Visit Form: Main House Survey,ò (Waltham, MA: Historic New England Property Care Files, 1991).
[48] G. F. Sprague & Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1991). ñSPNEA Interdepartmental Bill,ò (Waltham, MA: Historic New England Property Care Files, 1991).

Figure 5: Porch roof, 1990
Historic New England, Property Care Files

In 1992 an architectural conservator found that the flashing was original to the house, and he asserted that leaks through its joints were contributing to the houseǿs moisture problems *(Figure 6)*.[49] The following year an expert on coal tar roofing systems visited the house for another analysis. He agreed that the flashing needed to be replaced, but said that the roof itself would last a long time and only needed the application of a re-saturate.[50] He also recommended that the drains and scuppers on the porch roof be cleaned twice a year, and that strainers be installed on the canopyǿs drains.[51] Perhaps in response to this advice, the gutters cleaning was included on a budget lists for that year.[52] The flashing repairs were finally completed in 1994, but by the next year they had already failed.[53] The contractors returned to fix their mistakes in 1995, but their work was unsatisfactory again.[54] It is unclear whether or not they ever finished the job in manner acceptable to SPNEA.

[49] Clancey, *Repair and Maintenance*, 9.
[50] "Gropius Roof," Sarah Carroll to Greg Clancey, September 10, 1993, Massachusetts.
[51] Carroll, ñGropius Roof.ò
[52] Frank Thompson, ñMaintenance and Budget Recommendations for 1993,ò (Waltham, MA: Historic New England Property Care Files, 1993).
[53] Jeffrey Wallace to Steve and Tom Fay, May 4, 1995, Massachusetts.
[54] Jeffrey Wallace to Steve Fay, November 28, 1995, Massachusetts.

Figure 6: Solder joint of flashing, circa early 1990s
Historic New England, Property Care Files

The engineer Werner Gumpertz, who Mrs. Gropius had hired during earlier roofing projects, returned to the house the same year in order to analyze its current problems. In contrast to the roofing expertôs opinion, he said that sealants are ñhole fillersé not waterproofersò.[55] He recommended that the roof perimeter be raised in order to allow for drainage, that the fascia be removed in order to allow for investigation of the deck roof, and that metal cap flashing be used.[56] Finally, he suggested a technique called ñpondingò for finding the proper place for a drain.[57] There is no evidence that any of this work was carried out, but in 1996 Gumpertz returned with his engineering firm to conduct another investigation. This time he found that ñthe siding butts up against the curb in irregular cutsò, and that they needed to add to the curb in order to prevent water from leaking in.[58] He also noted that the slope to two drains on the marquee was poor, resulting in deterioration of the roof in that area.[59] One year later he reported that the porch roof framing had deflected downward, causing ponding on the roof.[60] He recommended that the framing be strengthened and that insulation be installed, and he also suggested the design

[55] *Gropius House: 1995 Work Report*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1995).
[56] Ibid.
[57] Ibid.
[58] Amy Geoffroy, *Gropius House Maintenance and Alterations History: 1938 to Present*, report, Property Care (MA: Society for the Preservation of New England Antiquities, 1997).
[59] Ibid.
[60] "Re: Gropius House Repairs, Lincoln, MA," Brent A. Gabby to Linda Willett, April 11, 1997, Simpson Gumpertz & Heger, Inc., Arlington, Massachusetts.

of new flashing.[61] Replacement of the roof, flashings, and gravel stop was completed in 1998, and a rain leader near the front door was power snaked around the same time along with two drains *(Figure 7)*.[62]

Figure 7: New roof from west, 1999
Historic New England, Property Care Files

Interventions

1998: Replacement of roof, flashings, and gravel stop completed. A rain leader near front door and two drains power snaked.

1997: Gumpertz recommended inspection and strengthening of porch roof framing, which was deflecting downward and causing ponding. Also suggested installation of insulation and new flashing.

1996: Mrs. Gropiusõs engineer, Werner Gumpertz, conducted second investigation and provided more advice.

1995: 1994 flashing repair failed, and correction of this work completed poorly. Mrs. Gropiusõs engineer visited and offered advice.

1994: Flashing replaced

1993: Analysis found that flashing needed to be repaired, but not roof itself. Repairs proposed. Gutter cleaning budgeted.

1992: Analysis found that leakage through flashings was likely causing some of houseõs moisture issues

1991: Damaged flashing and clogged gutters found to be causing rain runoff problem. Crack found in downspout at first floor level. Unspecified roof work carried out.

---

[61] Ibid.

[62] "Gropius House Update," Linda Willett to Jane Nylander and Robert Surabian, December 3, 1998, Massachusetts. Drain Doctor Inc., Invoice, (Waltham, MA: Historic New England Property Care Files, 1998).

1987: Unspecified downspout reported to be cracked
1986: New roof surface furnished and installed
1983: Roof repairs necessary
1981: Roof repaired; no further details given
1978: Roof over living room repaired twice
1977: Roof over living room repaired three times
1975: Soldering on flashings repaired as necessary from front corner of chimney to rear corner of right wall. New 16 oz. copper drainpan furnished and installed.
1973: Leaks in roof over master bedroom repaired
1972: Gravel cleat on left side of front entry opened from drain to cornice, renailed with stronghold nails, and finally cemented, membraned, and re-graveled in. Two downspouts cleaned and inspected.
1971: Roof reopened and renailed with stronghold nails, which were then cemented and membraned. Strips over broken joints soldered. Cleat regraveled in areas of leakage. Proposal to plaster and paint damaged area of southern overhang.
1970: Roof repaired; no specifics given, but likely related to improving drainage above porch. Separate roof repair included opening and resoldering broken joints, replacing loose nailing and cementing and membraning areas, re-graveling open areas, and covering bare spots on main roof.
1969: Engineers discussed porch drainage problems, and proposed an interior drain. In the case that drain was not feasible, they suggested addition of insulation in order to raise interior roof level. Also expressed intention to replace built up membrane.
1967: Unspecified leak repaired. Separately, roofing and flashing installed.
1957: Porch and marquee problems found to be associated with flashing rather than roof itself. Repaired.
1956: Gropiusôs requested repairs still not carried out.
1955: Porch and marquee roofs likely repaired sometime after 1947, but leaked again along with an unspecified area of main roof. More repairs carried out, but badly; further work requested.
1950: Poor 1947 repairs still not fixed
1949: Poor 1947 repairs still not fixed
1948: Marquee repair of previous year inadequate. New drain pipe not installed tightly enough, allowing tar to drip through. Mouth of drain too high, so water collected on roof and ran over edges to spoil plaster ceiling.
1947: Felt stripped and flashings repaired on marquee and porch roofs
1946: Leakages reported in 1942 had not been repaired
1945: Flashing repairs to porch and marquee included on to-do list
1942: Leakages reported in porch, roof overhang on south side, and marquee, becoming worse in cold weather and improving in warmer seasons.

BIBLIOGRAPHY

A. Belanger & Sons, Inc. Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV, March 25, 1970.

A. Belanger & Sons, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, September 29, 1967. A. Belanger & Sons, Inc. Invoice. Waltham, MA:

Historic New England Property Care Files, October 23, 1967.
Clancey, Gregory K. *Analysis of Repair and Maintenance Needs at the Walter Gropius House: Lincoln, Massachusetts.* Report. Conservation Center, Society for the Preservation of New England Antiquities. 1992.
C. P. Moody Invoice. Waltham, MA: Historic New England Property Care Files, 1978.
Drain Doctor Inc., Invoice, (Waltham, MA: Historic New England Property Care Files, 1998).
ñExterior.ò Waltham, MA: Historic New England Property Care Files, 1987.
Geoffroy, Amy. *Gropius House Maintenance and Alterations History: 1938 to Present*. Report. Property Care. MA: Society for the Preservation of New Englan Antiquities, 1997.
G. F. Sprague & Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1991.
Gilbert & Becker, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1986.
Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
Gropius House: 1995 Work Report. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1995.
"Gropius House Update." Linda Willett to Jane Nylander and Robert Surabian. December 3, 1998. Massachusetts.
"Gropius Moisture Intrusion and Plaster Repair Problems." Frank Thompson to Greg Clancy, Tom Decatur. July 29, 1991. Massachusetts.
"Gropius Roof." Sarah Carroll to Greg Clancey. September 10, 1993. Massachusetts.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
H. L. Foote to Walter Gropius. April 26, 1947. The Barrett Division, Malden, Massachusetts.
ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.
Ise Gropius to John. March 17, 1971. Gropius House, Lincoln, Massachusetts.
Jeffrey Wallace to Steve and Tom Fay, May 4, 1995, Massachusetts.
Jeffrey Wallace to Steve Fay. November 28, 1995. Massachusetts.
L. H. Hackett to Walter Gropius. July 8, 1957. Barrett Division Allied Chemical & Dye Corporation, Malden, Massachusetts.
Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1970.
Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, April 17, 1971.
Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, December 16, 1971.
Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1973.
Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property

Care Files, 1975.
"Re: Gropius House Repairs, Lincoln, MA." Brent A. Gabby to Linda Willett. April 11, 1997. Simpson Gumpertz & Heger, Inc., Arlington, Massachusetts.
"Roof on Porch, Gropius Residence." Werner H. Gumpertz to Ise Gropius. November 7, 1969. Simpson Gumpertz & Heger, Inc., Cambridge, Massachusetts.
ñSite Visit Form: Main House Survey.ò Waltham, MA: Historic New England Property Care Files, 1991.
ñSPNEA Interdepartmental Bill.ò Waltham, MA: Historic New England Property Care Files, 1991.
"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from Lynne M. Spencer. April 8, 1983. Massachusetts.
Thompson, Frank. ñMaintenance and Budget Recommendations for 1993.ò Waltham, MA: Historic New England Property Care Files, 1993.
Walter Gropius to H. L. Foote. June 15, 1949. Massachusetts.
Walter Gropius to Mr. Haskell. October 31, 1950. Massachusetts.
Walter Gropius to Lawrence Hackett, August 5, 1955, Massachusetts.
Walter Gropius to Lawrence Hackett, December 27, 1955, Massachusetts.
Walter Gropius to The Barrett Company. June 13, 1946. Massachusetts.
Walter Gropius to The Barrett Division. May 22, 1950. Massachusetts.
Walter Gropius to The Barrett Division. April 21, 1955. Massachusetts.
Walter Gropius to Thomas Mullane & Sons. December 18, 1948. Massachusetts.
Walter Gropius to Thomas Mullane & Sons. February 15, 1949. Massachusetts.

APPENDIX A: Analysis of Past Repairs

The effectiveness of past repairs to the roof was analyzed in 2016.

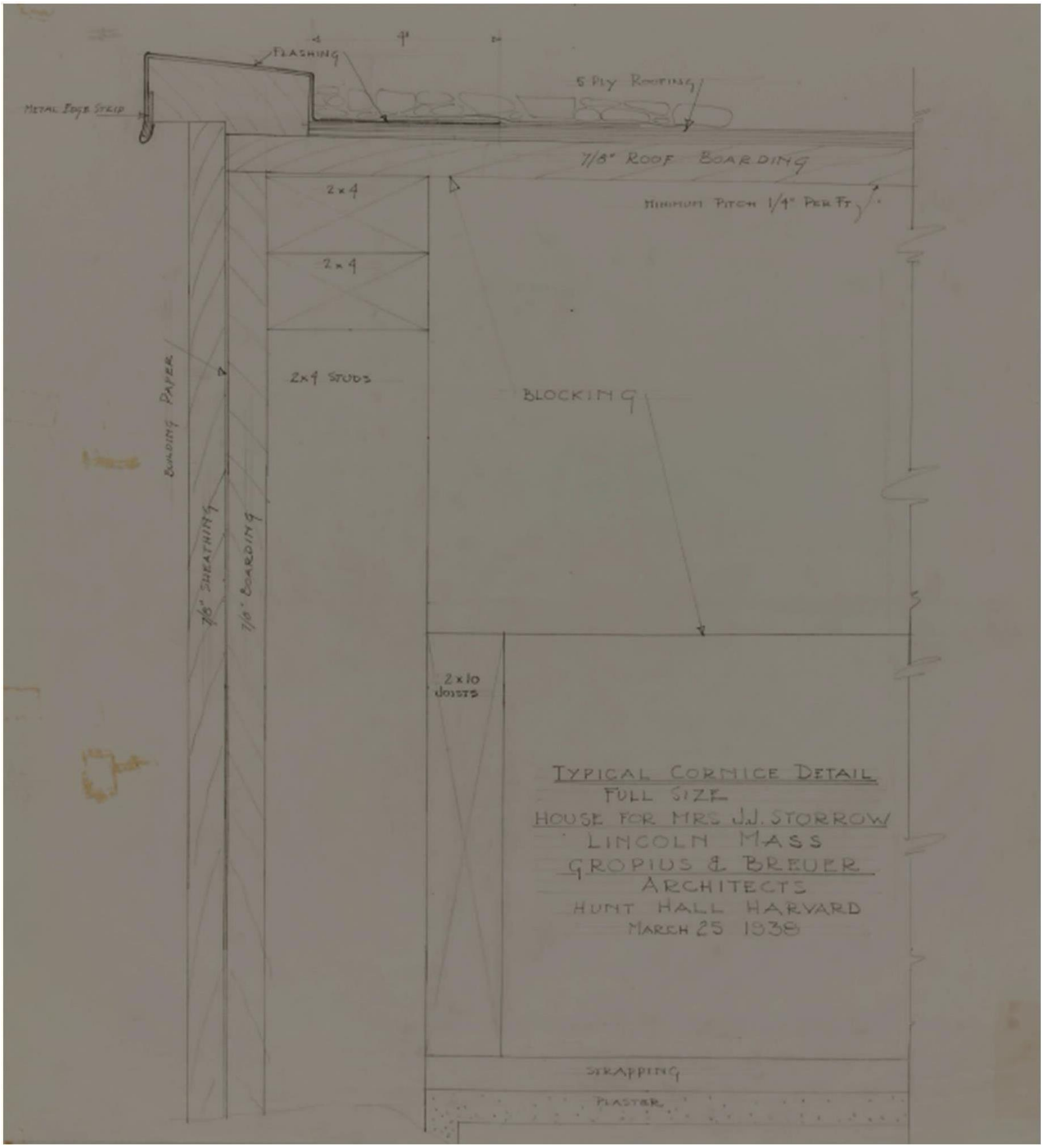
The Gropius House roof appears to have been troublesome from the start. The archival record is filled with references to roof repairs and alterations to problematic details. In light of its deficiencies, there has been one major detail change to the roof since the house was acquired by Historic New England.

Detail Change: Cornice and Flashing

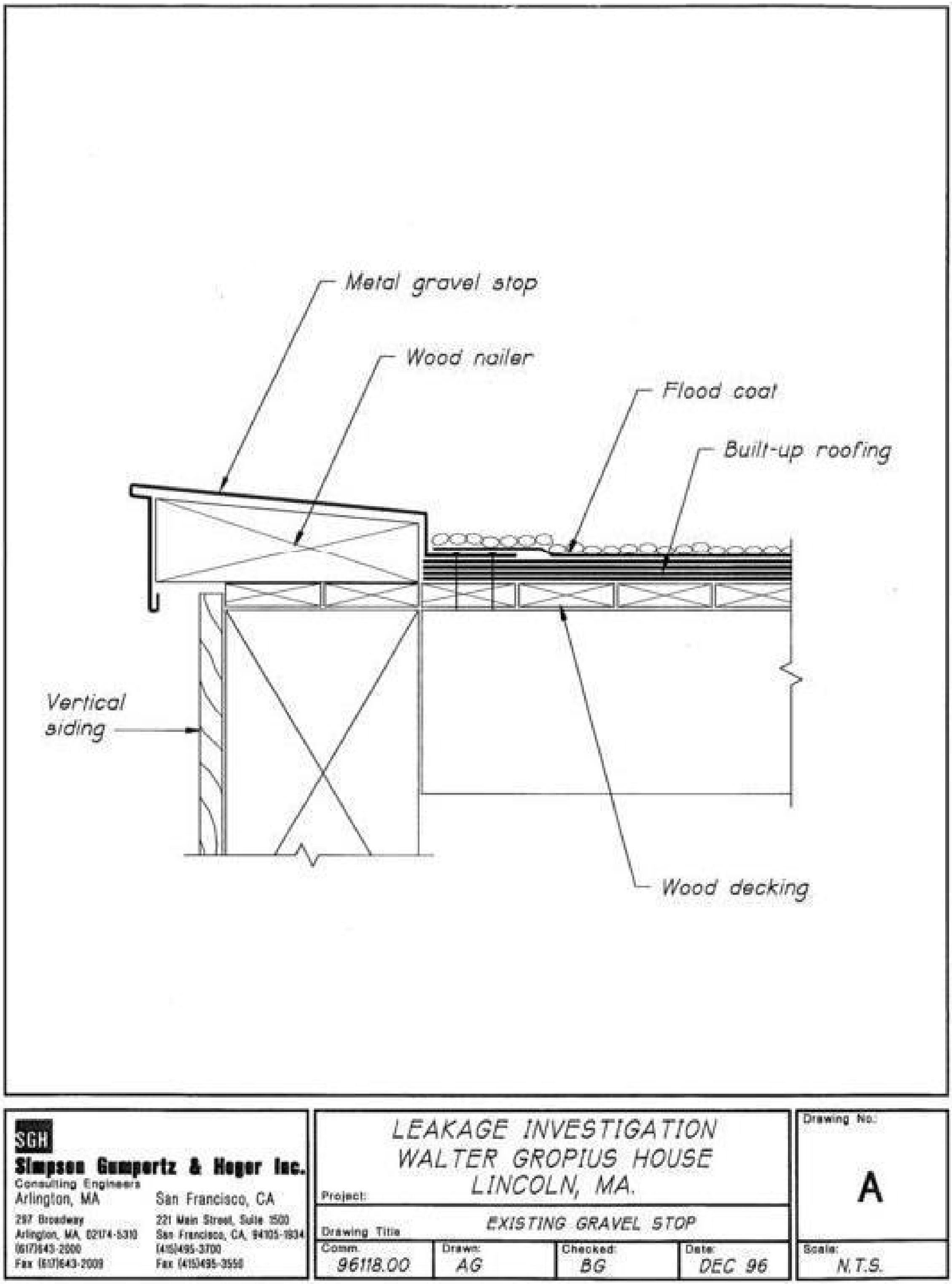
- In the late 1990s it became clear that there was a major issue with the gravel stop flashing details. In 1998, just ten years after the previous roofing repair, the roof was replaced along with the flashing and the cornice detail was altered at the same time. Two options for the replacement of both the gravel stop and the chimney flashing were provided by the consulting engineers, but it is not clear which of the methods were implemented. It is also unknown how the cornice detail was altered. None of these detail changes are visible to the public.

ANALYSIS
As of late 2016, there have been no instances of roofing failure since the detail change was implemented. Thus, there is no reason to suggest that the changes to the building were detrimental physically to the building. Additionally, the changes are not visible to the visiting public and so do not interfere with the interpretation of the site. For these reasons it would be practical to carry out any future replacements in kind, using the 1998 work as a guide. While the specific detail changes made in 1998 are unknown, the documentation provided on the following pages can aide future decision making.

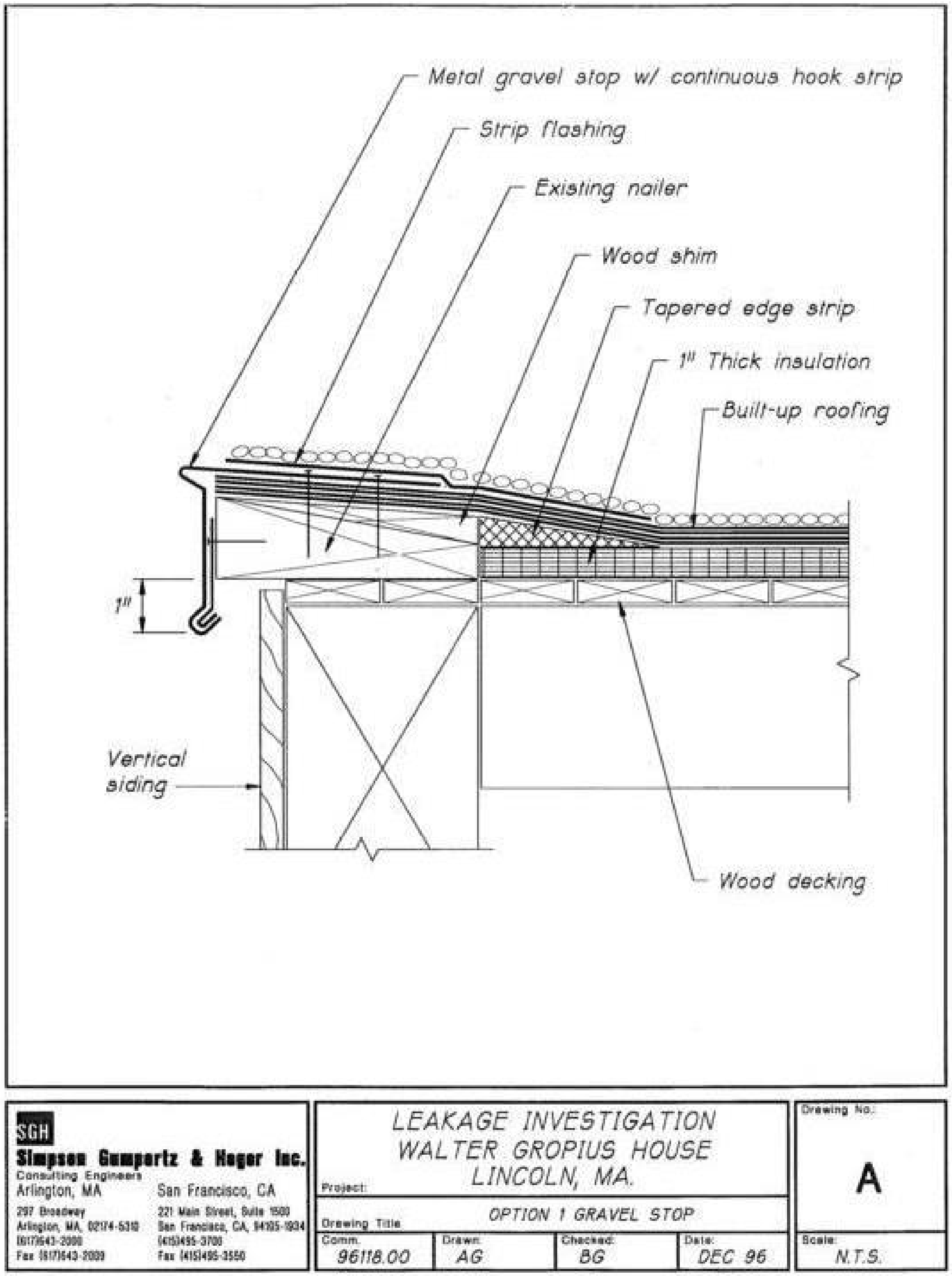
APPENDIX B: Detail Images



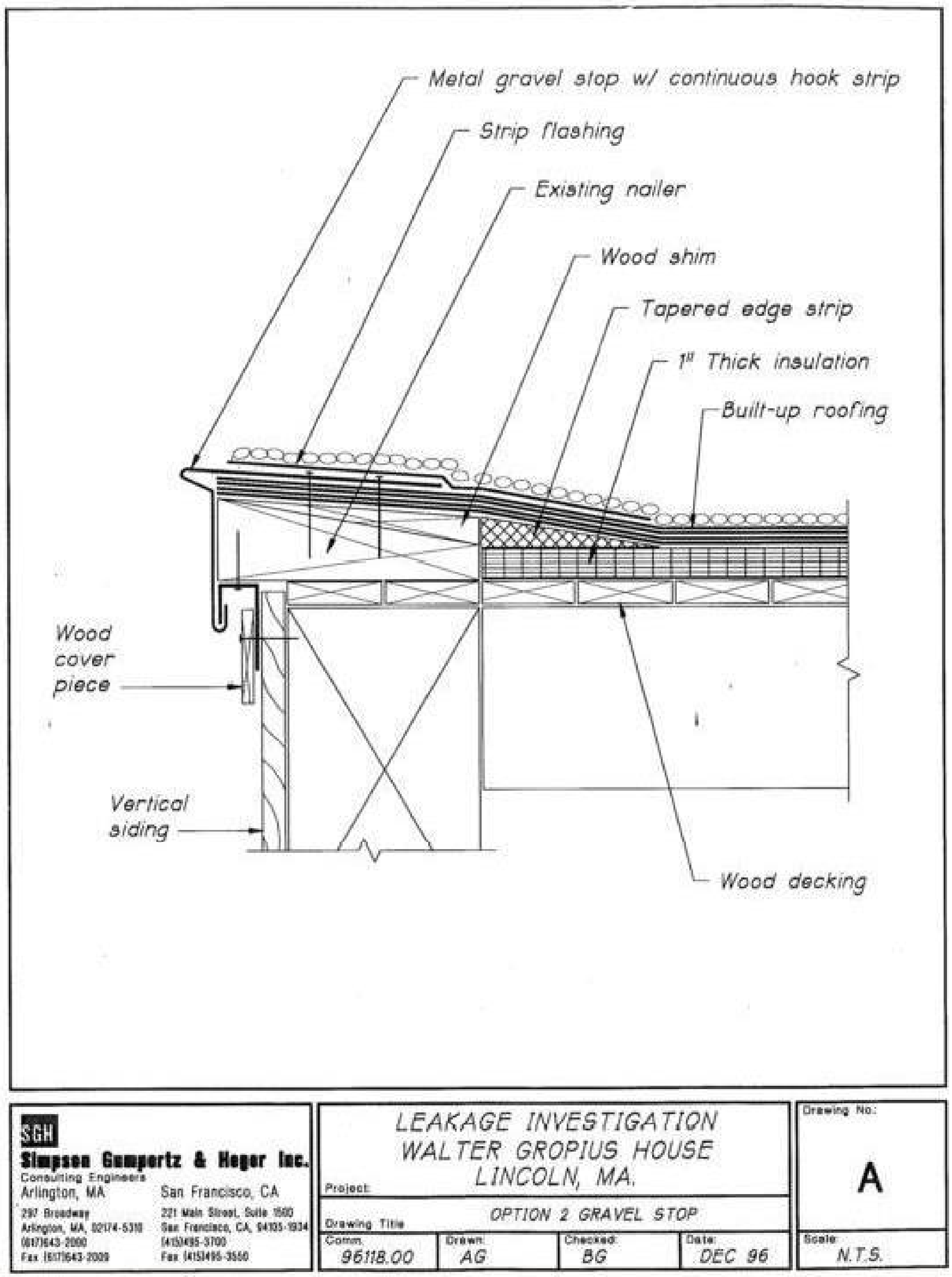
Cornice detail, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums



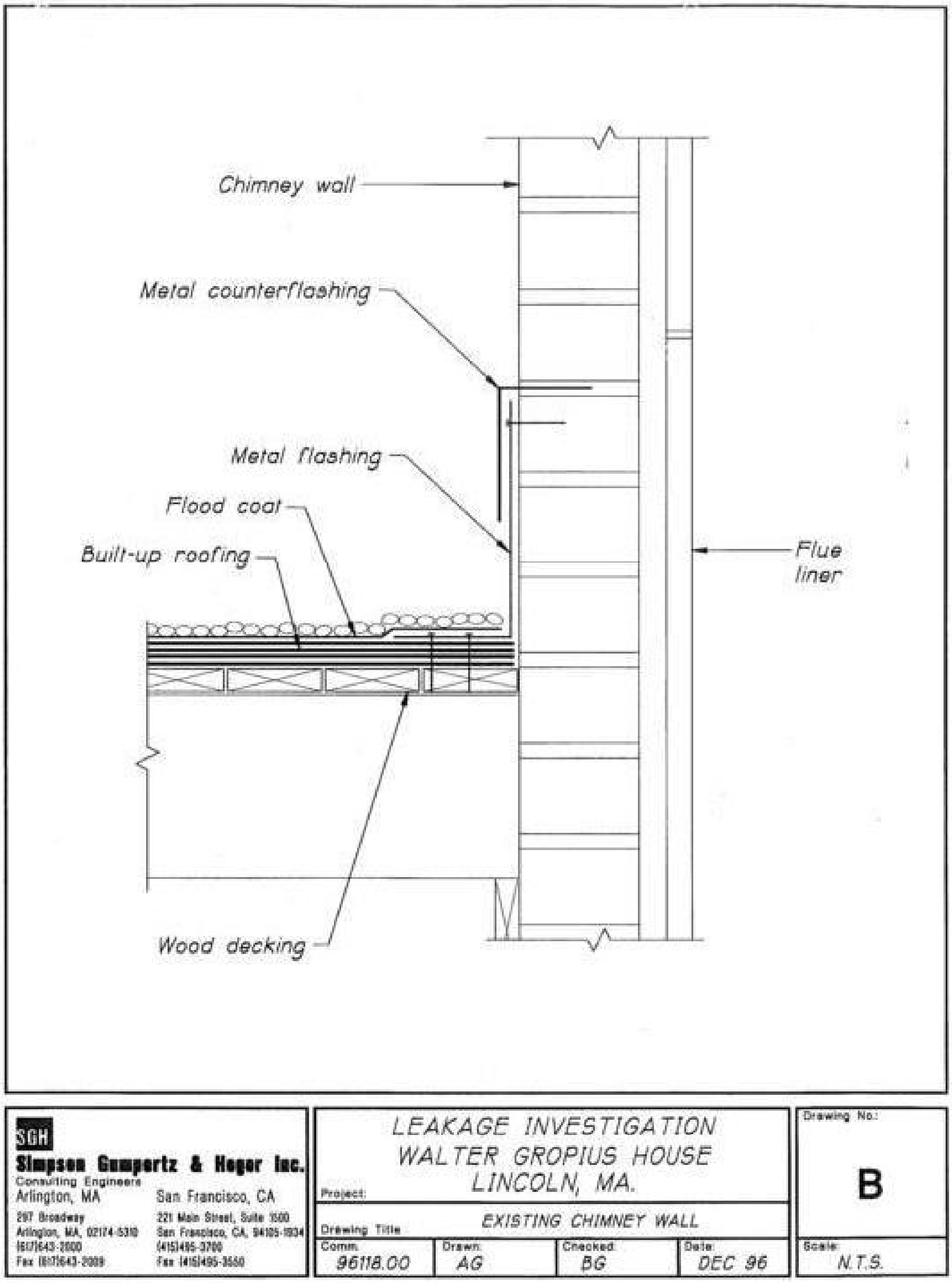
Existing conditions of gravel stop and cornice, Simpson, Gumpertz & Heger, Inc., 1996



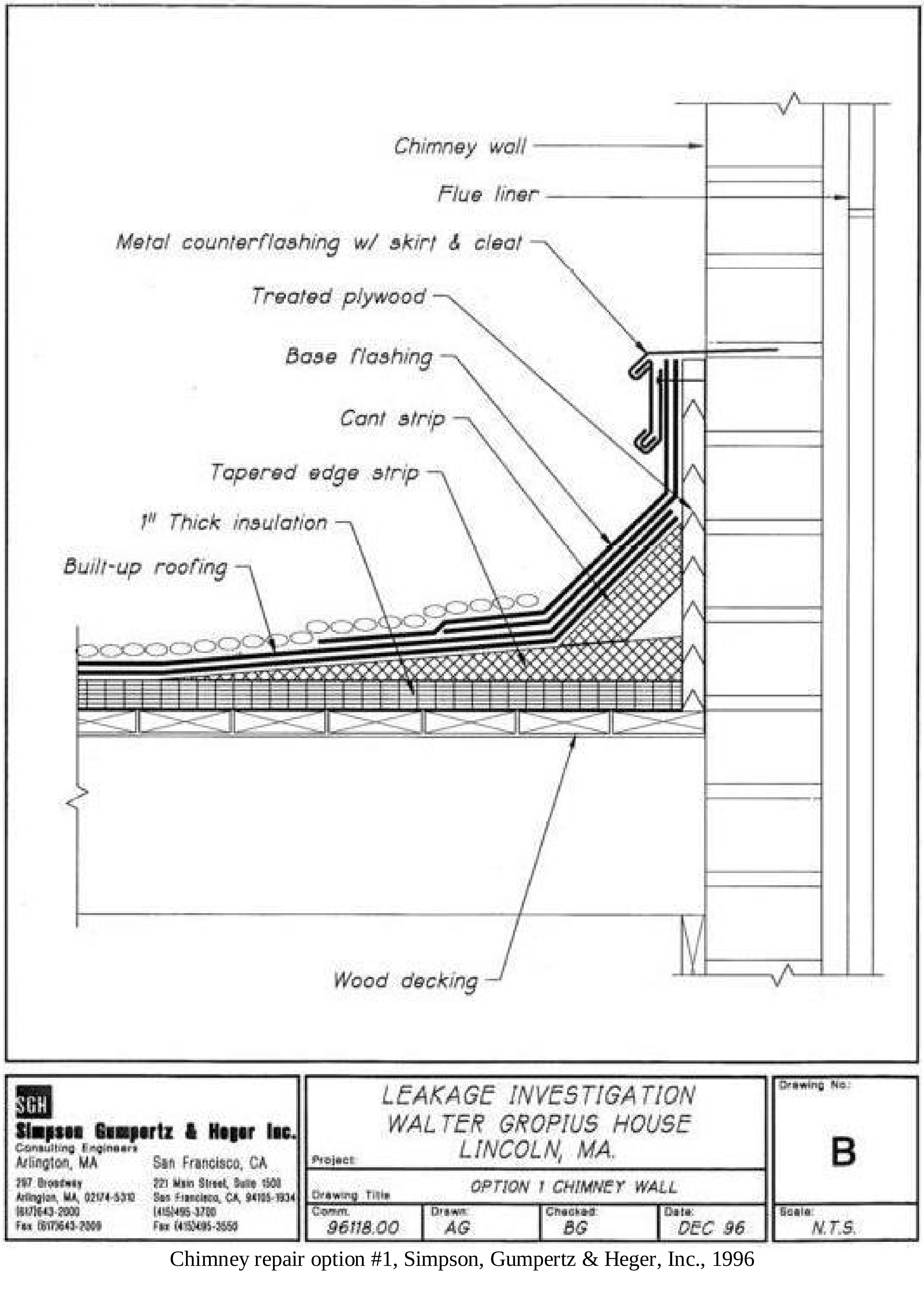
Gravel stop and cornice repair option #1, Simpson, Gumpertz & Heger, Inc., 1996



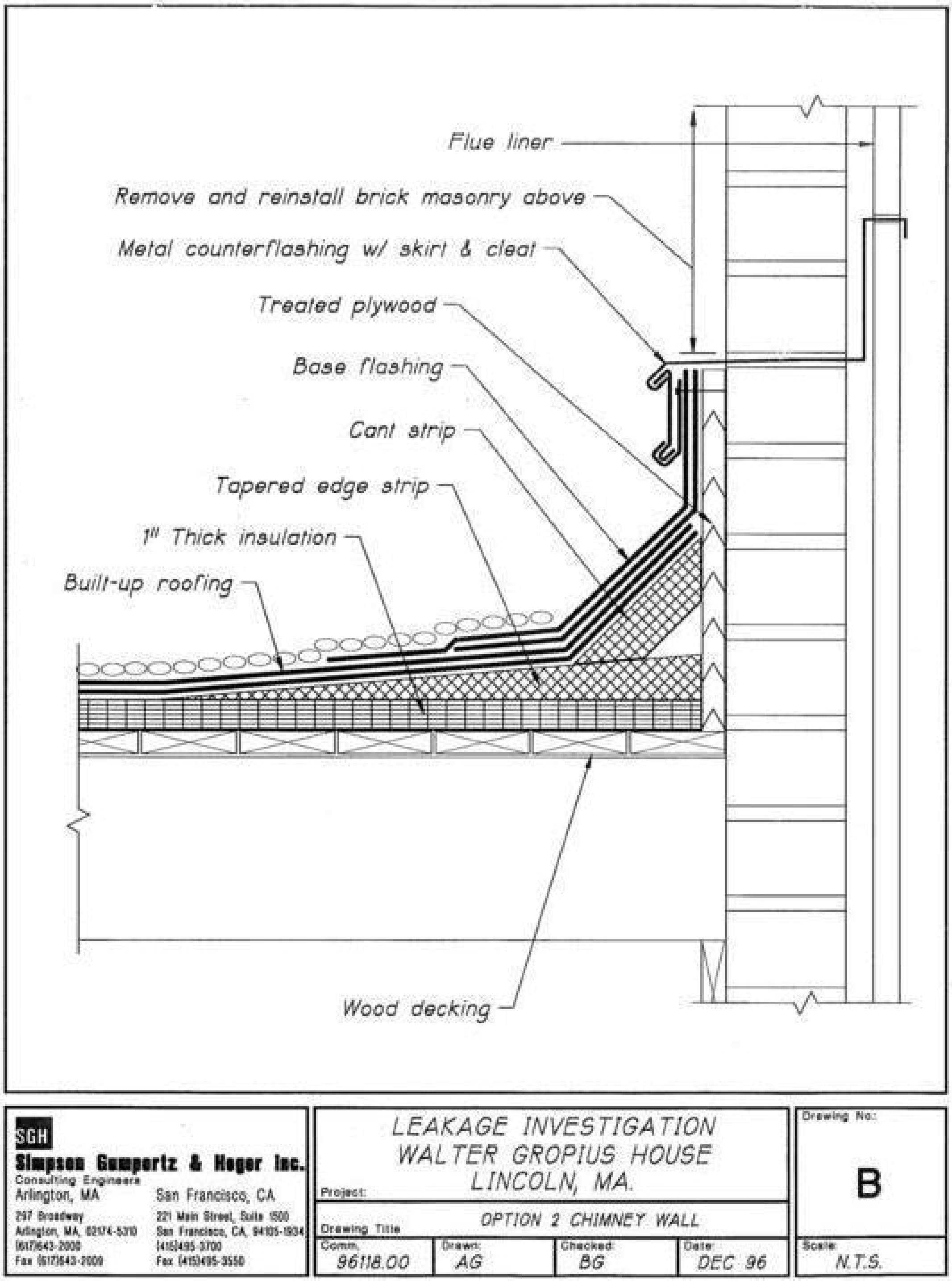
Gravel stop and cornice repair option #2, Simpson, Gumpertz & Heger, Inc., 1996



Existing conditions of chimney wall, Simpson, Gumpertz & Heger, Inc., 1996



Chimney repair option #1, Simpson, Gumpertz & Heger, Inc., 1996



Chimney repair option #2, Simpson, Gumpertz & Heger, Inc., 1996

GROPIUS HOUSE STRUCTURAL FRAMING

Property Name: Gropius
Structure: Gropius House
Feature: Structural Framing
Original Material: Douglas fir, steel, and yellow pine
Original Color: N/A
1965-1969 Material: Douglas fir, steel, and yellow pine
1965-1969 Color: N/A


Historic New England Property Care, 1997

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. This should be the continued upkeep approach and a patina of age or deterioration should be minimized.[1]

The structural timber and steel elements of the Gropius House must be kept in good repair at all times in order to protect the house, visitors, and staff members. Any replacements of materials should be made in kind, and there should be an effort to retain as much original fabric as possible.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

Wood Framing

- The framing of the house is twentieth-century dimensional stud construction
- Material replacement, when necessary, should be in matching species, dimensions and detailing.
- Repair protocol:
    - No intervention: leave existing materials
    - Minor intervention: use of filler or epoxy for minor cracks or areas of deterioration
    - Medium intervention: Defined as less than 50% loss of individual member. Splice repairs are approved for areas of minimal damage.
    - Major intervention: Defined as more than 50% loss of individual member. Complete replacement in kind approved.

Steel Columns

- Maintenance Protocols
    - Exterior paint should be kept in good condition in keeping with maintenance protocol of exterior cladding
    - Integrity of finish should be maintained because it is protecting steel from exposure. If there is a failure it must be treated as quickly as possible to avoid rusting.
    - Wire brush area to remove any oxidization or corrosion, spot apply rust converter, and apply finish paint
- Repair Protocols
    - Upon inspection in 2016, the 2002 repairs appear to be stable and have not required maintenance in the intervening years. The repair protocol used in that project are as follows:
        - Grit-blast columns to remove paint and rust
        - Paint with zinc primer, epoxy mid-coat, and urethane gloss matching existing color.
            - Evidence of past paint colors was lost during grit blasting repairs in 2002. A Munsell color was specified for this project, and the existing color should be reviewed. An interpretive decision may be necessary.
            - Note: there is one white lally column, and it is prone to rusting. It is presumed that this column was never treated in 2002 and thus has been repainted in situ.

Original Construction and Evolution:

The frame of the Gropius House was made of yellow pine framing lumber and Douglas fir framing lumber.[2] Bearing partitions were thoroughly spiked 3ò x 4ò fir members, and non-bearing partitions were 2ò x 4ò members of the same wood.[3] Those on the interior were

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 31.
[3] Ibid., 32.

braced with 1ò x 4ò pieces of spruce.[4] All partitions were bridged once in each story and ñtwice in the two spaces on each side of an opening offset to permit nailingò through 2ò x 4ò fir studs.[5] Boarding was comprised of 7/8ò boards between 6 and 8 inches wide with one surfaced side each.[6] The surfaced sides were laid against studs and nailed at every bearing partition.[7] 4ò x 6ò sills were halved and pinned at the joints, headers were hung in stirrups, and all floor joists were cross-bridged and measured 2ò x 10ò.[8] Wood furring strips were 1ò x 2ò and made of spruce, and ceilings were strapped with 1ò x 2ò members.[9] Large openings in the framing were spanned by steel ñI sectionò beams, which each bore fir nailing strips.[10] These beams ran through the living room, the dining room and study, from the screen porch to the stairs, and from the kitchen to the maidôs bathroom.[11] They were supported by doubled 2x8 beams.[12] There were steel or wrought iron anchors every six feet for beams and rafters resting on walls.[13] They were painted, bent into the top beam one inch, and split and turned four inches into the masonry.[14]

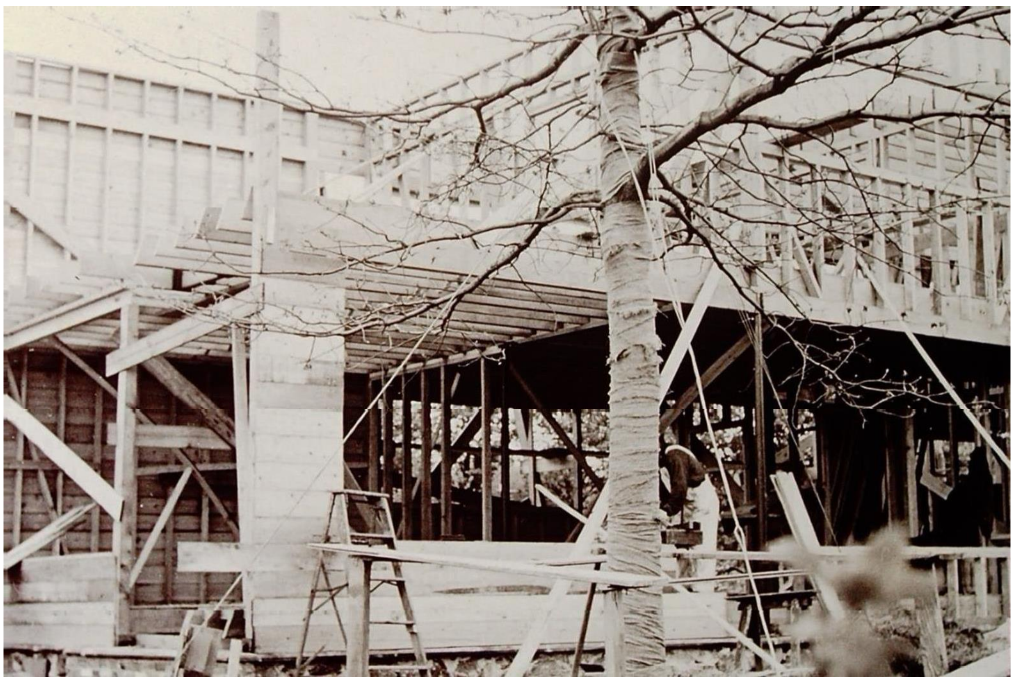


Figure 1: Framing during house construction, 1938
Historic New England Archives, Binder of Slides

[4] Ibid.
[5] Ibid., 33 and 32.
[6] Ibid., 33.
[7] Ibid.
[8] Ibid., 32. Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 14.
[9] Gropius and Breuer, ñSpecifications,ò 32.
[10] Ibid. Gropius, ñGropius House,ò 14.
[11] Walter Gropius and Marcel Breuer, *First Floor Framing Plan*, 1938, Modern and Contemporary Art, Harvard Art Museums, Cambridge, Massachusetts. Walter Gropius and Marcel Breuer, *Second Floor Framing Plan*, 1938, Modern and Contemporary Art, Harvard Art Museums, Cambridge, Massachusetts.
[12] Ibid.
[13] Gropius and Breuer, ñSpecifications,ò 22.
[14] Ibid.

Character-Defining Traits in the Interpretive Period:
The form of the Gropius House framing, which did not change between its construction and the interpretive period, was surprising to those who expected only cement and steel from a modern architect.[15] While Gropius had previously sung the praises of these more innovative materials, ñthe old white-painted house of New England seem[ed] to [him] the most charming feature of the landscapeò and he adapted his Bauhaus building to reflect regional tradition.[16]

History of Conservation and Maintenance Practices:
During a Massachusetts Historical Commission grant project carried out by the Society for the Protection of New England Antiquities (SPNEA) in 1986, deterioration was discovered in four studs, the horizontal sill, the vertical framing, the sheathing, and the corner post in the east wall near the kitchen entry to the house.[17] A visual assessment made it clear to SPNEA staff that pieces of the sill and the bottoms of the vertical framing had been replaced at least once before.[18] Although there is no remaining written record of any such work, it is logical that it happened given the fact that these elements are below the entry floor level and would therefore be easily damaged by water runoff.[19] The sheathing in the area had deteriorated, and when the sheathing was removed the corner post and four of the studs were found to be ñalmost completely rotted awayò.[20] The horizontal sill and the bottoms of the vertical framing were replaced with pressure-treated wood, the sheathing was reused where possible and otherwise replaced in kind, and the studs and corner post were also replaced.[21] Finally, the lally column near the kitchen entry was relieved of rust and scale before being primed and painted.[22] Its base was patched with cement grout.[23]

In 1997, engineers from Simpson, Gumpertz & Heger, Inc. found that the floor and ceiling joist framing in the east wall were supported by the interior plaster, window frames, and exterior siding rather than the structural framing.[24] All of the sheathing and framing in the house and the porch was inspected by the end of that year, and it was repaired or replaced in kind where necessary *(Figure 2)*.[25] Damaged areas included rotted wood in the sheathing boards and studs at the corner southeast of the entry, running both south and west.[26] These

[15] "Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset," *Boston Evening Transcript*, January 07, 1938.
[16] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 8.
[17] *Gropius House Development Project*, report, Section III - Narrative Report, Carpentry (Boston, MA: Historic New England, 1986), 2-3.
[18] Ibid., 2.
[19] Ibid.
[20] Ibid., 2 and 3.
[21] Ibid.
[22] *Development Project*, 1.
[23] Ibid.
[24]
[25] ñGropius House Specifications,ò (Waltham, MA: Historic New England Property Care Files, 1998), 10.
[26] Linda Willett, *Project Completion Report*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1999), 3.

members were replaced, and all adjacent wood was treated with Boracare.[27] The rotting northeast cornerpost was also repaired.[28]

Figure 2: Deteriorating southeast corner post, 1997
Historic New England Property Care Binders

In 2001 the steel support posts around the exterior of the building were repaired *(Figure 3)*.[29] The process involved excavating the surrounding soil to a level of six inches in order to determine the condition of the bases, removing deteriorating paint and corroded metal, and applying a zinc-rich primer and a coat of paint to the postsô surfaces.[30]

[27] Ibid.
[28] Ibid.
[29] Diane McGuire, ñSPNEA ï Walter Gropius House Projects, Lincoln, Massachusetts,ò (Waltham, MA: Historic New England Property Care Files, 2001), 3.
[30] Ibid.

Figure 3: Damaged steel column near porch, 2001
Historic New England Property Care Binders

Interventions

2001: Steel support posts around exterior repaired

1998: Rotted wood discovered in north and south ledgers of marquee, structural elements of screen porch, northeast cornerpost, and sheathing boards and studs southeast of entry. All sheathing and framing inspected; repaired or replaced where necessary.

1997: Engineering firm recommended structural repairs to east wall

1986: Elements of structural framing near kitchen entry deteriorating due to water infiltration; repaired or replaced where necessary. Lally column by kitchen entry refinished and cement base patched.

BIBLIOGRAPHY

"Gropius House." Linda Willett to Brian Pfieffer, Phillip Johnston, Jane Nylander, J. Wallace, Beth Shepard, and Annabel Hansen. March 30, 1998. Massachusetts.

Gropius House Development Project. Report. Section III – Narrative. Carpentry. Report. Boston, MA: Historic New England, 1986.

"Gropius House Repairs." Linda Willett to Beth Shepard, Annabel Hansen, Jane Nylander, Brian Pfieffer. April 15, 1998. Massachusetts.

"Gropius House Repairs, Lincoln, MA." Brent A. Gabby to Linda Willett. April 11, 1997. Simpson Gumpertz & Heger, Inc., Arlington, Massachusetts.

ñGropius House Specifications.ò Waltham, MA: Historic New England Property Care Files, 1998.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

Gropius, Walter, and Marcel Breuer. *First Floor Framing Plan*. 1938. Modern and Contemporary Art, Harvard Art Museums, Cambridge, Massachusetts.

Gropius, Walter, and Marcel Breuer. *Second Floor Framing Plan*. 1938. Modern and Contemporary Art, Harvard Art Museums, Cambridge, Massachusetts.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

McGuire, Diane. ñSPNEA ï Walter Gropius House Projects, Lincoln, Massachusetts.ò Waltham, MA: Historic New England Property Care Files, 1998.

"Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset." *Boston Evening Transcript*, January 07, 1938.

Willett, Linda. *Project Completion Report*. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1999.

GROPIUS HOUSE WINDOWS

Property Name: Gropius
Structure: Gropius House
Feature: Windows
Original Material: Steel frames; ¼ò plate and ñpullò glass, patterned translucent glass
Original Color: Gray
1965-1969 Material: Steel frames; ¼ò plate and ñpullò glass, patterned translucent glass
1965-1969 Color: Gray (Benjamin Moore #1624, Westcott Navy)

RS ID #240771, 2015

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

While the windows of the Gropius House have been repaired many times since they were installed, their basic form and design has remained essentially the same and should be protected in the future. Gropius chose a window style that was normally used in commercial rather than domestic architecture in the 1930s, a decision that corresponds with the Bauhaus preference for mass-produced products over custom designs.[2] If partial or complete replacement of the windows is ever necessary, all their components should be replaced in kind so that these aspects of the design intent are preserved. There should also be no major alterations to the windowsô sizes or shapes, since they still offer the brightness, views, and connection with the surrounding landscape that they were originally intended to provide. The window frames and surrounds must match the rest of the house in cleanliness and neatness, and should remain gray in order to reflect the results of paint analyses.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] Jeanmaire Dani, ñThe Walter Gropius Residence Lincoln Massachusetts: Construction History and Restoration Issuesò (masterôs thesis, Columbia University, 1995), 15.

Maintenance and Repair Protocols:
Last updated 2016. Information taken from Historic New England's 2014 "Re-Glaze and Repaint Glazing Failures."[3]

The window frames and glass should be kept in good repair. Minor maintenance should occur on a regular basis. When evidence of work becomes obvious, the replacement of finishes and materials should be considered in order to maintain the clean lines of the house's original design.

<u>Glazing Putty:</u>
Material note: Documentation from the 2000/2001 effort indicates that Sterling Elastic Glazing Compound was used. The use of Sarco's DualGlaze was originally planned for a tactical repair in 2013 because it is recommended for *in situ* and metal work. However, due to the temporary nature of the project, Sarco's MultiGlaze was eventually used despite the fact that it is meant for wood. It was removed as part of the 2015 work. As Sarco is a very small company, the availability of both glazing types is not guaranteed over the span of many years. Both Sterling and DualGlaze are oil based glazing putties prescribed for the glazing of metal sash. Either product may be used in a reglazing campaign

- Maintenance protocol:
    - Inspect annually looking for areas of paint loss, glazing loss, or signs of rust staining,
    - Spot maintenance of failing paint should occur in between major painting projects.
    - As long as there is a paint finish, there is no specific maintenance protocol for the putty itself.
- Repair protocol:
    - Remove existing glazing that has failed
    - Remove rust
        - If glazing must be removed to the point that the steel frames are exposed, evaluate condition of frame. If there is a rust buildup, use a brass wire brush to remove any surface rust.
        - Vacuum clean
        - Paint rebate with Rustoleum Clean Metal Primer, following manufacturer's directions
        - Note that this step should be completed in each area at the time the metal is exposed. Do not queue up multiple areas, which would leave metal exposed to the weather prior to priming.
    - Apply new glazing putty
        - Press glazing putty onto sash and against glass, being careful to fill height and width of L-shaped recess completely.
        - Smooth glazing to an angle that sheds water. There should be no gaps, spaces or indentations, and the glazing line should not be visible from the interior of the window. Shape corners to a rounded finish only.

[3] Bruce Blanchard, *Re-Glaze and Repaint Glazing Failures*, report (MA: Historic New England, 2014).

        - Remove excess glazing with mineral spirits before it sets. Denatured alcohol can also be used on the glass to easily clean off any glazing residue.
        - Glazing can only be done when the air temperature and the face temperature of the window are above 40ºF.
    - Paint glazing putty
        - After glazing putty has skinned over, paint entire putty line with Benjamin Moore 1624, Westcott Navy.
        - Paint should lap onto glass approximately 1/16ò

Window Frames:

Material notes: The Gropius House window frames are steel. Material replacement, when necessary, should be in kind.

- Maintenance protocol
    - Inspect annually looking for areas of paint loss, glazing loss, or signs of rust staining.
    - Maintain the paint finish.
    - As long as there is a paint finish, there is no specific maintenance protocol for the window frame itself.
- Repair protocol:
    - In situ repair, rust removal
        - If glazing must be removed to the point that steel frames are exposed, evaluate condition of frame. If there is rust buildup, use brass wire brush to remove any surface rust.
        - Vacuum clean
        - Paint rebate with Rustoleum Clean Metal Primer, following manufacturerǿs directions
        - Note that this step should be completed in each area at the time metal is exposed. Do not queue up multiple areas, which would leave metal exposed to weather prior to priming.
    - Repair requiring window removal (based on 1990s protocol that is developed and analyzed in Appendix A).
        - Note: The following protocol should be evaluated again before a new repair program is undertaken.
        - Remove window from building
        - Clean all parts
        - Remove glazing and glass
        - Assess window and determine repair strategy. If less than 40% is damaged, repair methodology should favor excising deteriorated materials and fusing new steel that matches profile in kind. If more than 40% of frame is lost, determine if fabrication of window matching existing would be more beneficial than repairs.
        - Strip heavily-painted areas with methylene chloride-based remover before grit blasting (1995 repair specified medium-grade Black Beauty, but softer medium may be preferable). Use unit with 3/16ò nozzle and air supplied by 20-gallon suppressor.

- Within eight hours of blast cleaning, apply 1.5 mil layer of zinc-rich coating with HVLP Capspray unit. Thin to 1:16, and then add second coat of 2.0 mils 24 hours later.
- Apply two finish coats of Benjamin Mooreôs M74/M75 Two Part Modified Aliphatic Urethane with HVLP Capspray unit
- Strip screen screws of paint and neutralize in water. Clean red bronze hardware with Extreem Metal Polish and neutralize with acetone. Spray all with Acryloid B-48N using HVLP Capspray unit.
- Use light, Teflon-based lubrication on slides after installation
- Insert polyethylene foam backer rod into joints between steel frame and wood sill and siding before applying Tremco Dymonic one-part Urethane caulking to joints
- Install and glaze windows

Original Construction and Evolution:
Standard Cotswold-type picture and ribbon windows manufactured by Hopeôs Windows were installed in the Gropius House during its original construction in 1938.[4] The steel frames were painted with a heavy shop coat of red lead and raw linseed oil paint, topped with a coat of gray metal paint.[5] The surrounds and sills were wood, and the glazing putty was made of ñpure linseed oil and pure whiting with an addition of 5% letharge.ò[6] The type of glass used in the windows varied by location; ¼ò polished plate glass was used for the large picture windows in the living and dining rooms (see Appendix B W1.5B, W1.6B, and W1.7B for illustrations) , while patterned translucent glass was installed in the pantry and the first floor bathrooms (W1.8A, W1.1, and W1.2).[7] ¼ò ñpullò glass was used in other windows throughout the house.[8] Side-hung casements were installed on extension clearing hinges welded to ventilators and frames, so that every room had small operable screened windows to the left and right of the large fixed panes.[9]

[4] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 21.
[5] Ibid., 24 and 43. The specifications list Bri-Mar steel guard and Dereka metal paint as potential coating brands. All historic slides and more modern photographs show that the frames and wooden surrounds were painted the same shade of gray, but in a letter to a painter dated to 1956 Gropius writes that he ñshould like to keep the white paint [on the rusty window frames], as gray would not fit so wellò (Walter Gropius to David A. Price, October 09, 1956, Massachusetts).
[6] Ibid., 21 and 48. ñLethargeò is a quoted misspelling of litharge. Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 15.
[7] Gropius, ñGropius House,ò 15.
[8] The term ñpull glassò is used by Ise Gropius in her history of the house. Its exact meaning is unclear, but it probably refers to a type of glass that was less expensive and more imperfect than the polished plate glass. Libby Owens Ford ñAò Double Strength Glass or ñAò Quality Pennvernon Window Glass are both listed in the specifications (Gropius and Breuer, ñSpecifications, 48), and may be the brands of the ñpullò glass that Ise refers to.
[9] Gropius and Breuer, ñSpecifications,ò 22. Gropius, ñGropius House,ò 15.

Figure 2: Installation of the windows, 1938
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
Evidence suggests that work carried out on the windows before 1969 was relatively minimal, and that windows were made up of almost all original or in-kind replacement material during the interpretative period. The changes that had been made were carried out in order to keep the windows in good working condition rather than to fundamentally change their appearance. In this way they maintained the aspects of significance attributed to them by their original design, including capturing the views available from the house. This reflects Gropiusôs ñdeliberate integration of architecture and landscape, of indoors and out, and out of ï in a larger sense ï Man and Natureò.[10] Throughout the design process, Ise writes, she and her husband ñwould plot which way the windows would have to face to take the best advantage of the light and the viewsò.[11] This planning led to large picture windows in the living and dining rooms *(Figure 3)*.[12]

However, the design of the windows also emphasized practicality, which is an important concept within the Bauhaus movement. The plainness of the windows that Gropius specified contrasted sharply with the ornamental nature of more traditional styles. In this way they were appropriate in a house full of mass-produced structural elements and basic hardware found in stock catalogues.[13] Gropiusôs windows of choice reflected his principle that ñthe art of architecture should not be a luxury, but the life-long preoccupation of the

[10] Tom Cochrane, Landscape Renovation Recommendations, report (MA, 1988), i.
[11] Gropius, ñGropius House,ò 4.
[12] Ibid., 7.
[13] Ibid., 5.

whole peopleò.[14] The light that the large windows brought into the living and dining rooms was another practical touch; Ise wrote that ñthe dazzling effect of bright light in a room does not originate from the light source itself but from the contrast between window space and the wall next to it which appears dark to the eyeò.[15] Since massive parts of the Gropiusô walls were windows, this contrast was decreased and a ñmuted or diffused lightò brightened the rooms.[16]

Ise also described the light and views as ñpleasantò and ñbeautifulò.[17] This suggests that the Bauhaus emphasis on utility was connected with the psychological effects of the houseôs design on its inhabitants. In order for a home to be practical, it must be an enjoyable place to live. In 1939, Ise herself said that ñôpeople make the mistake of thinking that the modern school cares nothing for beauty.ôò[18]

Figure 3: Large picture frame window on west elevation, 1967-68
Historic New England Archives, Binder of Slides

[14] Walter Gropius, ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar], *Bauhausverlag* (1923): 22-31.
[15] Gropius, ñGropius House,ò 9.
[16] Ibid.
[17] Ibid., 9 and 7.
[18] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 25.

History of Conservation and Maintenance Practices:
The windows of the house were not installed exactly as detailed in Gropiusõs original specifications. The plans include abbreviations indicating which type of glass should be installed in each window, but these markings are often inconsistent with the glass actually at the house today.[19] For example, Ati Johansen, the Gropiusô daughter, claims to have influenced the size and height of some windows as they were being constructed.[20] Also, during the first major window repair project carried out by Historic New England (then called the Society for the Preservation of New England Antiquities, or SPNEA) in 1986, it was discovered that ñthe sheathing was let into the steel channelsò of the windows.[21] This discovery was contrary to the previously held understanding of the windowsô construction, as gleaned from Gropiusõs drawings.

Evidence suggests that the windows did not require many major interventions while Gropius still lived at the house. The readjustment of window cranks was included on a list of repairs from 1945, and Gropius had to request the repair or replacement of worn window handles in 1946, 1953, 1959, and 1962.[22] In a 1946 letter he complained to Hopeõs Windows of stubborn stains on the window sills caused by the bronze screens.[23] However, more significant work on the windows only took place twice during Gropiusõs time and included the replacement of a basement window (WB1.1, WB1.2, or WB1.3) that had been blown in by a storm in 1967.[24] In 1949 and 1955 the re-glazing, the removal of loose putty, and caulking around the east windows (W2.9, W2.10, W1.9, or W1.10) was proposed, but there is no proof that the work took place.[25] While records of the houseõs management include a purchase order from plate glass installation in 1973, it is unclear where the new glass was installed.[26]

In 1982, as SPNEA prepared to take over the house from the aging Ise Gropius, an inspection found that ñcertain windows should be removed from the building, re-welded, and then returned. Some of the less deteriorated can be repaired in placeò.[27] A note from 1991 claims that windows were replaced in either 1983 or 1985, but there is no solid

---

[19] For the drawings mentioned, see Walter Gropius, *East and West Elevations*, 1938, Frances Loeb Library Special Collections, Harvard University, Cambridge, MA. And Walter Gropius, *South and North Elevations*, 1938, Frances Loeb Library Special Collections, Harvard University, Cambridge, MA. An example of this inconsistency is in the north elevation windows on the second floor, which are labeled ñribbedò in the drawings but are actually ordinary window glass.
[20] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 39-40.
[21] ñGropius House: Windowsò (Waltham, MA: Historic New England Property Care Files, 1986).
[22] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[23] Walter Gropius to Hope's Windows, January 21, 1946, Massachusetts. Walter Gropius to R. L. Cole, October 07, 1953, Massachusetts. Walter Gropius to Hopeõs Windows, 1959, Massachusetts. Walter Gropius to Hopeõs Windows, March 12, 1962, Massachusetts.
[24] Hopeõs Windows Invoice (Waltham, MA: Historic New England Property Care Files, 1967).
[25] Howard E. Custance to Walter Gropius, September 27, 1949, Custance Brothers, Inc., Lexington, Massachusetts. Howard E. Custance to Walter Gropius, April 11, 1955, Custance Brothers, Inc., Lexington, Massachusetts.
[26] Banner Glass Corp. Invoice (Waltham, MA: Historic New England Property Care Files, 1973).
[27] Daniel M. Lohnes to Beate Forberg, April 02, 1982, Massachusetts.

evidence or details to confirm that this happened.[28] It was in 1986 that restoration work was certainly completed *(Figure 4)*. Four windows on the first floor were removed for refurbishment along with one upstairs window.[29] Window vents and two doors were weather-stripped, all vents were adjusted for operation, defective caulking and glazing was removed and replaced, exterior glass was needle-caulked where necessary with Tremco Small Joint Sealant, all abrasions were primed and repainted after mechanical repairs and rust removal, and UV film was installed.[30] The replacement of a cracked pantry window was included on a list of necessary maintenance work, but it is unclear whether the replacement was ever carried out.[31]

Figure 4: Repairs to east elevation windows, 1985
Historic New England Archives, Binder of Slides

For almost a decade following the first major window overhaul, problems continued to develop. In 1987 panes of the dressing room (W2.10) and pantry (W1.8) windows were reported to be broken, and the hinge of the maidôs bathroom window wasnôt working. SPNEA staff struggled to clean the windows where UV film had been applied the previous year, and several sashes were rusting.[32] In 1988 more rust was reported, in addition to leaks

[28] ñGropius Notesò (Waltham, MA: Historic New England Property Care Files, 1982).
[29] Metal Sash Service Invoice (Waltham, MA: Historic New England Property Care Files, 1986).
[30] Ibid and ñGropius House: Windowsò (Waltham, MA: Historic New England Property Care Files, 1986). The window reinstallation completion report suggests that the upstairs window may have been located in Atiôs bedroom, but there is no further information about the specific windows removed (*Gropius House Completion Report: Window Reinstallation*, report [MA: Society for the Preservation of New England Antiquities, 1986].)
[31] Marla Sullivan, ñGropius House Listò (Waltham, MA: Historic New England Property Care Files, 1986).
[32] ñInterior Odd Jobsò (Waltham, MA: Historic New England Property Care Files, 1987). Elizabeth

in the south window of the master bedroom (W2.6) and the windows of the first floor bathroom (W1.2) and the maidœs room (W1.1).[33]

In 1989 a study of climate control carried out by Landmark Facilities Group found the windows to be the source of moisture-related problems in the house.[34] This was due to their design, along with the presence of the vertical siding and the excessive shading from trees that allowed rain to penetrate the structure.[35] Sills were rotting in the kitchen (W1.9) and in the first floor bathroom (W1.2) due to window condensation that developed when the resident overseer used the sink and shower in the winter.[36] The windowsô single layer of glass and the steel casements made the building unable to contend well with winter humidity generally.[37]

Figure 5: Rust on the south elevation master bedroom window, 1990
Historic New England Property Care Binder, Lyman Estate

Likely due to these factors, rust on the window framesô interior continued to present problems through 1991, in addition to questions about how to clean the UV film.[38] Repair

Redmond, ñAdditional Gropius Needsò (Waltham, MA: Historic New England Property Care Files, 1987). Elizabeth Redmond, ñGropius House Observationsò (Waltham, MA: Historic New England Property Care Files, 1987).
[33] Ellen, ñGropius Houseò (Waltham, MA: Historic New England Property Care Files, 1988). Rob Brown, ñQuarterly Report of Conditionsò (Waltham, MA: Historic New England Property Care Files, 1988).
[34] Ernest A. Conrad to Robert Kret, January 18, 1989, Landmark Facilities Group, Norwalk, Connecticut.
[35] Ibid.
[36] Ibid.
[37] Ibid.
[38] ñBuilding Conditions: Major Concerns ï Gropius Houseò (Waltham, MA: Historic New England Property

ideas for the windows on the north elevation included glazing replacement and the sealing of open joints in the window casings, but it is unclear whether this work was carried out.[39]

In 1992 Greg Clancey, an architectural conservator, studied the maintenance needs for the house and focused on the leaking windows. Clancey argued that the windows on the west elevation were the ones with the most leakage, and that poor caulking work in the 1985-86 restoration project probably caused much of the frame rusting problems.[40] Thus, he recommended that the old caulking be removed.[41] After metal components were treated with rust removal and Rustoleum and any necessary carpentry work was carried out, the windows were to be re-caulked using a polyurethane caulk with a bead no wider than 3/8ò.[42] However, it is again unclear whether this advice was put into action, despite the fact that ñglazingò was included in a budget note.[43]

In 1994 Coating System Design was hired to carry out another analysis of the windows. They concluded that the contact between the steel window frames and the wooden cladding, which was often wet, was causing the windows to rust.[44] The fact that there were metals other than lead in the frames complicated the issue further.[45] They proposed the removal of the frames and their coating with a zinc-rich primer.[46] They also recommended that the wood abutting the steel be coated with an alkyd-based wood primer and a long oil alkyd finish to prevent water damage.[47] In 1995 the window in Atiôs room (W2.6) over the rear porch was selected for a ñprototypeò window repair project because its corrosion was especially bad.[48] The specifications for the work reflect the advice of Coating System Design, and included the removal, repair, and reinstallation of the window *(Figure 6)*.[49] UV film was also reinstalled the same year.[50]

Care Files, 1991). ñRoom-by-Room SWAT Evaluationò (Waltham, MA: Historic New England Property Care Files, 1991).
[39] Frank Thompson, ñGropius Moisture Intrusion and Plaster Repair Problemsò (Waltham, MA: Historic New England Property Care Files, 1991).
[40] Gregory K. Clancey, *Analysis of Repair and Maintenance Needs at the Walter Gropius House: Lincoln, Massachusetts*, report, Conservation Center, Society for the Preservation of New England Antiquities (1992), 1 and 5.
[41] Ibid., 11.
[42] Ibid.
[43] ñGropius ï Site Workò (Waltham, MA: Historic New England Property Care Files, 1992).
[44] "An Evaluation for Options for Rectification of the Corroding Metal Window Frames at the Gropius House, Lincoln, MA," Clive H. Hare to Greg Clancey, May 25, 1994, Coating System Design, Inc., Lakeville, Massachusetts.
[45] Ibid.
[46] Ibid.
[47] Ibid.
[48] A. Votaw, ñGropius House Steel Window Prototype Restoration: 1995 Work Reportò (Waltham, MA: Historic New England Property Care Files, 1995).
[49] Ibid.
[50] New England Sun Control Invoice (Waltham, MA: Historic New England Property Care Files, 1995).

Figure 6: Steel window frame during grit blasting, 1995
Historic New England Property Care Binder, Lyman Estate

In 1995 a paint analysis of the houseõs exterior revealed the window surroundsô color history and paint adhesion issues. The rusting metal frames were pushing the paint away from the surface, which was exacerbated by the ongoing moisture problems.[51] The same was true of the wooden window surrounds, which were covered with moldy paint layers.[52] On both the frames and the surrounds, layers of paint containing oil-based and synthetic emulsion binding mediums adhered poorly to one another. There was also evidence of a metallic priming layer on the metal and the wood.[53] The colors of the paints on both features were various grays, and the shade chosen for repainting was Benjamin Mooreõs Westcott Navy (#1624).[54]

In 1995 repairs to an unspecified screen were proposed, and in 1996 screen clips and parts were sought.[55] During the latter year, Simpson, Gumpertz, and Heger Engineers water-tested the windows on the east elevation and found that water was able to infiltrate the structure at the sill, the sides of the window units, the ñTò mullion, and the joints of the header flashing.[56] As these problems were consistent with those found in the prototype

---

[51] Susan L. Buck, *Exterior Paint Samples -- Gropius House*, report, Conservation Center, Society for the Preservation of New England Antiquities (1995).
[52] Ibid.
[53] Ibid.
[54] Ibid.
[55] ñVictorian Glass & Mirror Co. Invoice,ò (Waltham, MA: Historic New England Property Care Files, 1995). Andy Votaw to Brenda, July 26, 1996, Massachusetts.
[56] Jeffrey Wallace and Amy Geoffroy, ñGropius House 1996 Work Reportò (Waltham, MA: Historic New England Property Care Files, 1996).

window, the windows on the east elevation underwent a similar repair process in 1997 with the addition of new lead-coated copper flashings *(Figure 7)*.[57] In 1998 the same work was carried out on the windows of the north elevation, including welding and repairs of bottom rails and stiles of the fixed windows.[58] The damage to vent windows was more limited.[59] The glass in the study window (W1.4A) had to be replaced after it was cracked during the removal process.[60] UV film was reinstalled at the same time.[61]

Figure 7: Steel window restoration work, 1997
Historic New England Property Care Binder, Lyman Estate

After the first round of repairs, the glazing on the windows was losing adhesion to the glass and creased in the paint at the lower rail.[62] The interior condensation problems caused by the use of sinks or showers persisted.[63] The windows were temporarily glazed with DAP1012 and the advice of Martin Hadlington, a conservation architect, was sought.[64] Hadlington hypothesized that the problem was occurring either due to porous paint allowing water to be trapped between the glazing compound and the glass, or the relative

---

[57] Linda Willett to Harry Seidler & Associates, June 17, 1997, Society for the Preservation of New England Antiquities, Boston, Massachusetts.
[58] ñGropius House Specificationsò (Waltham, MA: Historic New England Property Care Files, 1998).
[59] Ibid.
[60] Linda Willett, *Project Completion Report*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1999), 4.
[61] New England Sun Control Invoice (Waltham, MA: Historic New England Property Care Files, 1998).
[62] Linda Willett to Martin Hadlington, March 15, 1999, Society for the Preservation of New England Antiquities, Boston, Massachusetts.
[63] Ibid.
[64] Ibid.

purity of modern linseed oil putty compared to that used in the 1930s.[65] He recommended that SPNEA use a glazing product called Arbolite, manufactured by Adshead Radcliffe.[66] SPNEA then solicited and received more information about Arbolite, but it is unclear whether it was used.[67]

When the glazing was removed during the Save Americaĉs Treasures (SAT) grant project in 2001, it was bagged and three types were identified.[68] However, no information gleaned from these samples appears to have been recorded. Another note indicates that the problem may have come down to adhesion issues with the finish paint rather than the glazing, but this too is unclear.[69] In any case, the windows on the south and west elevations were eventually removed, repaired, and reinstalled as part of the SAT grant project *(Figure 8)*. The process was similar to that which had been carried out on the other elevations, and included cutting the frames in two unspecified places and welding in new material.[70] During their work staff found that the west living room window (W1.5) was somehow larger than its frame, so it had to be cut out.[71] In addition, the south living room window (W1.6) broke during removal and had to be replaced.[72] The project solved the major window problems that had been plaguing Gropius House for years.[73]

Figure 8: Window repair during the SAT grant project, 2001
Historic New England Property Care Binder, Lyman Estate

[65] "Walter Gropius House: Glazing Problems," Martin Hadlington to Linda Willett, May 19, 1999, Oban, Argyll, Scotland.
[66] "Walter Gropius House: Glazing Problems," Martin Hadlington to Linda Willett, May 25, 1999, Oban, Argyll, Scotland.
[67] Linda Willett to Adshead Ratcliffe & Co. Ltd., June 04, 1999, Society for the Preservation of New England Antiquities, Boston, Massachusetts.
[68] Bruce Blanchard, *Work Completion Report: Gropius House*, report, Society for the Preservation of New England Antiquities (2000).
[69] Jim McKeag, e-mail to Jamie, 2001.
[70] ñGropius House Specificationsò (Waltham, MA: Historic New England Property Care Files, 2001).
[71] Bruce Blanchard, *Gropius House Window Removal: West and South Elevations*, report (Lincoln, MA: Society for the Preservation of New England Antiquities, 2000), 1.
[72] Ibid.
[73] *Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, National Park Service, United States Department of the Interior, Final ed. (Boston, Massachusetts: Society for the Preservation of New England Antiquities, 2002).

Two tempered glass windows were re-glazed in 2003, and spot glazing also took place in 2013 and 2014.[74] In 2015 the wooden sill of the kitchen window (W1.9) pulled away from the building, allowing water into its interior and causing deterioration of the wall cavity.[75] A Dutchman repair was carried out on the sill *(Figures 9 and 10)*.[76]

Figures 9 and 10: Sill repair, 2015
RS ID #249326 and RS ID #249330

Interventions

2015: Earlier Dutchman repair of the wooden sill of kitchen window pulled away from building, allowing water into its interior. This is potentially causing ongoing deterioration of the wall cavity and perhaps of the building in general.

2014: Replacement and repair of glazing putty

2013: Spot glazing repair

2003: Two large, tempered glass windows re-glazed

2001: Windows on the south and west elevations removed, repaired and reinstalled. Lead-coated copper flashing installed at sills and window jambs.

1999: UV film installed on the north elevation windows as well as the west and south living room windows. Consultant hired to analyze glazing failure and suggest solutions.

1998: Windows and flashing on north elevation removed, repaired and reinstalled. Lead-coated copper flashing installed at sills and window jambs. UV film installed.

1997: Windows and flashing on east elevation removed, repaired and reinstalled. Lead-coated copper flashing installed at sills and window jambs. UV film installed.

1996: Windows on east elevation water-tested by engineers, showing many areas of water infiltration. Unspecified screen repaired and bonded to frame; screen clips sought.

1995: UV control film installed on windows, but later an intention to remove it was expressed. Window in Atiôs room over back porch chosen for prototype repair, which was carried out.

---

[74] Arlmont Glass, Inc. Invoice (Waltham, MA: Historic New England Property Care Files, 2003). ñGlazing Repair,ò Historic New England Property Care Electronic Database of Historical Projects, 2014. ñReglaze and Repaint Glazing Failitures,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

[75] ñWindow Sills,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

[76] ñWindow Sills,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

1994: Window issues analyzed and techniques suggested for repairs
1993: Need for repair of master bedroom and dressing room windows noted
1992: Many window leaks discovered during a survey of maintenance needs. Steel frames rusted throughout the house.
1991: Interior window frames still rusty. Caulking issues and paint-related problems plague window surrounds due to water infiltration around windows. Repairs suggested include new glazing, the sealing of open joints in window casings on north elevation, and the installation of storm windows to protect metal casements. UV film applied, but began to fade and peel on the second floor. Staff unsure how to wash the windows with UV film, and looked into UV paint used at Canadian museums. Problems with master bedroom windows caused major moisture issues, and repairs were carried out.
1989: Climate control study found that design of windows, occasional wetness of vertical clapboards, and shading from trees were causing the rusty frames, rotting window surrounds and condensation problems
1988: Rust on second floor window frames. Leaks in first floor bathroom window, south window of master bedroom, and maidôs room window.
1987: Basement window cleaned out. Window panes in dressing room and pantry broken. Hinge on maidôs bathroom window not working. Staff unsure how to clean glass with UV film applied. Several metal window sashes rusting despite recent repair.
1986: Four windows were removed and their openings were refurbished. Caulking, glazing, mechanical, hardware, and rust repairs carried out on all windows as needed. UV film installed. Cracked window in pantry included on list of maintenance work to be completed.
1982: Inspection of building found windows in need of repairs
1973: Purchase order for plate glass installation, with no location specified
1967: Basement window replaced after storm blows it in
1962: Request for replacement window handle and repairs to several sticky ones
1959: Window vents sticky due to malfunctioning handles. Screws broken on screens.
1955: Loose putty on windows removed. Re-glazing and caulking around windows on east elevation
1953: Request for the repair or replacement of worn window handles
1949: Proposal for removal of loose putty, re-glazing and caulking around windows on east elevation. Probably did not occur until 1955.
1946: Request for repair or replacement of worn window handles. Bronze screens causing stubborn discoloration of paint on window sills.
1938: Windows not installed as specified. Johansen claimed to have influenced the size and height of some, and installation differed from drawings. Glass types different in reality from those indicated on plans.

BIBLIOGRAPHY

ñAdditional Gropius Needs.ò Elizabeth Redmond. 1987. Massachusetts.

"An Evaluation for Options for Rectification of the Corroding Metal Window Frames at the Gropius House, Lincoln, MA." Clive H. Hare to Greg Clancey. May 25, 1994. Coating System Design, Inc., Lakeville, Massachusetts.

Andy Votaw to Brenda. July 26, 1996. Massachusetts.

Arlmont Glass, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 2003.

Blanchard, Bruce. *Gropius House Window Removal: West and South Elevations*. Report. Lincoln, MA: Society for the Preservation of New England Antiquities, 2000.

Blanchard, Bruce. *Re-Glaze and Repaint Glazing Failures*. Report. MA: Historic New England, 2014.

Blanchard, Bruce. *Work Completion Report: Gropius House.* Report. Historic New England. 2000.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

Buck, Susan L. *Exterior Paint Samples -- Gropius House.* Report. Conservation Center, Society for the Preservation of New England Antiquities. 1995.

ñBuilding Conditions: Major Concerns ï Gropius House.ò Waltham, MA: Historic New England Property Care Files, 1991.

Clancey, Gregory K. *Analysis of Repair and Maintenance Needs at the Walter Gropius House: Lincoln, Massachusetts.* Report. Conservation Center, Society for the Preservation of New England Antiquities. 1992.

Cochrane, Tom. Landscape Renovation Recommendations. Report. MA, 1988.

Dani, Jeanmaire. ñThe Walter Gropius Residence Lincoln, Massachusetts: Construction History and Restoration Issues.ò Master's thesis, Columbia University, 1995.

Daniel M. Lohnes to Beate Forberg. April 02, 1982. Massachusetts.

Ernest A. Conrad to Robert Kret. January 18, 1989. Landmark Facilities Group, Norwalk, Connecticut.

Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. National Park Service, United States Department of the Interior. Final ed. Boston, Massachusetts: Historic New England, 2002.

Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.

ñGlazing Repair.ò Historic New England Property Care Electronic Database of Historical Projects. 2014.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. *East and West Elevations*. 1938. Frances Loeb Library Special Collections, Harvard University, Cambridge, MA.

Gropius, Walter. *North and South Elevations*. 1938. Frances Loeb Library Special Collections, Harvard University, Cambridge, MA.

Gropius, Walter. ñThe House of New Livesò [Das Haus des neuen Lebens]. (1933).

Gropius, Walter. ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar]. *Bauhausverlag* (1923): 22-31.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J.

Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
Gropius House Completion Report: Window Reinstallation. Report. MA: Society for the Preservation of New England Antiquities, 1986.
ñGropius House List.ò Marla Sullivan. 1986. Massachusetts.
ñGropius House Observations.ò Elizabeth Redmond. 1987. Massachusetts.
ñGropius House Specifications.ò Waltham, MA: Historic New England Property Care Files, 1998.
ñGropius House Specifications.ò Waltham, MA: Historic New England Property Care Files, 2001.
ñGropius Notes.ò Waltham, MA: Historic New England Property Care Files, 1982.
ñGropius ï Site Work.ò Waltham, MA: Historic New England Property Care Files, 1992.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files. 1945.
Howard E. Custance to Walter Gropius. September 27, 1949. Custance Brothers, Inc., Lexington, Massachusetts.
Howard E. Custance to Walter Gropius. April 11, 1955. Custance Brothers, Inc., Lexington, Massachusetts.
ñInterior Odd Jobs.ò Waltham, MA: Historic New England Property Care Files, 1987.
Linda Willett to Harry Seidler & Associates. June 17, 1997. Society for the Preservation of New England Antiquities, Boston, Massachusetts.
Linda Willett to Martin Hadlington. March 15, 1999. Society for the Preservation of New England Antiquities, Boston, Massachusetts.
Linda Willett to Adshead Ratcliffe & Co. Ltd. June 04, 1999. Society for the Preservation of New England Antiquities, Massachusetts.
McKeag, Jim. E-mail to Jamie. 2001.
Metal Sash Service Invoice. Waltham, MA: Historic New England Property Care Files, 1986.
New England Sun Control Invoice. Waltham, MA: Historic New England Property Care Files, 1995.
New England Sun Control Invoice. Waltham, MA: Historic New England Property Care Files, 1998.
ñReglaze and Repaint Glazing Failitures.ò Historic New England Property Care Electronic Database of Historical Projects. 2015.
ñRoom-by-Room SWAT Evaluation.ò Waltham, MA: Historic New England Property Care Files, 1991.
Thompson, Frank. *Gropius Moisture Intrusion and Plaster Repair Problems.* Waltham, MA: Historic New England Property Care Files. 1991.
ñVictorian Glass & Mirror Co. Invoice.ò Waltham, MA: Historic New England Property Care Files. 1995.
Votaw, A. ñGropius House Steel Window Prototype Restoration: 1995 Work Report.ò Waltham, MA: Historic New England Property Care Files, 1995.
Wallace, Jeffrey and Amy Geoffroy. ñGropius House 1996 Work Report.ò Waltham, MA: Historic New England Property Care Files, 1996.
"Walter Gropius House: Glazing Problems." Martin Hadlington to Linda Willett. May 19,

1999. Oban, Argyll, Scotland.
"Walter Gropius House: Glazing Problems." Martin Hadlington to Linda Willett. May 25, 1999. Oban, Argyll, Scotland.
Walter Gropius to David A. Price. October 09, 1956. Massachusetts.
Walter Gropius to Hope's Windows. January 21, 1946. Massachusetts.
Walter Gropius to Hopeœs Windows, 1959, Massachusetts
Walter Gropius to Hopeœs Windows, March 12, 1962, Massachusetts
Walter Gropius to R. L. Cole. October 07, 1953. Massachusetts.
Willett, Linda. *Project Completion Report*. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1999.
ñWindow Sills.ò Historic New England Property Care Electronic Database of Historical Projects. 2015.

Appendix A – Analysis of Past Repairs

The effectiveness of past repairs to the windows was analyzed in late 2016.

The steel windows of the Gropius House have been repaired many times, and documentation suggests that the projects undertaken between 1995 and 2001 saw work on every window in the house. These projects employed the same basic methodology ï removal of the window, followed by surface treatment and grit blasting of the frames so that a full condition assessment could be performed. Areas of deterioration, which were typically located in the bottom corners, were cut out of the frames and replaced with new fused pieces. The frames were then treated with zinc and a urethane finish.

ANALYSIS
The repairs undertaken between 1995 and 2001 appear to have been mostly successful. Only the glazing has failed between the workôs completion and late 2016. Although the urethane paint finish seems to be holding well, areas of rust are developing along the bottom rail where moisture is penetrating the glazing. The glazing itself appears wrinkled, as though it dried quickly. Historic New Englandôs carpentry foreman, Bruce Blanchard, reported on a site visit that this was evidence of failure in the original treatment completed in the 1990s. At this time the glazing was painted with the same urethane finish as the windows, but these materials are incompatible. The glazing moves with shifts in the environment, but the urethane paint is less forgiving. A glazing compound designed for wood windows was used recently at the site, but it failed almost immediately and was replaced.

Future work should follow the same protocols as those used between 1995 and 2001. However, it may be prudent to use a softer grit in the future to prolong the life of the steel windows. It should also be noted that the paint chronology has been lost from the windows due to previous treatments, so a paint analysis is the only remaining record of its history. Another project that would be beneficial in the future is the research and documentation of each individual windowôs repair history. Time did not allow for this work to be undertaken in 2016.

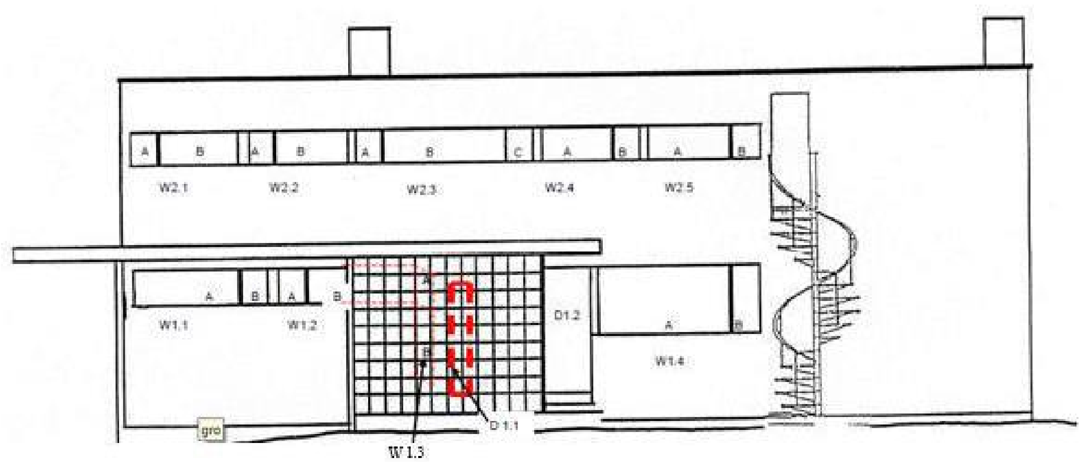
Detail Change 1: Flashing

- Upon discovery that water had been infiltrating the building since the houseôs original construction, the flashing above and below the windows was altered. In 2016 time did not allow for a full analysis of this work, but the repair seems to be fulfilling its purpose. There were no visual changes that would be obvious to a layperson.

Detail Change 2: Possible Kerf Implementation

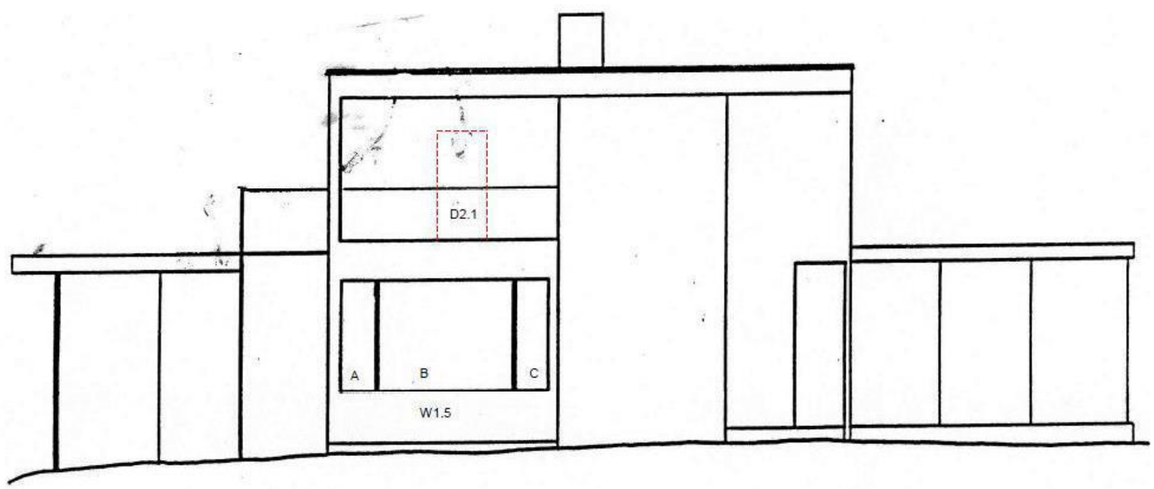
- A kerf, or excavated channel, runs the length of the window sill. It was intended to prevent water from traveling under the sill and back into the building by directing it off the edge of the window instead. Since members of the SPNEA carpentry crew were frequently implementing this change in the late 1990s and early 2000s, it seems likely that they created the feature. However, it is unknown whether or not Gropiusôs original window sills were the inspiration for the work.

APPENDIX B: Window Schedule
Historic New England, 2009



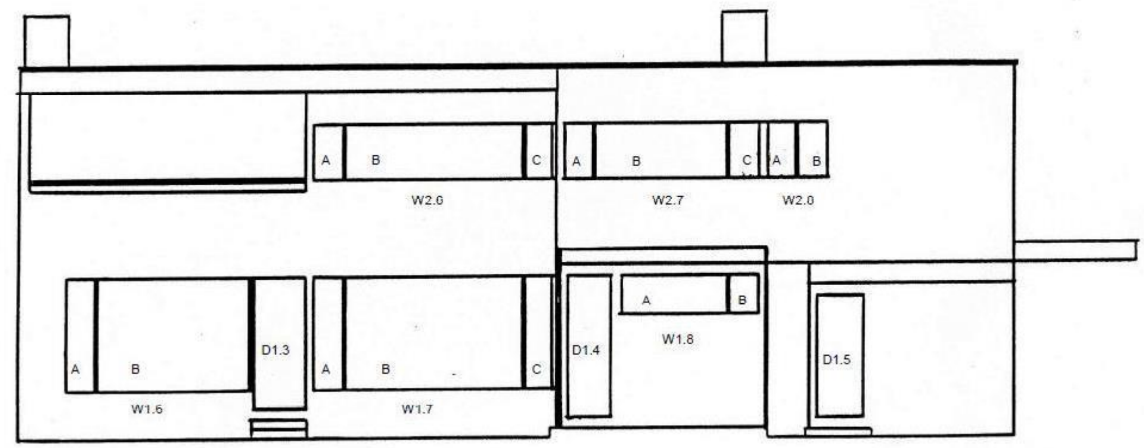
North Elevation

W1.4A replaced with tempered glass 1997



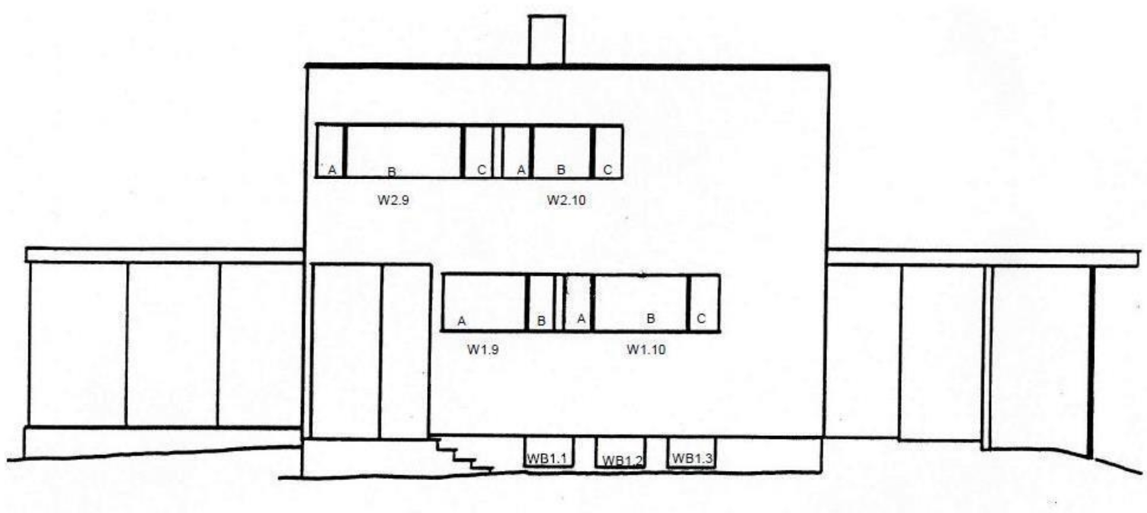
West Elevation

W1.5B replaced 2001



South Elevation

W1.6B replaced 2001



East Elevation

Gropius House Specialty Glass

Property Name: Gropius
Structure: Gropius House
Feature: Specialty glass
Original Material: Owens-Illinois ñInsuluxò 11 ¾ x 11 ¾ glass blocks, #407; Libbey-Owens-Ford Glass Company ñLouvrexò fluted glass; and ribbed glass also likely manufactured by the Libbey-Owens-Ford Glass Company
Original Color: N/A
1965-1969 Material: Owens-Illinois ñInsuluxò 11 ¾ x 11 ¾ glass blocks, #407; Libbey-Owens-Ford Glass Company ñLouvrexò fluted glass; and ribbed glass also likely manufactured by the Libbey-Owens-Ford Glass Company
1965-1969 Color: N/A

RS ID #280880, 2016

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. This should be the continued upkeep approach and a patina of age or deterioration should be minimized.[1]

Evidence suggests that the specialty glass of the Gropius House was in excellent condition during the interpretive period. Today, it should be kept in good repair whenever possible in order to maintain the clean lines crucial in Bauhaus architectural features. The specialty glass has been identified as ribbed, fluted Louvrex, and glass blocks. Cracked glass blocks should be replaced even where the cracks are historic, because small imperfections could allow moisture to cause more severe damage. Epoxy repairs should be attempted with the other specialty glass until the aesthetic of the glass is deemed marred by the repairs. When replacing glass careful attention must be paid to its visual qualities, specifically the patterning and color. If custom and salvage replacements are not possible, a modern material that echoes the character-defining features of the original should be sourced.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016
Material notes: Three types of specialty glass - Owens-Illinois ñInsuluxò 11 ¾ x 11 ¾ glass blocks, #407; Libbey-Owens-Ford Glass Company ñLouvrexò fluted glass; and Ribbed glass also likely manufactured by the Libbey-Owens-Ford Glass Company

- Maintenance Protocol
  - Inspect the specialty glass annually looking for new cracks or breaks.
  - Snow should be promptly cleared away from the base of the glass block wall to minimize water penetration into the support system that has resulted in rust jacking in the past.
- Repair Protocol
  - Although the option matrix developed from the report issued by Jablonski Building Conservation, Inc. (JBC) (Appendix B) does not recommend the use of epoxy to secure broken specialty glass windows, Historic New England will continue the practice unless the glass is broken in too many pieces to be stable, the break is allowing moisture to penetrate to the frame or interior, or the breaks are deemed visually distracting to the aesthetic.
  - In 2016 Historic New Englandôs interpretive task force, PPIP, reviewed the options for the glass block (Appendix B) and determined that it was critical to match the aesthetic of both sides of the block. Additional research is needed regarding the viability of cutting and re-adhering salvaged blocks so that the patterning matched or to discuss with Owens-Corning the viability of re-establishing the block pattern.
  - Regardless of the repair protocol, the sash frames should be stripped of any paint or rust and coated with primer and a corrosion inhibiting substance.[2] This is consistent with previous treatments to the steel frame windows that do not contain specialty glass.
  - Regardless of the glass repair or replacement method selected for the exterior block wall, the steel channel at its ends should be replaced with a non-corroding metal and the caulking should be swapped with a butyl-rubber expansion joint seal.[3] In order for this repair to be carried out properly, the connection at the top of the steel channel must be better understood.[4] The exposed metallic rebar should be cleaned of corrosion product by wire brushing and covered with a rust converter and two coats of a zinc oxide rust-inhibiting enamel primer.[5] Further corrosion of the steel can be slowed by careful maintenance of the cement mortar, which has a high pH level that allows a thin, protective oxide layer to form on the

[2] Ibid., 21.
[3] Ibid., 24.
[4] "Gropius House Glass Entry Wall - Conditions Assessment," Elizabeth Acly to Mary Jablonski, November 20, 2015, Cirrus Structural Engineering, LLC, Columbia, Connecticut, 5.
[5] Jablonski, *Conservation Plan*, 24.

metal.[6] If this work is not carried out, the increasingly corroded steel reinforcing bar will cause major glass cracking.[7]

Original Construction and Evolution:
Three kinds of specialty glass were installed in the Gropius House; the ñribbedò and the fluted ñLouvrexò types produced by the Libbey-Owens-Ford Glass Company, and Owens-Illinoisô ñInsuluxò #407 11 ¾ x 11 ¾ glass blocks (see Appendix A for details from the original plans).[8] The ribbed and fluted glass was made by passing molten glass through two metal forming rolls, one of which was textured.[9] The fluted glass was then installed horizontally at the first floor bathrooms and vertically at the east wall of the coat closet in the entry hall.[10] The ribbed glass is present in the pantry, where it is oriented horizontally.[11]

The glass blocks were made by pressing together two halves of molten glass, each of which were patterned with fluting on their inside faces.[12] During this process a partial vacuum was created inside the hollow blocks, allowing them to provide insulation when built into a wall and preventing condensation from forming on their interior.[13] The blocks were then coated with a substance that improved their bond with mortar.[14] In order to form the walls at the front entry ell and between the study and dining rooms, they were set in Portland cement with expansion joints at jambs and heads and metal reinforcement in the larger mortar joints.[15] Only the wall at the front entry ell will be discussed in this report.

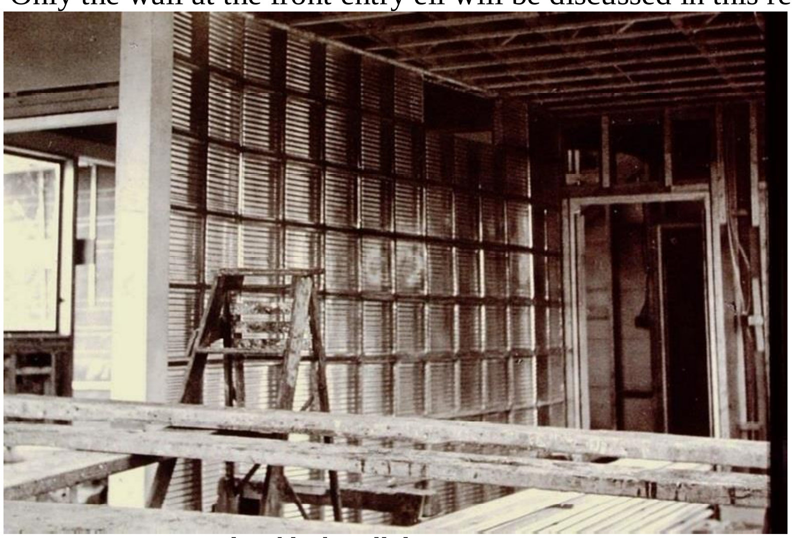


Figure 1: Interior glass block wall during construction, circa 1937-38
Historic New England Archives, Binder of Slides

[6] Ibid., 19-20.
[7] Ibid., 20.
[8] Ibid., 1.
[9] Ibid., 10.
[10] Ibid., 4.
[11] Ibid.
[12] Ibid., 10.
[13] Ibid.
[14] Ibid.
[15] Ibid.

Character-Defining Traits in the Interpretive Period:

There are no written records of any activity regarding the specialty glass before the house was acquired by the Society for the Preservation of New England Antiquities (SPNEA). While historical photographs are not detailed enough to show the condition of the features during the interpretive period, the lack of maintenance carried out by Gropius suggests that at that time they exhibited the precision of Bauhaus design. For this reason, the intent behind their original installation still defined their character between 1965 and 1969.

All three kinds of glass exemplify Gropiusô s preference for standard materials, which were cheaper than the custom-made features fabricated for more traditional houses.[16] The glass types were developed in the 1930s and were used in much of the modern architecture being designed at that time.[17] The fluted and ribbed glass provide privacy at the ground floor areas of the house, and the horizontal and vertical arrangement of their textured patterns accentuates Gropiusô s linear window design.[18] The exterior glass block wall floods the rooms with light, while ñimparting a sense of volume without the solidity conveyed by traditional masonry and providing detail through the intrinsic elegance of materials rather than applied ornamentò.[19] Linear patterns, bright, open spaces and emphasis of materials themselves over ornament are all hallmarks of the Bauhaus style.[20]

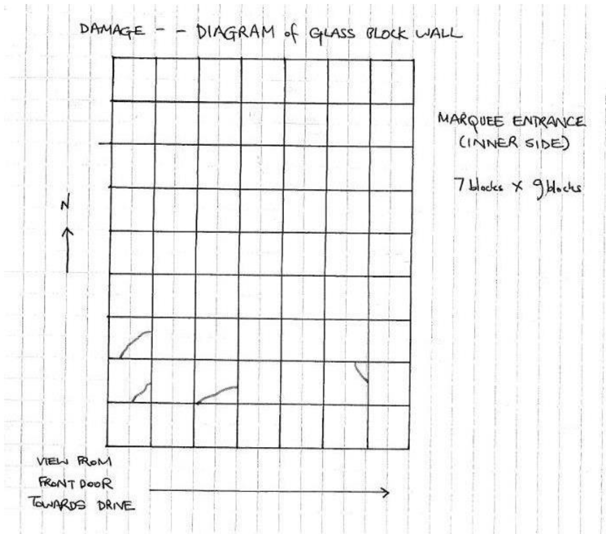
Figure 2: Exterior glass block wall, 1965
Historic New England Archives, Binder of Slides

[16] Ibid., 3.
[17] Ibid., 8-10.
[18] Ibid., 4.
[19] Ibid., 5.
[20] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 269.

History of Conservation and Maintenance Practices:
The first written record concerning the specialty glass is from 1986, when a need for the re-glazing of two unspecified ñribbedò windows was noted during a Massachusetts Historical Commission grant project.[21] The work was never carried out because SPNEA staff could not locate the correct replacement material, due in part to the fact that the glass could not be tempered to meet modern safety requirements.[22] In 1987 when the recaulking of the glass block wall was included on a to-do list.[23] During the same year, a man living in New Jersey told SPNEA that he would be willing to donate the rippled glass window in his home to replace a cracked one at the Gropius House.[24] The New Jersey house was designed by a pupil of Gropius in 1939 and ñdistinctly recalls the house at Lincoln, Mass.ò.[25] It is somewhat unclear which Gropius panel had broken and when the damage occurred. Although the broken window is described as ñribbed,ò its location ñby the doorò and the vertical orientation of the replacement piece suggests that the panel in question is the fluted one by the coat closet *(Figure 3)*.[26] SPNEA staff reacted to the offer with enthusiasm because they had found that the ñLouvrexò glass was no longer produced, but there is no evidence to suggest that the replacement was actually carried out.[27] In fact, it is unlikely that it was given a 1995 report that the glass in the entry hall was cracked.[28]

Aside from notes about SPNEAôs intention to treat the exterior glass block wall with UV screening in 1989 and 1990, most of the information available about the specialty glass comes in reports warning of developing breakage.[29] By 1990 four of the exterior glass blocks were cracked, and in 1996 one new crack was discovered along with the widening of another *(Figure 4)*.[30] During a major repair project on the property in 1998, an older crack in the fluted glass by the front closet was repaired with a two-part UV-resistant epoxy called Hxtal.[31] Information about glass blocks manufactured by the Pittsburgh Glass Company was printed in 2000, suggesting that SPNEA was considering replacement options at the time.[32] However, there is no evidence that the work was ever carried out.

[21] *Gropius House Development Project*, report, Section III - Narrative Report, Finishes (Boston, MA: Historic New England, 1986), 5.
[22] Ibid.
[23] ñExteriorò (Waltham, MA: Historic New England Property Care Files, 1989).
[24] J. C. Furnos to Nick Langhart, July 1, 1987, Stanton, New Jersey.
[25] Ibid.
[26] Nick Langhart to Margaret R. Burke, July 07, 1987, Massachusetts.
[27] Ibid.
[28] ñJeanmaire Dani, ñThe Walter Gropius Residence Lincoln Massachusetts: Construction History and Restoration Issuesò (masterôs thesis, Columbia University, 1995), 37.
[29] ñGropius Listò (Waltham, MA: Historic New England Property Care Files, 1989). Nancy Mazer, ñMeeting with John Connollyò (Waltham, MA: Historic New England Property Care Files, 1990).
[30] Mazer, ñMeeting with John Connolly.ò "Damage to Glass Block Wall," Annabel Hanson to Linda Willett, July 17, 1996, Gropius House, Lincoln, Massachusetts.
[31] Linda Willett, *Project Completion Report*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1999), 3.
[32] "Glass Block Sizes," Pittsburgh Glass Block Company, accessed May 30, 2000, http://www.glass-block.com/basics_specs.cfm.



Figures 4 and 5: Sketch of glass block wall condition, Annabel Hanson, 1996 and failure of glass block caulking, 2009
Historic New England, Property Care Files and RS ID #56667

In 2016 JBC completed a conservation plan based on their 2015 analysis of the architectural glass at the Gropius House *(Figure 6)*. At this time they found that six of the blocks in the second and third courses of the exterior glass wall exhibited shear stress cracks.[33] They predicted that the cracks would widen with the expansion of freezing moisture in the winter, creating even more opportunities for damage.[34] They also found the mortar in the feature to be hard, which makes its expansion joints crucial.[35] Unfortunately, the only feature of the wall designed to relieve stress in this way is cork padding located at the ends of the wall where it abuts the steel channel.[36] The steel reinforcements are corroding where they have been exposed to air and moisture.[37]

JBC staff also found a hole in the ribbed glass of pantry window, which had worsened with stress on the glazing *(Figure 7)*.[38] The breakage had been covered by packing tape as a temporary solution.[39] There was additional damage at the bottom of the vertical fluted glass, where the severe stress cracking observed was probably the same breakage noted in 1987 and 1995.[40] There were two stress cracks in the fluted glass of the first floor bathroom windows.[41]

[33] Jablonski, *Conservation Plan*, 19.
[34] Ibid.
[35] Ibid.
[36] Ibid.
[37] Ibid.
[38] Ibid., 14.
[39] Ibid.
[40] Ibid., 15.
[41] Ibid.

Figure 6: Mary Jablonski surveys broken glass block, 2015.
RS ID #265467

Figure 7: Crack in ribbed glass on south elevation, 2015
RS ID #277155

Interventions

2016: Jablonski Building Conservation, Inc. completed interim conservation plan on specialty glass
2000: Glass block replacement investigated
1996: At least one new crack in glass block wall observed, and another widened significantly. Potential repair methods discussed.
1995: Crack in fluted glass window near coat rack in entry hall noted. Likely related to issues discussed during consideration of glass replacement in 1987.
1990: Planning for UV screen installation on glass block wall. Four cracked blocks noted.
1989: Planning for UV screen installation on glass block wall
1987: Glass from 1939 house designed by a Gropius pupil offered to SPNEA as a replacement for the broken fluted glass window in entry hall. Probably did not come to fruition. Re-caulking of glass wall included on to-do list.
1986: Two ribbed windows needed to be re-glazed, but SPNEA could not locate correct replacement material.

BIBLIOGRAPHY

Conservation Plan: Architectural Glass and Acoustical Plaster. Report. Property Care, Historic New England. Report. Gropius House: Lincoln, MA. New York, NY: Jablonski Building Conservation, 2016.

"Damage to Glass Block Wall." Annabel Hanson to Linda Willett. July 17, 1996. Gropius House, Lincoln, Massachusetts.

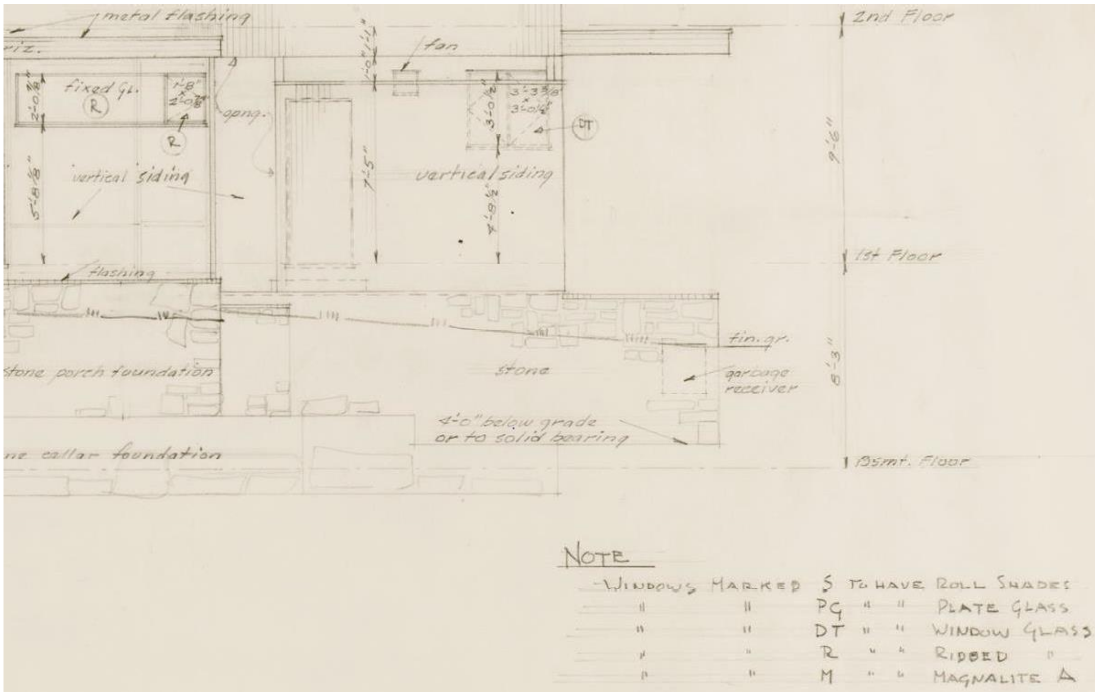
Dani, Jeanmaire. ñThe Walter Gropius Residence Lincoln, Massachusetts: Construction History and Restoration Issues.ò Master's thesis, Columbia University, 1995.

ñExterior.ò Waltham, MA: Historic New England Property Care Files, 1989.

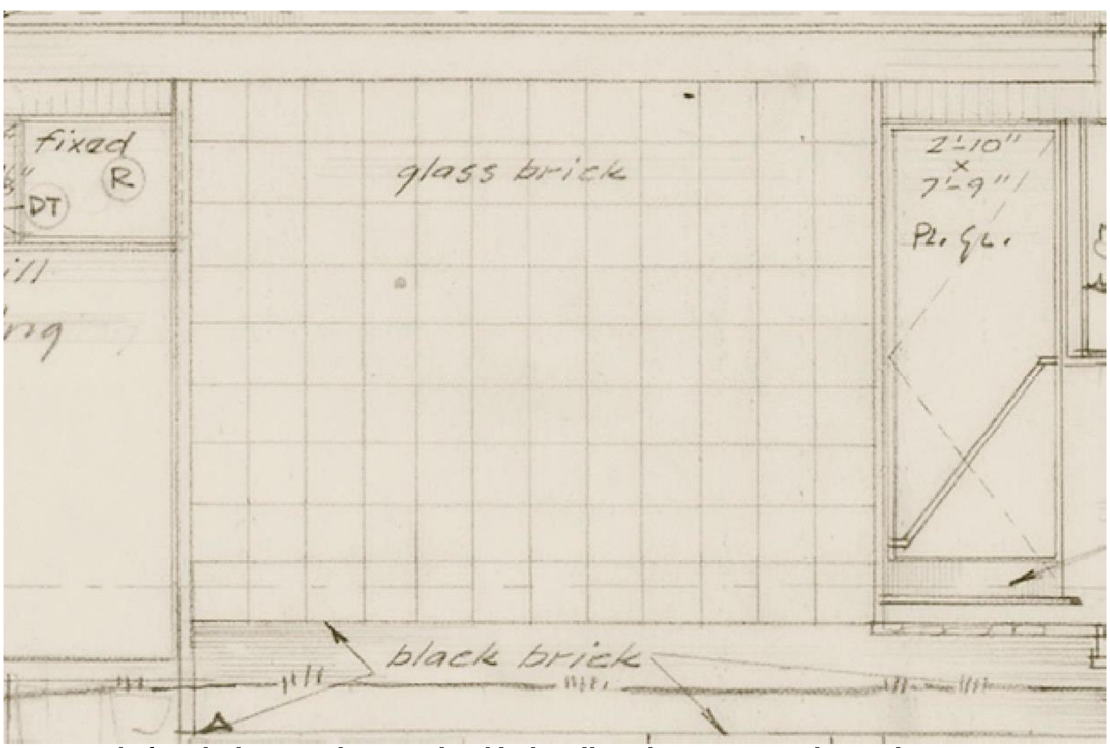
"Glass Block Sizes." Pittsburgh Glass Block Company. Accessed May 30, 2000. http://www.glass-block.com/basics_specs.cfm.

Gropius House Development Project. Report. Section III ï Narrative. Finishes. Report. Boston, MA: Historic New England, 1986.
"Gropius House Glass Block." Peter Gittleman to Linda Willett. February 1, 1996. Massachusetts.
"Gropius House Glass Entry Wall - Conditions Assessment." Elizabeth Acly to Mary Jablonski. November 20, 2015. Cirrus Structural Engineering, LLC, Columbia, Connecticut.
ñGropius List.ò Waltham, MA: Historic New England Property Care Files, 1989.
Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
J. C. Furnos to Nick Langhart. July 1, 1987. Stanton, New Jersey.
Mazer, Nancy. ñMeeting with John Connolly.ò Waltham, MA: Historic New England Property Care Files, 1990.
Nick Langhart to Margaret R. Burke. July 07, 1987. Massachusetts.
Willett, Linda. *Project Completion Report*. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1999.

APPENDIX A: Original Plan Details



Detail of south elevation showing different glass types, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums



Detail of north elevation showing glass block wall, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

APPENDIX B: Glass Block Options

The glass repair and replacement options provided by Jablonski Building Conservation in 2016 are summarized in the following table. For further information on each method, see the firmǿs full report.[42]

Glass Replacement Options

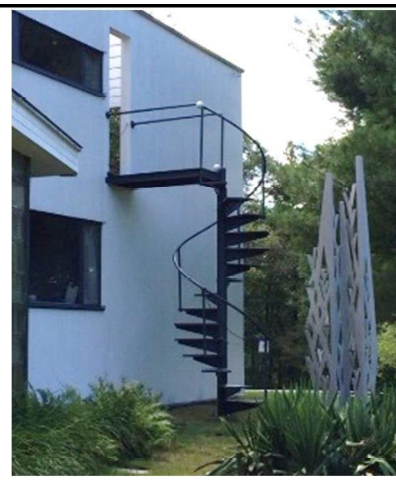
	"Ribbed"	**Libbey-Owens-Ford fluted "Louvrex"**	**Owens-Illinois "Insulux" #407 Blocks**
Modern Replacement	Bendheimǿs JBCO-162 ñribbed.ò Slight difference in color is acceptable if adjacent glass is also replaced.	If salvage and custom options prove to be unavailable, replace features with fluted glass that has a different profile but retains the character-defining features of original. Example: Gray Glassǿs 1-inch ñflutedò glass. May also have to replace adjacent glass for continuity of appearance.	None available
Salvaged Replacement	Good option if salvage replacements found	Good option if salvage replacements found	Salvaged blocks of the exact type are rare, but Owens-Illinois ñInsuluxò #402 and #416 blocks are very similar and more easily obtained.
Custom Replacement	Not recommended	Feasibility under consideration	1: Cut blocks with flutes perpendicular to original (such as Owens-Illinois ñInsuluxò #402 or #416), orient them to make them look like #407, and rejoin them. Untested approach. Would take away vacuum effect. 2: Have exact replicas made by Owens-Corning, modern successor to Owens-Illinois. Only possible if company receives enough orders. Very long, expensive process. Color of glass would differ from original.

[42] Ibid., 20-26.

Glass Repair Options

	“Ribbed”	**Libbey-Owens-Ford fluted “Louvrex”**	**Owens-Illinois “Insulux” #407 Blocks**
Repair In-place	Could repair by injecting epoxy into cracks, but not recommended. Difficult process, likely to be visible, and would prevent cleaning of glass and corroded metal.	Could repair by injecting epoxy into cracks, but not recommended. Difficult process, likely to be visible, and would prevent cleaning of glass and corroded metal.	Could repair by injecting epoxy into cracks, but not recommended. Prevents cleaning of glass, access to both sides of glass impossible, and insufficient original material remains at worst cracks.
Repair Off-site	Could repair by removing glass and rejoining it before replacing, but not recommended. Repairs are likely to be visible, and glass may break during removal.	Could repair by removing glass and rejoining it before replacing, but not recommended. Repairs are likely to be visible, and glass may break during removal.	Not recommended

GROPIUS HOUSE EXTERIOR STAIRS

Property Name: Gropius **Structure:** Gropius House **Feature:** Exterior Stairs **Original Material:** Concrete and steel **Original Color:** Gray **1965-1969 Material:** Concrete, flagstone, mortar, and steel **1965-1969 Color:** Gray (color-matched to Munsell #2.5PB 4/2)	 RS ID #236752, 2015

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. This should be the continued upkeep approach and a patina of age or deterioration should be minimized.[1]

The exterior stairs must be kept in good repair in order to maintain the house in its 1960s condition and to ensure the safety of staff and visitors, although the use of the spiral stairs is prohibited by visitors.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016

The exterior stairs be kept in good repair. Minor maintenance should occur on a regular basis. When evidence of work becomes obvious, the replacement of finishes and materials should be considered.

Kitchen stairs

- Bluestone steps
  - Stones are original. As they are bedded in a mortar, they should continue to be used even with cracks and breaks until they are deemed beyond salvage.
- Stone side wall and risers
  - Stones alongside stairs and in risers are bedded in strong mortar. They should be retained, and their identity, location, and orientation should be documented before any project requiring their repair or rebuilding so that they can be returned to their historic location.
- Bedding Mortar
  - Type N Mortar Mix with Portland Cement (Quikrete Mortar Mix #1102 pre-packaged mix of Portland cement and sand, or approved equivalent). See Appendix A for analysis of past mortar formulas.
- Maintenance Protocol:
  - Inspect stairs annually to review conditions.
  - The mortar has proven susceptible to deterioration by salts or products used for melting of snow and ice. These products are not ideal for any historic environment, but using pure sand creates additional issues within house. Whichever product is used, it should be swept off stones as soon as it is no longer performing.
- Repair protocol:
  - Note: Petrographic and chemical analysis of the more historic Portland material should be included as part of a future project to determine any special properties used by Walter Gropius.
  - Loose stones are to be photographed in situ. The location and orientation of each should then be labeled with blue tape and marker.
  - *Remove all loose and deteriorated mortar* by sweeping, vacuuming, or hosing
  - Where there was loose mortar, clean all voids and cracks with water hose and pointing tool
  - After water dries to damp, apply ñWeldbondò Bonding Agent to edges of existing mortar to ensure proper adhesion with new cement
  - Let dry
  - Following manufacturerôs instructions, mix Type N cement directly from prepackaged bag with appropriate amount of water to desired consistency

  Rebedding Stones
  - Lay down level bed of mortar

- Ensure that bed depth and stone depth together will result in smooth, level surface after stones are set
- Set stones in proper location and orientation in bed, pressing down firmly to ensure full contact with bedding mortar
- Using 4ô level, ensure that adjacent stones are in the same plane in order to avoid tripping hazards
- Mortar joints between stones, again ensuring that stones and mortar are in the same plane
- Once mortar sets, surface of each stone should be rubbed with damp piece of burlap to remove haze left from mortar. Judicious use of distilled vinegar may be used to aid in removal of any mortar haze from the face of the stone. Each mortar joint should be ñstruck offò using stiff bristled brush.
- Cover stones with wet burlap overnight to keep new mortar from drying out too rapidly. Depending on weather conditions, this dampening process may be continued for an additional day or two.
- Note: Stones set on vertical faces of stair structure are to be set in a similar fashion. Additional temporary supports will be necessary to hold stones in place until mortar sets.

Step nosing

- Apply mortar mix to areas of nosing, building out to existing edges. Using 4ô straight edge, align face and tool smooth.
- Let dry to leather hard and strike off, brushing loose material from repair with soft bristled brush
- Wet down and cover with wetted burlap
- Erect stanchions to keep visitors and staff from using steps
- Let cement cure over several days, continuously damping down burlap so newly applied cement cures slowly
- Once cured, dampen adjacent stone surfaces and rub with burlap to remove any staining caused during repair process

Circular Stair

- Maintenance Protocol
  - Inspect the paint surface on an annual basis looking for deteriorated paint or signs of rusting.
  - Exterior paint should be kept in good condition in keeping with protocol detailed in exterior cladding section
  - Integrity of finish must be maintained, as it protects steel from exposure. If bare steel is not treated as quickly as possible, it will start to rust. Wire brush area to remove any oxidization or corrosion, spot-apply a rust converter, and apply finish paint.
  - When the clean look of stairs is marred despite maintenance activities, it is time to discuss a larger project
- Repair Protocol

- The 1998 sandblasting repairs was deemed effective when reviewed in 2016. No visible signs of rust or degradation of the paint finish (see Appendix B for analysis of 1998 repair).
- The only recommended change in methodology from the 1998 process is to better define the materials of the blasting. Give preference to gentler materials.
- 1998 scope, abbreviated:
    - Each riser should be numbered before removal and its location documented so it can be returned to its original location when work is completed.
    - Dismantle the stair.
    - Remove all heavy surface rust, dirt and previous coatings using a hand scraper.
    - Sandblast all steel to meet the requirements of SSPC-SP6
    - Repair any damaged elements
    - Hot dip each element using molten zinc colored to match Munsell #2.5PB 4/2.
    - Reassemble stairs using stainless steel fasteners.

Original Construction and Evolution:

There are two sets of exterior stairs at the Gropius House. One of these is made of stone and cement mortar and leads to the kitchen entrance at the east façade. The stepsô construction was not included in the specifications for the house, but their inclusion on Gropiusôs plans suggests that they are original *(Figure 2)*. The base was made of reinforced concrete and ñfinished with irregularly cut flagstone set in mortar and groutedò.[2]

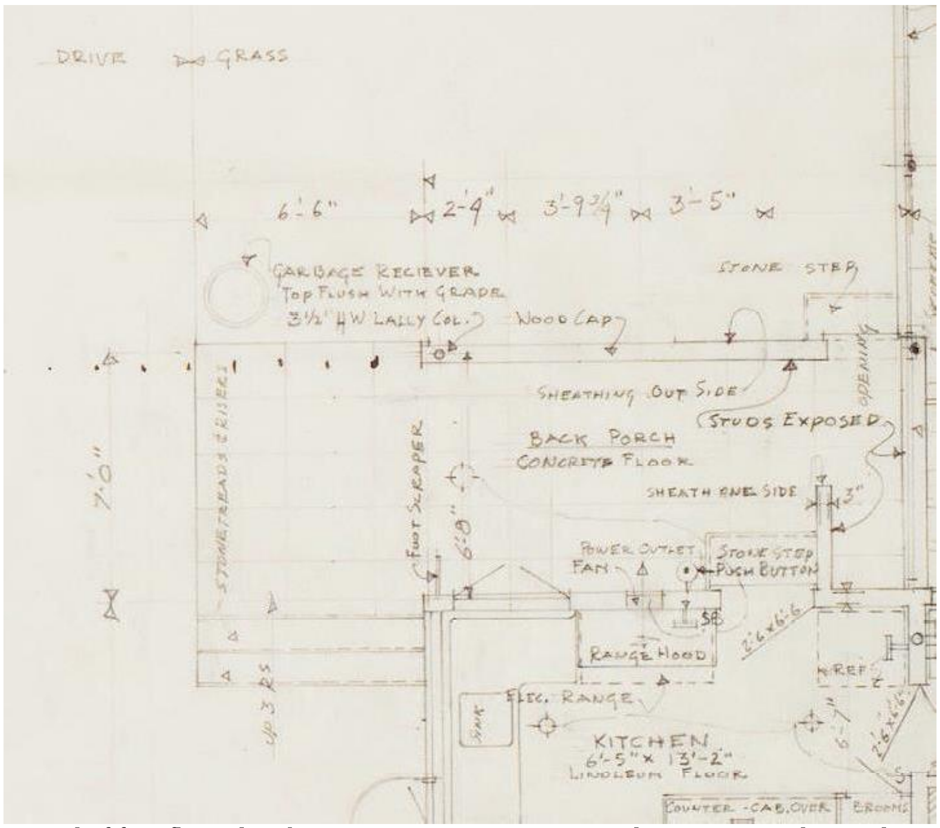
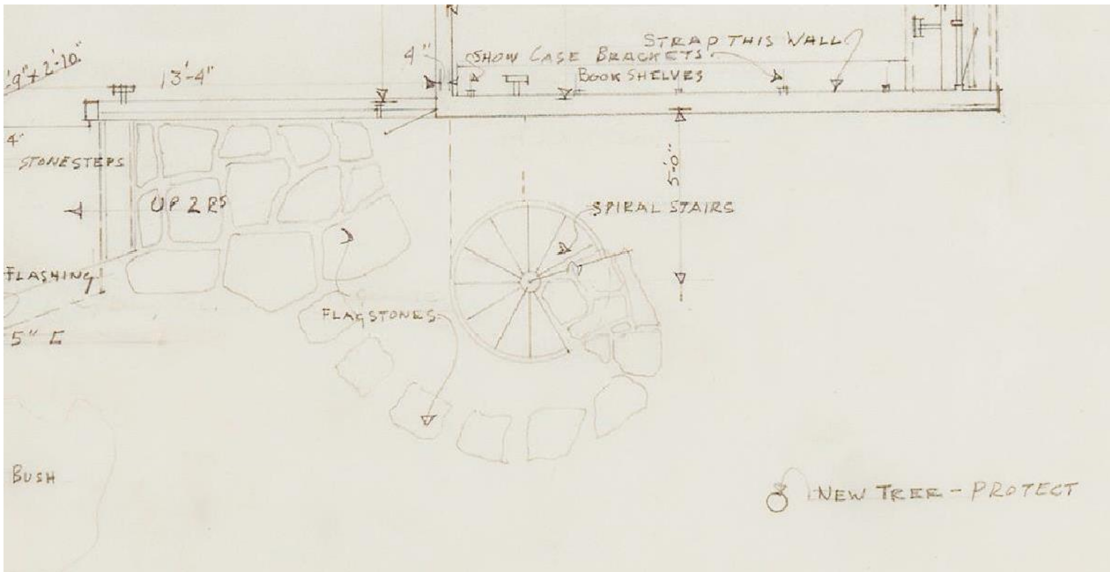


Figure 2: Detail of first floor plan showing exterior stone stairs, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 14.

The other set of stairs is composed of steel in a spiral shape and leads to the porch deck from the north façade. Gropiusôs specifications indicate that it was a standard piece ordered from Duvinage Spiral Stair Company, and that its parts included a steel center pole, a handrail, and uprights.[3] It was stabilized at the base with concrete footings.[4] The staircase was cantilevered and bolted to the house with a metal platform.[5]



Detail of first floor plan showing exterior spiral stair, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

Character-Defining Traits in the Interpretive Period:
Since there is no evidence of maintenance or alterations to the exterior staircases between their construction and the interpretive period, they still reflected Gropiusôs original design intentions by the late 1960s. The spiral staircase in particular is evidence of the functionalism central to Bauhaus principles, because it allowed the Gropiusô daughter Ati to welcome friends ñwithout having to meet her parents or the maidò in the main part of the house.[6] Gropiusôs attention to Atiôs request is significant because he placed value in ñthe spontaneous ideas of childrenò, which he found ñstimulating and less encumbered with the preconceived stylistic notions of their eldersò.[7]

[3] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 23.
[4] Gropius, ñGropius House,ò 14.
[5] Gropius and Breuer, ñSpecifications,ò 23.
[6] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 270. Gropius, ñGropius House,ò 11.
[7] Ibid., 4.

History of Conservation and Maintenance Practices:

Kitchen Steps

The first recorded intervention on the kitchen steps took place in 1986 during a Massachusetts Historical Commission (MHC) grant project undertaken by the Society for the Preservation for New England Antiquities (SPNEA). The steps needed to be rebuilt entirely after frost heaving caused the flagstones to loosen from the concrete, but due to budget constraints the flagstones and cement trim were simply patched.[8] In 1997, unspecified repairs were carried out on the feature.[9] It was finally reconstructed in 2001, but the flagstones were coming loose from the concrete stairs again by 2012.[10] They were collected and stored by Historic New England staff to allow for the replacement of the mortar.[11] Further repairs were required two years later after the mortar failed completely.[12] By 2016 the nosing on the stairs presented a trip hazard, so it was repaired by Historic New England *(Figure 4)*.[13]

Figure 4: Kitchen steps after nosing repair, 2016
RS ID #278687

Spiral Stairs

[8] *Gropius House Development Project*, report, Section III - Narrative Report, Finishes (Boston, MA: Historic New England, 1986), 1.
[9] Warwick CarpentersôCo. Invoice, (Waltham, MA: Historic New England Property Care Files, 1997).
[10] Hill Town Restoration Invoice, (Waltham, MA: Historic New England Property Care Files, 2001).
[11] ñStone Stair Repair,ò Historic New England Property Care Electronic Database of Historical Projects, 2013. ñRepair Rear Stairs to Kitchen,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.
[12] ñRepair Rear Stairs,ò electronic database.
[13] ñRear Stair Repair,ò Historic New England Property Care Electronic Database of Historical Projects, 2017.

The limited budget of 1986 MHC project prevented the blast-cleaning and refinishing of the spiral staircase that was necessary at the time, but the featureǿs rusty areas were brushed or ground smooth, spot-primed, and painted instead.[14] The staircase was exhibiting severe corrosion by 1997.[15] It was finally grit-blasted the following year, and subsequent treatments included hot-dip galvanizing, new coats of paint, and the brazing of three rings attaching treads to the center post.[16] The stair was reinstalled about ¼ö off the building in order to allow for water drainage. The top threshold was loose in 2009, and it was repaired within the next few years.[17]

Figure 5: Spiral staircase, 1997
Historic New England Property Care Binders

[14] Ibid.
[15] Harry Seidler to Chip Harkness, Ati Gropius Johansen, and the Society for the Preservation of New England Antiquities, May 5, 1997, Harry Seidler & Associates, Milsons Point, Australia.
[16] "Gropius House Update," Linda Willett to Jane Nylander and Robert Surabian, December 3, 1998, Massachusetts.
[17] *Property Care - Gropius - 2009.PMF Assessment Photos - Exterior - GRO.09162009.Loose Threshold at Top of Spiral Stairs.017,* September 16, 2009, Resource Space, Historic New England, Lincoln.

Interventions:

2016: Nosing on kitchen steps failed and was repaired
2014: Mortar on kitchen steps failed and was repaired
2012: Flagstones on kitchen steps came loose due to deterioration of concrete bedding. Mortar replaced. Threshold from spiral stairs to porch deck repaired.
2001: Flagstone steps by kitchen reconstructed
1998: Spiral staircase grit-blasted, hot-dip galvanized, and coated with paint
1997: Spiral staircase in urgent need of rust removal and a fresh coat of paint. Stone steps by kitchen repaired.
1986: Spiral staircase brushed or ground smooth, spot primed, and painted where rusted. Patch repairs to stone steps by kitchen carried out.

BIBLIOGRAPHY

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum,* March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

Gropius House Development Project. Report. Section III ï Narrative. Finishes. Report. Boston, MA: Historic New England, 1986.

"Gropius House Update." Linda Willett to Jane Nylander and Robert Surabian. December 3, 1998. Massachusetts.

Harry Seidler to Chip Harkness, Ati Gropius Johansen, and the Society for the Preservation of New England Antiquities. May 5, 1997. Harry Seidler & Associates, Milsons Point, Australia.

Hill Town Restoration Invoice. Waltham, MA: Historic New England Property Care Files, 2001.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Property Care - Gropius - 2009.PMF Assessment Photos - Exterior – GRO.09162009.Loose Threshold at Top of Spiral Stairs.017, September 16, 2009, Resource Space, Historic New England, Lincoln.

ñRear Stair Repair.ò Historic New England Property Care Electronic Database of Historical Projects, 2017.

ñRepair Rear Stairs to Kitchen.ò Historic New England Property Care Electronic Database of Historical Projects, 2013.

ñStone Stair Repair.ò Historic New England Property Care Electronic Database of Historical Projects, 2013.

Warwick CarpentersôCo. Invoice. Waltham, MA: Historic New England Property Care Files, 1997.

APPENDIX A: Analysis of Past Repairs

<u>Kitchen Steps</u>
The effectiveness of past repairs to the kitchen stairs was analyzed in 2016.

Although the construction details for the kitchen steps have not been located, they are known to have been made with ñPortlandò cement. There have been several repair campaigns over the stairsô history, including a 2001 reconstruction that took place in tandem with the environmental abatement of an oil tank spill. Unfortunately, specifications for this work do not remain and related invoices are vague. A series of repairs implemented in 2012 and 2014 failed because lime was added to the Portland mix in order to create a softer mortar. It became clear that the location of the feature made a hard Portland mix with no lime necessary, so repairs were implemented in 2015 with a commercially available Type N mortar (Portland Quikrete Mortar Mix #1102, which is a pre-packaged mix of Portland cement and sand).

ANALYSIS
The successes and failures of past repairs suggest that a harder mortar mix is appropriate. The bluestone flagstones embedded in the mortar have withstood the test of time. Future repair campaigns should generally follow the 2015 repair protocol, with the following exception.

Mortar from the 2001 repair shows a high level of aggregate on its surfaces. It is unclear how faithfully this repair matched those previous, so it is unknown whether this aesthetic should be matched. Other examples of concrete at the site that appear to be historic but exist in locations more protected from winter wear show less aggregate. Thus, it is possible the mortar used in 2001 matched the original in kind and is now exhibiting a natural weathering pattern. However, the material may also simply have been replicated based on the contractorõs formula. Petrographic and chemical analysis of the historic Portland material should be included as part of a future project in order to determine properties of the mortar used by Gropius.

APPENDIX B: Analysis of Past Repairs

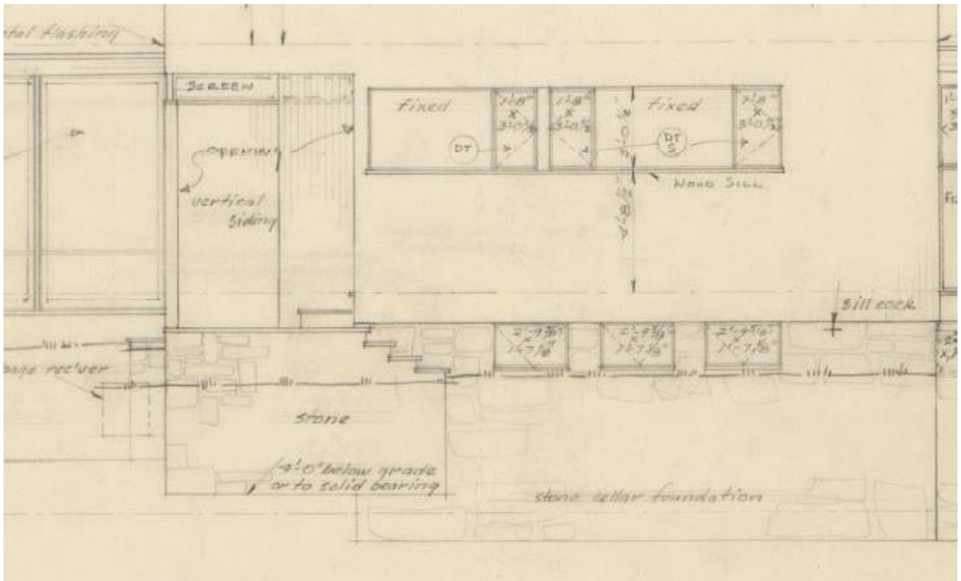
<u>Circular Stairs</u>
The effectiveness of past repairs to the steel circular stair was analyzed in 2016.

The steel spiral staircase was repaired conservatively in 1986 through the hand scraping of rusted areas. Its condition apparently deteriorated significantly by 1998, prompting the implementation of a more aggressive approach that entailed the dismantling of the stair, the treatment of the rust both by hand and grit blasting, and a hot dip galvanized bath.

Detail Change: The stairs were installed about ¼ò away from the house to prevent water from being trapped between the stair and the house. This detail change is not readily apparent, and does not appear to have resulted in any kind of failure.

ANALYSIS
Visual inspection in 2016 did not reveal any signs of rust or degradation of the paint finish. Although the aggressive 1998 treatment seems to have been beneficial to the stairs, it also destroyed any indications of the featureõs paint history. The only evidence that remains is the fact that Munsell #2.5PB 4/2 was specified for the 1998 work. In addition, frequent dismantling and rebuilding of the stairs might stress their original components, particularly the risers. Good maintenance practices should help prolong the life of the feature and the treatment.

APPENDIX C: Original Plan Details



Detail of east elevation showing exterior stone stairs, Walter Gropius and Marcel Breuer, 1938 Busch-Reisinger Museum, Harvard Art Museums

GROPIUS HOUSE MARQUEE

Property Name: Gropius
Structure: Gropius House
Feature: Marquee
Original Material: Lally columns, stucco or plaster
Original Color: Unknown
1965-1969 Material: Lally columns, stucco or plaster ï possibly different from original
1965-1969 Color: Lally columns painted gray (Benjamin Moore #1624, Westcott Navy)

RS ID #243264, 2015

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

The marquee defines the entrance to the house and is an important example of Gropiusõs preference for asymmetrical design. In keeping with the treatment approach for the exterior of the house, the marquee should be kept in good repair. When evidence of treatments becomes obvious, renewal of the materials should be considered in order to maintain the clean lines of the houseõs original design.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

- As an exterior feature and the primary visitor entrance, the marquee should be kept in good repair
- Minor maintenance of finishes and the materials should occur on a regular basis
- Once evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered
- See Screen Porch, Structural Framing, and Roofs, Gutters and Downspouts sections of this document for additional treatment guidance
- Treatment of glass block wall is covered in Specialty Glass section of this document

<u>Lally Columns</u>

- Maintenance Protocols
    - Exterior paint should be kept in good condition in keeping with maintenance protocol of exterior cladding
    - Integrity of finish should be maintained because it is protecting steel from exposure. If there is a failure it must be treated as quickly as possible to avoid rusting.
    - Wire brush area to remove any oxidization or corrosion, spot apply rust converter, and apply finish paint
- Repair Protocols
    - Upon inspection in 2016, the 2002 repairs appear to be stable and have not required maintenance in the intervening years. The repair protocols used in this project were as follows:
        - Grit-blast columns to remove paint and rust
        - Paint with zinc primer, epoxy mid-coat, and urethane gloss matching existing color.
            - Evidence of past paint colors appears to be removed with the grit blasting protocol from 2002. The existing color should be reviewed with the circular stair which does specify a Musell color and an interpretive decision may need to be made.

<u>Marquee Floor</u>

- Stones should be level and safe for public access
- While Gropius allowed grass to grow between flagstones, current foot traffic has made re-establishing grass in these spaces impractical and infeasible.
    - Testing of different grassy materials still needs to take place as of late 2016, and area is currently dressed with dirt. Planting of moss should be attempted to emulate green organic matter. Dirt and stone dust are not good options because they get tracked into house. If plantings continue to be problematic, the effectiveness of a polymeric stone dust could be tested.
- Any project involving removal of stones should include documentation of their identities and locations in order to ensure that they are returned in their original pattern. This work would likely involve labeling each stone with an ID and its orientation and creating a corresponding map of the stones.

Ceiling

- Inspect annually to review conditions.
- Stucco ceiling has undergone many generations of repair
- Any repair project should attempt to match existing material and texture of ceiling. Emphasis should be placed on renewal of finish across entire ceiling so that there is a unified look.

Original Construction and Evolution:

The marquee is a roof supported by steel lally columns that projects asymmetrically from the front entrance of the house toward the driveway *(see figures 1 and 2, as well as Appendix A)*.[2] There is no definitive evidence of its original ceiling finish, but based on early maintenance records it seems to have been stucco.[3] A glass block wall extends from the marquee to the west into the building, but in this report it will be treated as a separate feature (see Specialty Glass section of this document). There were several repairs to the marquee between its construction and the interpretive period, but its design was not altered.

Figure 2: Connection between driveway, marquee, and house entrance, c. 1939-41
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:

Since the marquee was not significantly altered between its construction and the late 1960s, it retained the significant elements of Gropiusôs original design intentions *(Figure 3)*. The featureôs asymmetry makes it a good example of functionalism in Bauhaus design. Rather

---

[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 14.
[3] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).

than ñforcing the arrangement of rooms into a rigid symmetrical patternò, Gropius preferred to let their shape develop ñorganicallyò based on the uses of the different spaces.[4] For example, it was logical that the marquee would extend diagonally toward the northeast, because its purpose was to join the entrance of the house with the driveway.[5]

Figure 3: Marquee, 1965
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
Historical documents indicate that the marquee first required maintenance in 1945, when the re-stuccoing of its ceiling was included in a to-do list.[6] The ceiling was still an issue in 1948, when Gropius complained about the poor installation of a new drainpipe. He wrote that the pipe had been installed too high and loose, so that water collecting on the roof of the marquee was running over the edges onto its ceiling.[7] A letter from 1955 suggests that Gropius eventually replaced the ceiling with a textured material manufactured by California Stucco Products.[8] Gropius was unhappy with the stucco, which came out patchy and uneven.[9] By 1957 bubbles had formed in it and hung down 6-8 inches.[10] Gropius requested a replacement of the ceiling in 1959 when a 20ò x 20ò patch of stucco fell, but

[4] Ise Gropius (lecture, Massachusetts, 1939), 17.
[5] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 21-22.
[6] ñHouse Repairs.ò
[7] Walter Gropius to Thomas Mullane & Sons, December 18, 1948, Massachusetts.
[8] Walter Gropius to California Stucco Products of New England, Inc., July 11, 1955, Massachusetts.
[9] Ibid.
[10] Walter Gropius to Carl M. Stiles, February 8, 1957, Massachusetts.

the damage was still unrepaired and worsening a year later.[11] There is no evidence that the ceiling was ever repaired, but the work must have been carried out eventually because the problem is not mentioned again in historical documents. An undetailed 1990 plaster repair at an unknown location may be related to the marquee, and in 1998 rotting wood was found in its south and north perimeter framing members. The structural failure was attributed to the lack of expansion joints in the copper work, and the framing members were replaced that year with new ones made of Douglas fir.[12] By 2000, the paint on one of the light fixtures and on some the lally columns was reported to be chipped and failing.[13]

Figure 4: Marquee and house entrance, 1957
Historic New England Archives, Binder of Slides

[11] Walter Gropius to Carl M. Stiles, September 1, 1959, Massachusetts. Walter Gropius to Carl M. Stiles, April 22, 1960, Massachusetts.
[12] Linda Willett, *Project Completion Report*, report (Boston, MA: Society for the Preservation of New England Antiquities, 1999), 3.
[13] ñMuseums Department Purchase Orders 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990). "Paint Failure at Gropius," Jeff Wallace to Marianne Zephir, July 12, 2000, Massachusetts.

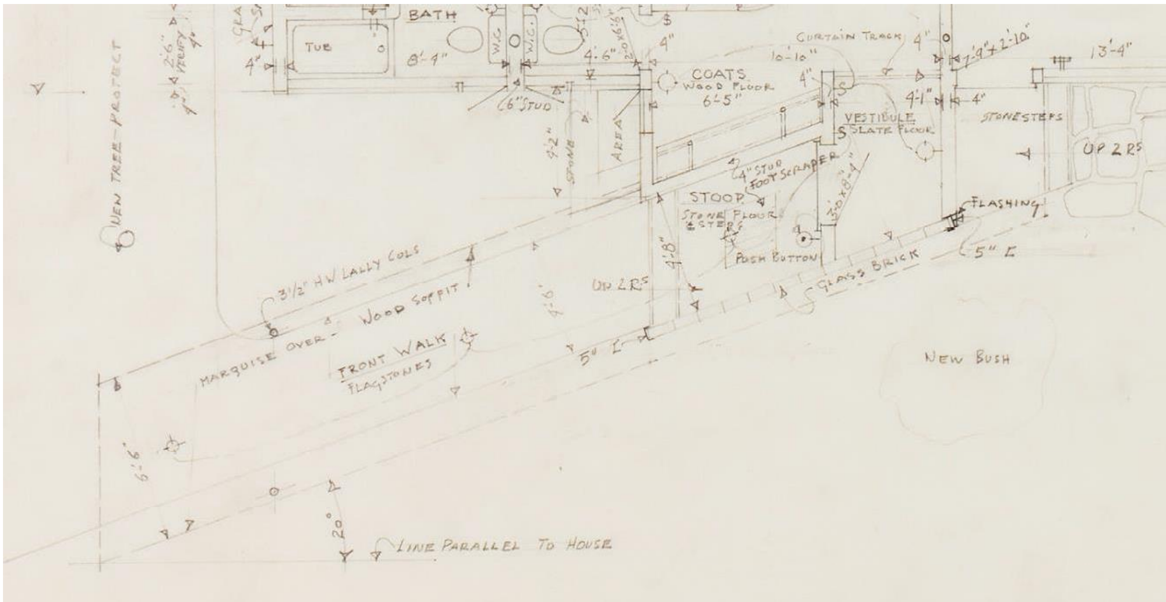
Interventions

2000: Paint on light fixture and lally columns chipped and failing
1998: Cantilevered framing members extensively repaired
1990: Plaster repaired, possibly on marquee. Location unknown.
1960: Gropius reported that patches of stucco were falling from ceiling and requested its complete replacement a second time
1959: 20ò x 20ò section of stucco ceiling fell down. Gropius requested replacement.
1957: Bubbles forming in stucco ceiling and hanging down 6-8 inches
1955: California Stucco Productsô textured material came out patchy and uneven on ceiling
1948: Ceiling damaged by water due to poorly installed drain
1945: List of repairs included re-stuccoing of ceiling

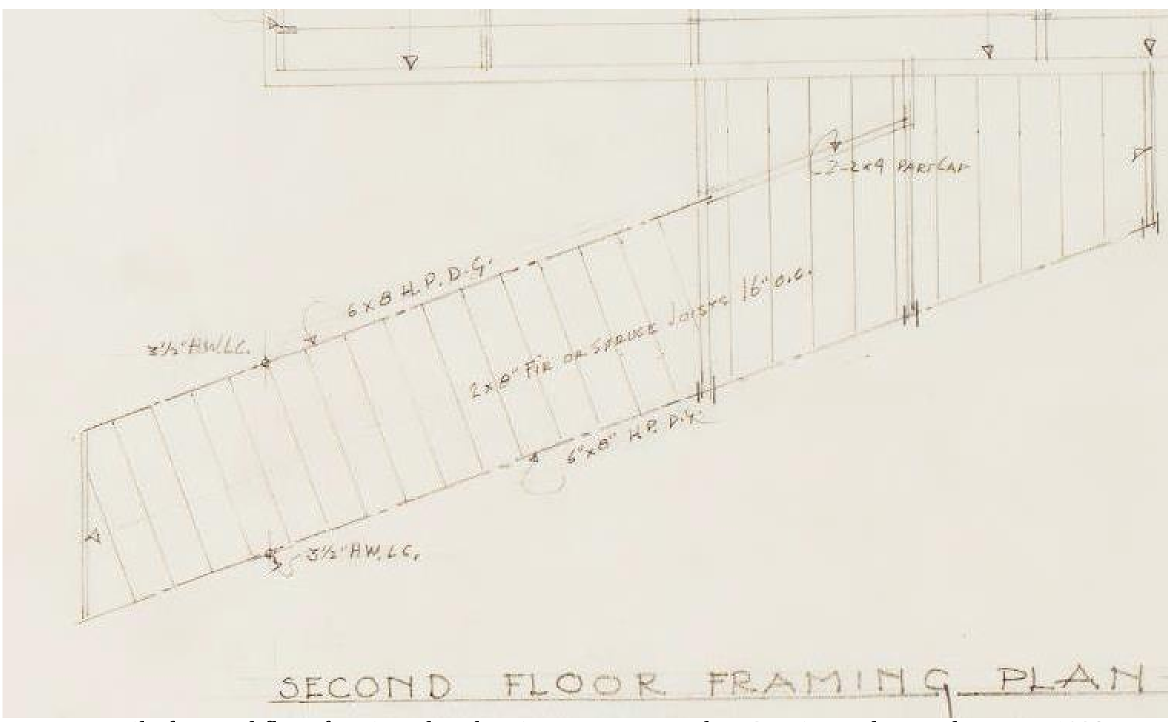
BIBLIOGRAPHY

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home,* July 1939, 21-25.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Ise. Lecture, Massachusetts, 1939.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.
ñMuseums Department Purchase Orders 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).
"Paint Failure at Gropius." Jeff Wallace to Marianne Zephir. July 12, 2000. Massachusetts.
Walter Gropius to California Stucco Products of New England, Inc. July 11, 1955. Massachusetts.
Walter Gropius to Carl M. Stiles. February 8, 1957. Massachusetts.
Walter Gropius to Carl M. Stiles. September 1, 1959. Massachusetts.
Walter Gropius to Carl M. Stiles. April 22, 1960. Massachusetts.
Walter Gropius to Thomas Mullane & Sons. December 18, 1948. Massachusetts.
Willett, Linda. *Project Completion Report*. Report. Boston, MA: Society for the Preservation of New England Antiquities, 1999.

APPENDIX A: Original Plan Details



Detail of first floor plan showing marquee, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums



Detail of second floor framing plan showing marquee, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

GROPIUS HOUSE SCREEN PORCH

Property Name: Gropius
Structure: Gropius House
Feature: Screen Porch
Original Material: Copper-bearing galvanized steel screens with electrically welded corners and 16-mesh, rustless, copper bronze netting; bluestone floor set in 1ò thick concrete; steel lally columns; vermiculite plaster ceiling manufactured by California Stucco Company
Original Color: Bronze screens, beige ceiling

RS ID #240754, 2015

1965-1969 Material: Copper-bearing galvanized steel screens with electrically welded corners and 16-mesh, rustless, copper bronze netting[1], bluestone floor set in 1ò thick concrete, steel lally columns, cement plaster ceiling[2]
1965-1969 Color: Bronze screens, beige ceiling

[1] Some of the screens were replaced with aluminum during the Gropiusôtime because the copper turned green with age. However, this change does not seem to have occurred by the interpretive period. See Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 10.
[2] In ñGropius House: A History,ò Ise Gropius writes that the vermiculite plaster ceiling was replaced with cement plaster (page 14). While she did not specify the year that this took place, the work was likely finished shortly after Gropius declared the California Stucco material unfit for outdoor use in 1957. See Walter Gropius to Carl M. Stiles, April 18, 1957, The Architects' Collaborative, Cambridge, Massachusetts.

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[3]

In keeping with Historic New Englandǿs treatment of the houseǿs exterior, the screen porch should be kept in good repair. When evidence of any treatments becomes distracting, renewal of the materials should be considered in order to preserve the original clean lines of the house.

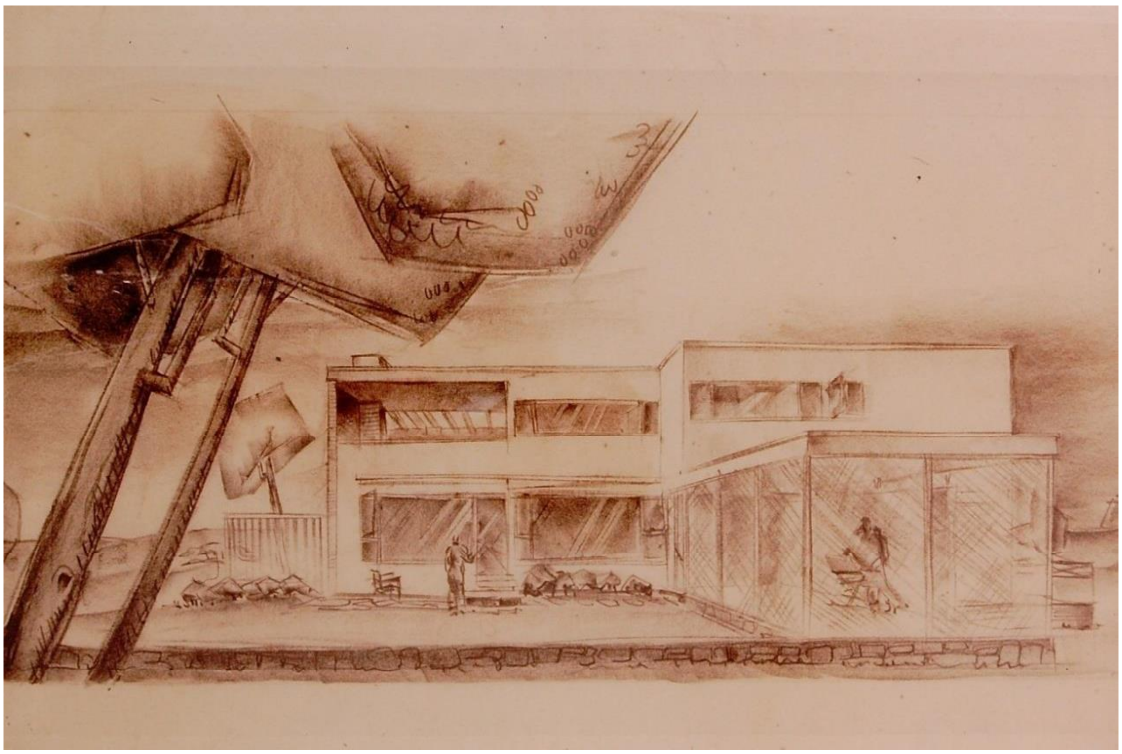


Figure 1: Pre-construction drawing of Gropius House south elevation, Water Gropius, circa 1937
Historic New England Archives, Binder of Slides

[3] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

- As an exterior feature and an important space for visitor access, the screen porch should be kept in good repair
- Minor maintenance of finishes and materials should occur on a regular basis
- When evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered
- See the Exterior Siding, Structural Framing, and Roofs, Gutters and Downspouts sections of this document for further treatment guidance

<u>Lally Columns</u>

- Maintenance Protocols
  - Exterior paint should be kept in good condition in keeping with maintenance protocol of exterior cladding
  - Integrity of finish should be maintained because it is protecting steel from exposure. If there is a failure it must be treated as quickly as possible to avoid rusting.
  - Wire brush area to remove any oxidization or corrosion, spot apply rust converter, and apply finish paint
- Repair Protocols
  - Upon inspection in 2016, the 2002 repairs appear to be stable and have not required maintenance in the intervening years. The repair protocol used in that project are as follows:
    - Grit-blast columns to remove paint and rust
    - Paint with zinc primer, epoxy mid-coat, and urethane gloss

<u>Screens</u>

- Maintenance Protocols
  - Inspect annually for holes and overall condition.
  - Holes in screens should be patched until they become an aesthetic distraction

- Repair Protocols
  - All screens were likely replaced in 2002, so if necessary current screens may be replaced to match originals.
  - Screens should be replaced with materials and coloring matching those of interpretive period (copper)

<u>Stone Floor</u>

- Maintenance Protocol
  - Inspect annually for uneven stones. Stones should be level for safety reasons
- Repair Protocol
  - Any project involving removal of stones should include documentation of their pattern to ensure they are returned to their original locations. This would entail labeling each stone with an ID and its orientation and creating a corresponding map of stones.
  - Pull up pavers

- Identify existing base layer and replace in kind
- Replace material as needed and compact.
- Re-level setting bed and re-install pavers.

<u>Porch Ceiling</u>

- Inspect annually to review conditions.
- Current material appears to be California Stucco product
- Repair Protocol
    - Any repair project should attempt to match existing material and texture of ceiling.
    - Emphasis should be placed on renewal of finish across entire ceiling so that there is a unified look.

Original Construction and Evolution:
The porchôs screens were made of copper-bearing galvanized steel, and had electrically welded corners as well as 16-mesh, rustless copper netting.[4] The ceiling was finished with vermiculite plaster manufactured by the California Stucco Company, and it was held up by steel lally columns.[5] On the floor, bluestone slabs were set in 1 inch of concrete.[6] While an early historic image shows the porch without a screen during the Gropiusô residence, the original design plans for the house clearly note that it would be a screen porch *(Figure 2)*.

Gropius undertook many repairs to the screen porch before the interpretive period, but they were all related to practical issues rather than design alterations. The most significant of these was the replacement of the vermiculite plaster ceiling with ordinary cement plaster. The former had been one of the many experimental materials that Gropius sought to incorporate into his designs, but in 1955 he concluded that it was inappropriate for outdoor use after it was repeatedly damaged by water.[7] It is unclear when exactly the replacement took place, but it was likely to have been carried out in 1957. Most of Gropiusôs other work relating to the porch involved screen replacement and repair.

[4] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 21.
[5] Gropius, ñGropius House,ò 14.
[6] Gropius and Breuer, ñSpecifications,ò 18.
[7] Walter Gropius to California Stucco Products of New England, Inc., July 11, 1955, Cambridge, Massachusetts.

Figure 2: Gropius House south elevation, Paul Davis, 1938
Historic New England Archives

Character-Defining Traits in the Interpretive Period:

The screen porch reflected Gropiusôs original design intentions during the interpretive period. While porches in the region were usually put on the front of houses, Gropius positioned his own at the back.[8] He reasoned that it may have been enjoyable to sit on a front porch before cars were invented, but by the twentieth century it only brought one closer to vehicular pollution.[9] While Gropius had altered the traditional screen porch design by changing its location, he and Ise considered the feature ñthe best invention in New Englandò.[10] Thus, the porch is one of many elements on the property that reflects the principles of both traditional New England architecture and the Bauhaus movement.

[8] Gropius, ñGropius House,ò 6.
[9] Ibid.
[10] Ibid., 10.

Figure 3: Screen porch in winter, 1966
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
Aside from the repair of a screen door in 1940, which cannot be definitively linked to the porch, the first record of alterations to the screen porch is from 1942 when roof leakages began to cause damage to the plaster ceiling.[11] Four years later the problem had still not been addressed, so the damage persisted.[12] By 1950, Gropius wrote that one-third of the plaster was coming off the ceiling.[13]

[11] Cambridge Screen Manufacturing Company Invoice, (Boston, MA: Historic New England Archives, Family Papers, Section IV, 1940). Walter Gropius to the Barrett Company, June 13, 1946, Cambridge, Massachusetts.
[12] Gropius to the Barrett Company.
[13] Walter Gropius to Mr. H. L. Foote or Mr. Grime, May 22, 1950, Massachusetts.

Figure 4: Screen porch, 1944
Historic New England Archives, Binder of Slides

In 1954, seven screen panels were described as ñbadly damagedò in a quote for a repair addressed to Gropius.[14] The contractor proposed to remove the panels, straighten them, and then submerge them in an acid tank overnight to remove the scale and dirt that had collected on their surfaces.[15] Finally, new copper bronze wire would be soldered to the frames.[16] It is unclear whether this quote was accepted, but two years later the same company did remove, rewire, and replace one of the porchôs panels.[17]

A letter that Gropius wrote to California Stucco Products in 1955 implies that he had just put in a new ceiling with one of their products, and he complained that it had come out patchy and uneven.[18] He asked why the company had recommended their vermiculite plaster to him rather than ordinary stucco.[19] They replied that they did not believe stucco would have stuck to the painted surface of the ceiling, and that they would not have had room to apply it in a coat thick enough to extend past the drip line.[20] In 1956, Gropius wrote again to report that roof issues were causing large bubbles filled with water to form

[14] "Metal Screen Repairs," Arthur L. McAvoy to Walter Gropius, December 14, 1954, Boston Screen & Sash Co., Arlington, Massachusetts.
[15] Ibid.
[16] Ibid.
[17] "Metal Screen Repair," Charles H. McAvoy to Walter Gropius, April 26, 1956, Boston Screen & Sash Co., Arlington, Massachusetts.
[18] Gropius to the Barrett Company.
[19] Ibid.
[20] Carl M. Stiles to Walter Gropius, July 15, 1955, California Stucco Products of New England, Inc., Cambridge, Massachusetts.

in the ñnewò plaster ceiling.[21] It is unclear when this ñnewò ceiling was installed, but California Stuccoôs 1955 letter implies that the work may have been done in late summer of that year.[22] By 1957 the bubbles were hanging down six to eight inches.[23] The ceiling was finally replaced again the same year, after the roof was repaired.[24] This ceiling lasted over ten years, during which time some of the porchôs panels were rewired and several of the frame angles had to be re-fixed.[25] In 1970 the ceiling finally had to be replaced and painted.[26] The lally columns were painted at the same time, and an angle iron was reinstalled.[27] A scupper was also installed.[28]

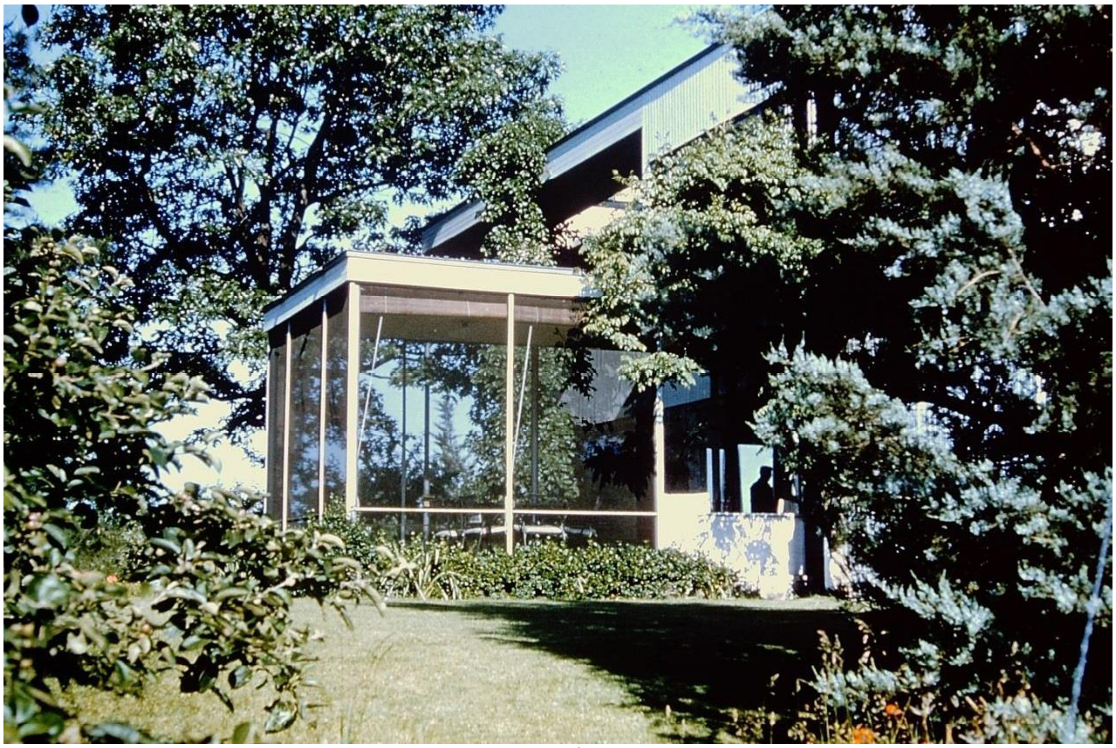


Figure 5: Screen porch from southeast, 1957
Historic New England Archives, Binder of Slides

When the porch screens were blown in and damaged during a storm in 1972, Gropiusôs wife Ise laid the blame on the contractors who had reinstalled them after the 1970 ceiling replacement.[29] While there is no record of the specific repair work related to the storm

[21] Walter Gropius to Lawrence Hackett, December 27, 1956, The Architects' Collaborative, Cambridge, Massachusetts.
[22] Stiles to Gropius, 1955.
[23] Walter Gropius to Carl M. Stiles, February 8, 1957, The Architects' Collaborative, Cambridge, Massachusetts.
[24] Carl M. Stiles to Walter Gropius, March 10, 1957, California Stucco Products of New England, Inc., Cambridge, Massachusetts.
[25] Boston Screen & Sash Co. Invoice, (Waltham, MA: Historic New England Property Care Files, 1960).
[26] Custance Brothers, Inc., (Waltham, MA: Historic New England Property Care Files, 1970).
[27] Ibid.
[28] Ibid.
[29] Ise F. Gropius to Custance Brothers, Inc., February 21, 1972, The Gropius House, Lincoln, Massachusetts.

damage, it is likely that some of the copper panels were replaced with aluminum ones at this time. Ise wrote that such replacements happened in 1976 when the copper had turned green with age, but while there were repairs to a porch screen and an unidentified screen door that year, a 1972 bill was the first to include the painting of ñaluminumò on the porch.[30] It is probable that the new screens were painted to match the color of the older bronze ones.

Five porch screens were re-screened and reinstalled in 1977, and in 1983 falling plaster was noted on the porch.[31] In 1986, the Society for the Preservation of New England Antiquities (SPNEA) patched the ceiling with a California Stucco product that matched the existing finish and refurbished the screens.[32] In 1988 the screen braces were rusting, and one year later two leaks were reported in the ceiling.[33] The ceiling partially dismantled in order to facilitate the repair of the leaks, and it was patched up again in early 1990 *(Figure 6)*.[34] During the same year rust on the porch screens was reported again, and by 1991 the screens required painting and more regular removal in winter.[35] Two years later one screen needed to be spray painted to look like bronze, which suggests that there had been a repair or replacement of some kind.[36]

---

[30] Gropius, ñGropius House,ò 10. Nashoba Eave Trough, Co. Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1976). Haki Zaganjori Invoice, (Boston, MA: Historic New England Archives, Family Papers, Section IV, 1972).
[31] Nashoba Eave Trough, Co. Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1977). "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from L. M. S, April 08, 1983.
[32] *Gropius House Development Project*, report, Section III - Narrative Report, Finishes (Boston, MA: Historic New England, 1986), 5 and 6.
[33] "Gropius House," Ellen to Gay, April 26, 1988, Massachusetts. ñGropius,ò (Waltham, MA: Historic New England Property Care Files, 1989).
[34] "Hot Water Heat, Gropius House," Thomas G. Penney to Frank Thompson, November 10, 1989, G&P Service Contractors, Inc., Somerville, Massachusetts.
[35] Nancy Mazer, ñMeeting with John Connolly,ò (Waltham, MA: Historic New England Property Care Files, 1990). "Gropius SWAT - Summary," Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard, Frank, Joe, Millie, Kathy Francis, Peter Gittleman, March 1, 1991, Massachusetts, 2.
[36] Peter Gittleman, ñGropius Needs List,ò (Boston, MA: Otis House Files, 1993).

Figure 6: Porch ceiling is patched after leak repairs, 1989
Historic New England, Property Care Binders

The only major restoration of the porch since the property was purchased by SPNEA was completed in 2001 as part of a Save Americaôs Treasures grant project *(Figure 7)*. There is evidence of two types of screens considered for purchase in 2000, but it is unclear if one of them was eventually used.[37] In either case, it is certain that the most deteriorated porch screens were replaced by 2001.[38] Those in better condition were removed, grit-blasted for the removal of paint and rust, and painted with a zinc primer, an epoxy mid-coat, and urethane gloss.[39] The lally columns were also grit-blasted, and their worst rusty areas were

[37] "Gropius Screening," Joshua Wright to Ann Marie DiLucia, November 15, 2000, Society for the Preservation of New England Antiquities, Waltham, Massachusetts. "Order Information Page," GDC/City Wire Cloth, 1998, accessed June 9, 2000, http://www.citywirecloth.com/ord_info.html.
[38] *Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002), 2.
[39] Ibid.

removed and patched before they were fully coated with zinc primer and urethane gloss.[40] Finally, the deteriorating flagstones in the porch were repaired and leveled.[41]

Figure 7: Screen porch during 2001 repairs
RS ID #57137

There were additional, smaller issues with the porch in later years. The following photographs show a ceiling stain found during a 2009 assessment, and holes patched in the screens in 2012 *(Figures 8 and 9)*.

Figures 8 and 9: Porch ceiling stain (2009) and screen damage (2012)
RS ID #56590 and RS ID #152164

[40] Ibid.
[41] Ibid.

Interventions

2001: Repairs to porch undertaken as part of Save Americaœ Treasures grant project, including leveling of flagstones, restoration and replacement of screens where necessary, and restoration of lally columns
2000: SPNEA staff searched for new screens
1993: One screen needed to be spray-painted to make it look bronze
1991: Screens needed to be painted and removed more regularly during winter
1990: Two heating pipes within ceiling repaired, which required the opening and patching of ceiling. SPNEA staff reported that screen frames were rusty.
1989: Ceiling was leaking
1988: Rust reported on screen braces
1986: Screening removed, repaired and reinstalled; water-damaged stucco ceiling replaced
1983: Reports of plaster falling off porch
1977: Five screens replaced
1976: Screens repaired
1972: Screens blew down during snowstorm, which Mrs. Gropius attributed to incorrect reinstallation work after 1970 ceiling replacement. Repaired and painted.
1970: New ceiling installed and painted. Lally columns repainted. Angle iron reinstalled. Lead-coated copper scupper installed.
1960: Metal frames rewired
1957: Bubbles in ceiling plaster had grown to hang down 6-8 inches. New (probably cement) plaster applied to ceiling after roof repair took place earlier that year.
1956: One metal porch panel removed, rewired, and reinstalled. Large bubbles filled with water formed in ñnewò plaster ceiling and werer attributed to roof problems. Unclear when ñnewò plaster was applied, but likely in late summer 1955.
1955: California Stucco Productsô vermiculite plaster had been used as ceiling finish; possibly newly installed in 1955. Came out patchy and uneven
1954: Removal, strengthening, cleaning, and replacement of copper bronze wire proposed. Unclear if proposal was accepted.
1950: One-third of plaster ceiling was coming down due to roof problems
1947: Leaking roof caused damage to plaster ceiling
1940: Screen door repaired; unclear where door was located

BIBLIOGRAPHY

Boston Screen & Sash Co. Invoice. Waltham, MA: Historic New England Property Care Files, 1960.

Cambridge Screen Manufacturing Company Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV, 1940.

Carl M. Stiles to Walter Gropius. March 10, 1957. California Stucco Products of New England, Inc., Cambridge, Massachusetts.

Carl M. Stiles to Walter Gropius. July 15, 1955. California Stucco Products of New England, Inc., Cambridge, Massachusetts.

Custance Brothers, Inc. Waltham, MA: Historic New England Property Care Files, 1970.

Gittleman, Peter. ñGropius Needs List.ò Boston, MA: Otis House Files, 1993.Gropius, Ise. ñGropius.ò Waltham, MA: Historic New England Property Care Files. 1989.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

"Gropius House." Ellen to Gay. April 26, 1988. Massachusetts.

Gropius House Development Project. Report. Section III – Narrative. Finishes. Report. Boston, MA: Historic New England, 1986.

"Gropius Screening." Joshua Wright to Ann Marie DiLucia. November 15, 2000. Society for the Preservation of New England Antiquities, Waltham, Massachusetts.

"Gropius SWAT - Summary." Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard, Frank, Joe, Millie, Kathy Francis, Peter Gittleman. March 1, 1991. Massachusetts.

Haki Zaganjori Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV. 1972.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

"Hot Water Heat, Gropius House." Thomas G. Penney to Frank Thompson. November 10, 1989. G&P Service Contractors, Inc., Somerville, Massachusetts.

Ise F. Gropius to Custance Brothers, Inc. February 21, 1972. The Gropius House, Lincoln, Massachusetts.

Mazer, Nancy. ñMeeting with John Connolly.ò Waltham, MA: Historic New England Property Care Files, 1990.

"Metal Screen Repairs." Arthur L. McAvoy to Walter Gropius. December 14, 1954. Boston Screen & Sash Co., Arlington, Massachusetts.

"Metal Screen Repair." Charles H. McAvoy to Walter Gropius. April 26, 1956. Boston Screen & Sash Co., Arlington, Massachusetts.

Nashoba Eave Trough, Co. Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1976.

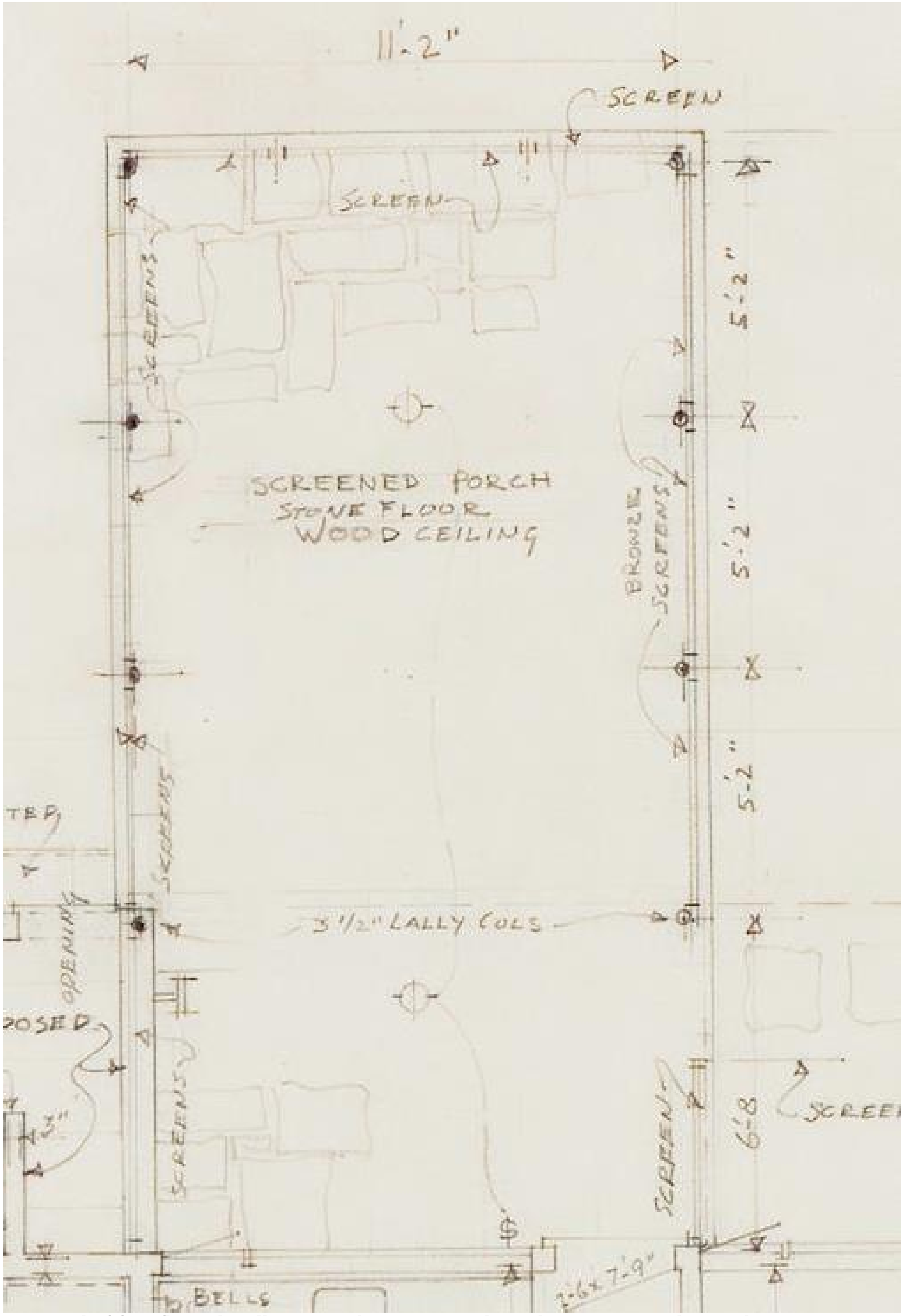
Nashoba Eave Trough, Co. Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1977.

"Order Information Page." GDC/City Wire Cloth. 1998. Accessed June 9, 2000. http://www.citywirecloth.com/ord_info.html.

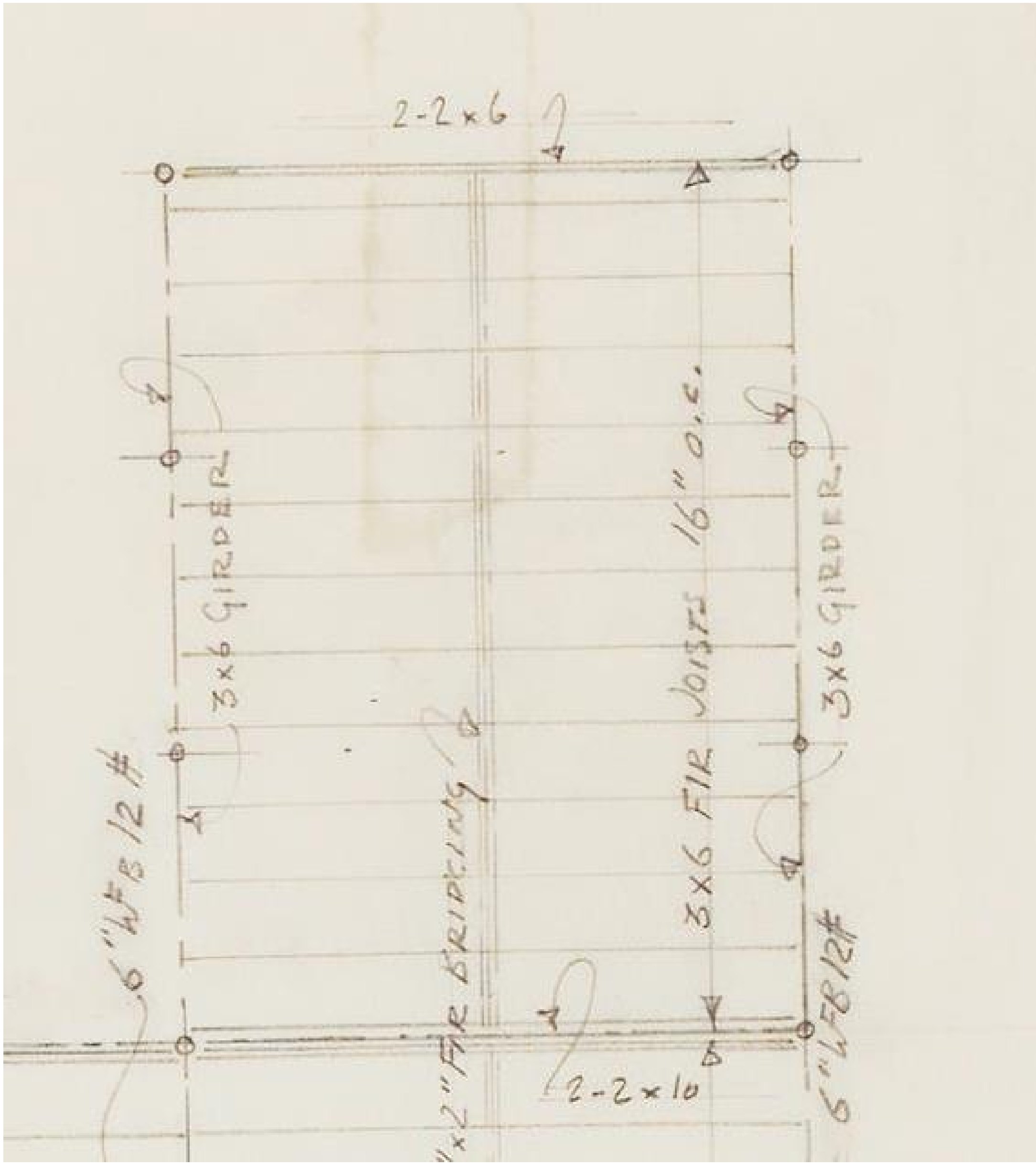
"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from L. M. S. April 08, 1983.

Walter Gropius to the Barrett Company. June 13, 1946. Cambridge, Massachusetts.
Walter Gropius to California Stucco Products of New England, Inc. July 11, 1955. Cambridge, Massachusetts.
Walter Gropius to Carl M. Stiles. February 8, 1957. The Architects' Collaborative, Cambridge, Massachusetts.
Walter Gropius to Carl M. Stiles. April 18, 1957. The Architects' Collaborative, Cambridge, Massachusetts.
Walter Gropius to H. L. Foote or Grime. May 22, 1950. Massachusetts.
Walter Gropius to Lawrence Hackett. December 27, 1956. The Architects' Collaborative, Cambridge, Massachusetts.

APPENDIX A: Original Plans



Detail of first floor plan illustrating the screen porch, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums



Detail of second floor framing plan showing screen porch, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

GROPIUS HOUSE TRELLISES

Property Name: Gropius **Structure:** Landscape **Feature:** Trellises **Original Material:** Redwood (likely) **Original Color:** White **1965-1969 Material:** Redwood (likely) **1965-1969 Color:** White (matching Benjamin Mooreôs ñCloud Whiteò #967)	 RS ID #270394, 2016

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

The trellises should function as outdoor ñwalls,ò extending the reach of the house and creating a sense of privacy in the south lawn. In order to maintain them as such, they must be kept in good structural repair. They should be the same white color as the house, and repainting should be carried out wherever a coating has failed so that the clean look associated with Bauhaus design is retained. Finally, plants must flourish on both trellises in order to make them effective screens. They should be covered in salmon-colored roses to match the plantings in the earliest available photographs, and a healthy Concord grape vine should climb up the west trellis.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016

The trellises should be kept in good repair. Minor maintenance should occur on a regular basis. When evidence of work becomes obvious, the replacement of finishes and materials should be considered.

Trellises:

- The trellises are wood
- Material replacement, when necessary, should be in matching species, dimensions and detailing. One exception to this rule is the east trellis, which is currently a 1986 replacement of pressure-treated wood. Pressure-treated wood should be eliminated and replaced with the original wood species (redwood).
- Maintenance protocol
    - Maintain the paint finish.
    - As long as there is a paint finish, there is no specific maintenance protocol for the wood itself.
    - Once evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered
- Repair protocol:
    - Minor intervention: use of filler or epoxy for minor cracks or areas of deterioration
    - Medium intervention: Defined as less than 50% loss of individual member. Splice repairs, typically in the form of half-lap joints are approved for areas of minimal damage.
    - Major intervention: Defined as more than 50% loss of individual member. Complete replacement in kind approved.

Paint:

- Paint currently used is Benjamin Mooreôs ñCloud Whiteò #967
- Paint color should be replaced in-kind.
- Paint materials have shifted from oil to latex. These changes have currently been approved, but modern latex has the potential to present a different aesthetic appearance from oil. Future consideration may be made about switching from latex to a different type of paint that more accurately reflects the original paint aesthetics.
- Maintenance protocols:
    - In order to maintain a white appearance, the paint surfaces can be washed using a mild detergent such as D2 and a soft bristled brush.
- Repair protocol
    - The standard specification for painting can continue to be used emphasizing brush application for the final coat.

Plant Material:

- Roses should be reestablished on both trellises. While historic material is no longer extant, the fact that roses were robust enough to block view through trellises was important aspect of Gropiusŏs original design. Preference will be given to fast-growing climbing roses with a deep red or pinkish color. They can then be cut or staked back when maintenance on trellis is required. See plantings section of this document for interpretive discussion of rose type.

Original Construction and Evolution:
Two trellises were included in the original landscape design of the Gropius House, extending from the sides of the building to the west and east respectively *(Figure 1)*.[2] They were likely made of redwood, and photographs of the features from 1939-40 show that both had been painted white.

Figure 1: Gropius House and trellises from the south, Paul Davis, circa 1939-40
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
Historical photographs are not clear enough to show details of the trellisô appearance between 1965 and 1969. However, 1970 repairs to the east trellis suggest that its condition had declined by the interpretive period.[3] In all other respects the trellises do not seem to have changed by the interpretive period, and therefore the intent behind their original design was still significant. From the beginning, the trellises reflected Gropiusôs idea that ñóthe modern home should have tentacles in the garden.ôò[4] They were semi-permeable walls that created ñóopen planô roomsé which mimic[ked] the screens and furniture inside

[2] Walter Gropius and Marcel Breuer, "Gropius Residence, Lincoln, Massachusetts, 1938: Landscaping Plan," digital image, Browse Our Collection, accessed September 27, 2016, http://www.harvardartmuseums.org/collections?q=walter gropius lincoln landscape.
[3] Custance Brothers Invoice (Waltham, MA: Historic New England Property Care Files, 1970).
[4] "Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset," *Boston Evening Transcript*, January 07, 1938.

the houseò.[5] In 1999 Ati Johansen, the Gropiusô daughter, contributed a further dimension to this idea by asserting that the east trellis was meant to separate the public driveway from the privacy of the garden.[6]

Figure 2: West trellis, 1968
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
As previously stated, the trellises were incorporated into the original design of the Gropius landscape. They were painted white from the earliest years of the propertyøs existence. Work was carried out on the trellises twice while Mrs. Gropius lived at the house on her own. The one to the east was repaired and repainted in 1970, and in 1981 one of them was repaired after it was damaged by a windstorm. Whether the second incident involved the east or the west trellis is unclear. In 1985, very soon after the Society for the Protection of New England Antiquities (SPNEA) acquired the property, the east trellis was rebuilt with pressure-treated wood and a redesigned cap for better water shedding.[7] The west trellis was not replaced until 2005. In 2016 it had to be stabilized due to failing timber near its base *(Figures 3 and 4)*. The most recent written record of work on the east trellis was a repainting job completed in 2008.[8]

[5] Kramer, *Landscape History*, 4.
[6] "RE: Landscaping and Garden of Gropius House," Ati Johansen to Peter Gittleman, October 04, 1999, Stanfordville, New York.
[7] *Gropius House Development Project*, report, Section III - Narrative Report, Carpentry (MA: Society for the Preservation of New England Antiquities, 1986), 2.
[8] Goodhue Painting Invoice (Waltham, MA: Historic New England Property Care Files, 2009.

Figures 3 and 4: West trellis: failing timber (left) and new stabilization techniques (right), 2016
RS ID #263883 and RS ID #263888

Interventions

2016: West trellis stabilized in response to failing timber near base
2008: East trellis primed and painted
2005: West trellis replaced
1986: East trellis rebuilt with pressure-treated wood and redesigned with a cap to facilitate water shedding
1985: To-do list included thickening or replacing roses at east trellis
1981: Windstorm damaged one of the trellises; unclear which one. Repaired.
1970: East trellis repaired and painted

BIBLIOGRAPHY

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

Custance Brothers Invoice. Waltham, MA: Historic New England Property Care Files. 1970.

Gropius House Development Project. Report. Section III - Narrative Report. Carpentry. MA: Society for the Preservation of New England Antiquities, 1986.

Gropius, Walter, and Marcel Breuer. "Gropius Residence, Lincoln, Massachusetts, 1938: Landscaping Plan." Digital image. Browse Our Collection. Accessed September 27, 2016. http://www.harvardartmuseums.org/collections?q=walter gropius lincoln landscape.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

"Landscape Problems at Gropius." Maryanne Zephir to Dianne McGuire. July 12, 2000. Gropius House, Lincoln, Massachusetts.

"RE: Landscaping and Garden of Gropius House." Ati Johansen to Peter Gittleman. October 04, 1999. Stanfordville, New York.

"Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset." *Boston Evening Transcript*, January 07, 1938.

GROPIUS HOUSE ROOF DECK

Property Name: Gropius
Structure: Gropius House
Feature: Roof Deck
Original Material: Redwood, iron, canvas, possibly California Stucco
Original Color: Materials probably unpainted
1965-1969 Material: Redwood, iron, canvas, possibly California Stucco
1965-1969 Color: Materials probably unpainted

RS ID #270303, 2016

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

In keeping with the approach for the maintenance of the house's exterior, the roof deck should be kept in good repair. When the evidence of any treatment becomes obvious, renewal of the materials should be considered in order to achieve the clean lines that originally characterized the deck.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

- As an exterior feature and an important space for visitor access, the roof deck should be kept in good repair
- Inspect annually for signs of deterioration. Test floor boards specifically looking for signs of weakness.
- Minor maintenance of finishes and the materials should occur on a regular basis
- Once evidence of repairs and maintenance becomes obvious, replacement of finishes or materials should be considered
- See the Exterior Siding and Roofs, Gutters and Downspouts sections of this document for further treatment guidance

<u>Porch Deck</u>

- Any repairs or replacement should be made in-kind with redwood
- Minor repairs maybe undertaken to splice new wood in to repair broken deck boards. Care should be taken as to make sure joints in the boards are over deck supports.
- As of 2016, staff are concerned about the safety of the deck because the boards have been cracking with increasing frequency in recent years. While repairs and modifications to the deck have been carried out several times, the exact layout of the underlying sleepers is unclear. There are also few details available about the widening of the spaces between the boards, which was carried out by the Society for the Preservation of New England Antiquities (SPNEA) in 1986. These questions could be answered during the replacement of the feature, which should happen soon. The work would be most cost effective if it took place at the same time as a roof replacement.

<u>Acrylic Screens</u>

Maintenance Protocols

- Cording should be tightened annually to keep the screens appearing crisp.
- Acrylic material keeps its color longer than canvas, but it will still have to be replaced in time. Its estimated lifespan is ten years. The screens should be monitored through various seasonal conditions so that they are replaced before excessive wear and tear is visible.

Original Construction and Evolution:

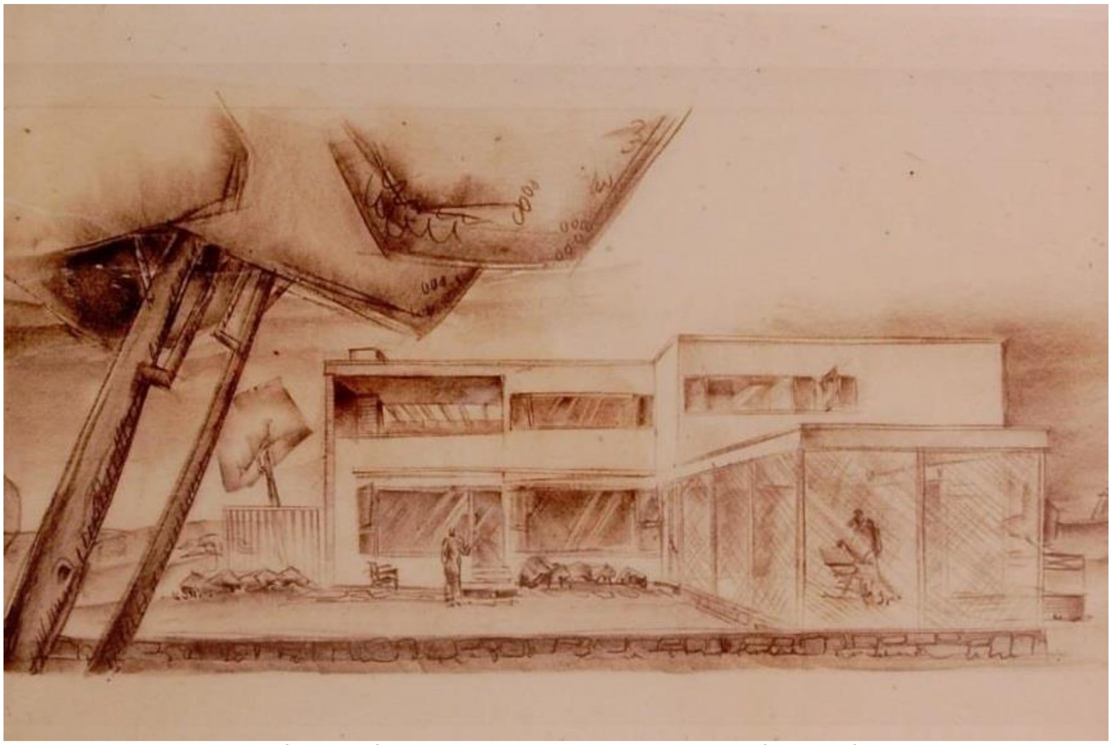


Figure 1: An early design of the roof deck shows a larger solid section of the roof and no brise soleil, 1937
Historic New England Archives, Binder of Slides

The roof deck was part of the original design of the Gropius House, but very little about its construction is included in the Gropiusôs specifications. It was enclosed by the building at the north and east and open to the air at its south and west sides, where galvanized iron rails were soldered to the parapet flashing.[2] The deckôs wearing surface was 1ò Trinidad Asphalt, and it was partially roofed with widely spaced wooden boards *(Figure 2)*.[3] There is little evidence of significant changes to the deck between its construction and the interpretive period, but a 1945 repairs list suggests that canvas was used at the roof deck early on.[4] It was likely fastened to the railings for privacy. Ceiling repairs were requested in 1955, but it is unclear whether they were carried out and if they involved altering the material.[5]

---

[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 11. Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 21.
[3] Gropius and Breuer, ñSpecifications,ò 32. Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 25.
[4] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[5] Walter Gropius to Carl M. Stiles, May 22, 1957, The Architects' Collaborative, Cambridge, Massachusetts.

Character-Defining Traits in the Interpretive Period:
Throughout its history, the deck represented the practicality of flat Bauhaus roofs, which Gropius liked to use as extra living space.[6] It also reflected Gropiusôs tendency to merge indoor and outdoor areas.[7]

Figure 2: Partial ceiling of roof deck, circa 1967-68
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
The need to reattach canvas on the roof deck was included in a 1945 repairs list.[8] The note likely refers to material that was attached to the iron rails and is visible in various historic images *(Figure 3)*. The only other record of the deckôs condition during Gropiusôs lifetime is from 1955, when he wrote that the textured stucco product used as its ceiling finish came out patchy and uneven.[9] By 1959 the stucco had begun to fall down in large patches, and Gropius requested that it be replaced.[10] Although he wrote repeatedly that stucco had always been a poor choice for exterior ceilings, he described the repairs he needed as ñrestuccoò work.[11] Thus, it is unclear whether the stucco was reapplied or replaced with a

[6] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 274.
[7] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[8] ñHouse Repairs.ò
[9] Walter Gropius to California Stucco Products of New England, Inc., July 11, 1955, The Architects' Collaborative, Cambridge, Massachusetts.
[10] Gropius to Stiles.
[11] Ibid.

different material. In fact, there is no evidence that the requested repair was carried out at all; the problem had not been addressed by 1960.[12]

Figure 3: Courtesy of Harvard Art Museums/Busch-Reisinger Museum, Gift of Walter Gropius, BRGA.82.118. Photograph by Robert Damora.

In 1977 Mrs. Gropius had 340 square feet of the boards replaced.[13] During the deckôs reconstruction by SPNEA in 1986, research indicated that Mrs. Gropius had replaced original redwood boards with fir ones during her project.[14] SPNEAôs decision to replace the deck came partly from a desire to restore it to redwood, and partly from a need for better drainage.[15] The new boards were placed slightly farther apart from each other than the old ones so that wet leaves could not clog them so easily.[16] In addition, new pressure-treated sleepers rested on another layer of pressure-treated wood, which was elevated off the gravel roof with ñwalk treadsò.[17] This new layer of wood would be sacrificial if the drainage system should fail.[18]

[12] Walter Gropius to Carl M. Stiles, April 22, 1960, The Architects' Collaborative, Cambridge, Massachusetts.
[13] James Yarasitis, ñNew Boards on Roof Deck,ò (Waltham, MA: Historic New England Property Care Files, 1977).
[14] *Gropius House Development Project*, report, Section III - Narrative Report, Carpentry (Boston, MA: Historic New England, 1986), 2.
[15] Ibid.
[16] Ibid.
[17] Ibid.
[18] Ibid.

Figure 4: Roof deck, 1977
Historic New England Archives, Binder of Slides

By 1987 the drain needed to be cleaned, and a year later the decking was soft in numerous places.[19] An undetailed record of a plaster repair took place in 1990 and may be related to the ceiling of the roof deck.[20] In 1991 the deck required repairs and was clogged with leaves and other debris, but it is unclear if these issues were addressed.[21] Ceiling repairs were carried out in 2002, and while no details about the work were recorded pictures indicate that the finish was replaced or patched *(Figure 5)*.[22] Extra sleeper support was needed by 2014, but the project was deferred to a later date.[23] However, one board was replaced around the same time.[24] Two more boards were partially replaced in 2015, but western red cedar was used for the work because redwood could not be sourced in the appropriate length. Another partial board replacement took place near the door in 2016.

[19] ñExterior,ò (Waltham, MA: Historic New England Property Care Files, 1987). Ron Brown, ñQuarterly Report of Conditions,ò (Waltham, MA: Historic New England Property Care Files, 1988), 8.
[20] ñMuseums Department Purchase Orders 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).
[21] "Gropius SWAT - Summary," Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard, Frank Thompson, Joe, Millie OôConnell, Kathy Francis, Peter Gittleman, March 1, 1991, Massachusetts, 3. "Gropius/Moisture," Millie O'Connell to Tess and Frank Thompson, March 4, 1991, Massachusetts.
[22] *Property Care - Gropius - 2002.projects - GRO.05012002.Deck Ceiling Repairs.003,* May 01, 2002, Resource Space, Historic New England, Lincoln.
[23] ñAtiôs Deck ï Extra Sleeper Support,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.
[24] ñCFAD 2014,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

Figure 5: Roof deck ceiling repair or replacement, 2002
RS ID #57056

In 2015 the safety risk associated with the wide-spaced railings was recognized, and Historic New England staff decided to re-institute the canvas screen seen in historic photos. While images only showed one screen in place, current safety concerns dictated that both voids be filled with the same screen material. There was some debate about the color of the new screen. One historic image shows that it had a blue and orange stripe pattern, while others were black and white and only showed dark and light stripes. While there was some opinion that the blue and orange pattern would be in keeping with Gropiusô use of color - however much it would have clashed with the pink wall ï this combination was not available at the time. It is also possible that color degradation in the historic slide may have provided misleading color information for this feature. The replacement screens were fashioned from acrylic awning material with black and white horizontal stripes and grommets in the same locations as determined from the photographs *(Figure 6)*. The northernmost screen was secured to the pink wall using stainless steel threaded eyes. Black nylon parachute cord of approximately 3/16ò diameter was then used to whip through the grommets and around the railing, replicating the installation detail seen in the historic images. The chimney and flashing presented a challenge in installation of the southernmost screen. A 2ô eastern white pine board approximately 1ò x 4ò was secured to the chimney using masonry anchors let into the mortar joints between bricks. Stainless steel eyes were then secured to this board, and the screen was secured to the railing as previously described. Due to the height of the flashing, it was necessary to secure the lowest points of the screen directly on the deck boards in order to achieve the desired effect. At the same time that these new screens were installed, three stainless steel chains spaced approximately 10ò apart were secured across the opening to the spiral stair in order to discourage the stairôs rogue use during an unsupervised excursion to the deck.

Interventions

2016: One deck board partially replaced in front of door
2015: Fabric purchased in order to function as deck screen. Two boards partially replaced in western red cedar, due to lack of availability of redwood in prescribed length.
2014: Need for extra sleeper support was noted, but project deferred. One board replaced.
1991: Repairs required. Clogged with leaves and other debris.
1990: Plaster repaired, possibly on deck ceiling. Location unknown.
1988: Decking soft in numerous places
1986: Fir boards replaced with redwood, and installed with slightly larger gaps in order to facilitate drainage. Sleepers replaced with new ones made of pressure-treated wood, which rested on layer of sacrificial pressure-treated wood. The latter was elevated off gravel roof with ñwalk treads.ò
1977: Redwood boards replaced with fir
1960: Repair or replacement of stucco requested
1959: Stucco falling down in large patches. Replacement requested.
1955: Stucco ceiling finish came out patchy and uneven when applied
1945: Re-fixing canvas on roof deck included on to-do list

BIBLIOGRAPHY

ñAtiôs Deck ï Extra Sleeper Support.ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

Brown, Ron. ñQuarterly Report of Conditions.ò Waltham, MA: Historic New England Property Care Files, 1988.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

ñCFAD 2014.ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.Gropius, Ise. ñExterior.ò Waltham, MA: Historic New England Property Care Files, 1987.

ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius House Development Project. Report. Section III – Narrative. Carpentry. Report. Boston, MA: Historic New England, 1986.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

"Gropius/Moisture." Millie O'Connell to Tess and Frank Thompson. March 4, 1991. Massachusetts.

"Gropius SWAT - Summary." Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard, Frank Thompson, Joe, Millie OôConnell, Kathy Francis, Peter Gittleman. March 1, 1991. Massachusetts.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Home Depot Receipt. Waltham, MA: Historic New England Property Care Files, 2015.

ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.

ñMuseums Department Purchase Orders 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).

Property Care - Gropius - 2002.projects - GRO.05012002.Deck Ceiling Repairs.003. May 01, 2002. Resource Space, Historic New England, Lincoln.

Walter Gropius to California Stucco Products of New England, Inc. July 11, 1955. The Architects' Collaborative, Cambridge, Massachusetts.

Walter Gropius to Carl M. Stiles. April 22, 1960. The Architects' Collaborative, Cambridge, Massachusetts.

Walter Gropius to Carl M. Stiles. May 22, 1957. The Architects' Collaborative, Cambridge, Massachusetts.

Yarasitis, James. ñNew Boards on Roof Deck.ò Waltham, MA: Historic New England Property Care Files, 1977.

GARAGE (VISITOR CENTER)

Property Name: Gropius **Structure:** Garage (Visitor Center) **Feature:** Garage (Visitor Center) **Original Material:** Varying and partly reflected in house features **Original Color:** Varying and partly reflected in house features **1965-1969 Material:** Varying and partly reflected in house features **1965-1969 Color:** Varying and partly reflected in house features	 RS ID #274762, 2016

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

The exterior of the garage should be treated similarly to the main house. This means that the vertical wood siding should be kept clean, crisp and repainted, and that if individual wooden members cannot be brought back to this condition they should be replaced. The removal of fungus from the siding is thus a major priority. The historic interior of the garage is not visible because an interior space was created using modern framing and materials to serve as a visitor center. The new interior walls and ceiling can theoretically be removed in the future with little harm to the historic fabric of the garage. The walls, ceilings and floor covering are modern materials and can be modified with no concern about loss of historic material.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016

When evidence of treatments such as splice repairs in a façade or the layering of paint becomes obvious, renewal of the materials should be considered in order to maintain the clean lines of the houseęs original design. The overall maintenance and repair of the garageęs exterior follows the protocols for the main house, as found in the Roof, Gutters, and Downspouts and Exterior Siding sections of this document.

Interior Finishes:
The interior finishes of the visitor center are modern, so they can be repaired or replaced with little concern for historic fabric. If a repair to the visitor center walls or ceilings allows for a view of the historic framing, it should be visually inspected and photographed for documentation.

Garage Doors:
The garage doors should be maintained and kept in operable condition. If a repair is necessary, effort should be made to retain its historic materials. If this is not possible, they should be replaced in kind.

Exterior Light:
A modern three-headed light fixture under the front eave of the garage is controlled by a timer inside the building. The lightbulbs are halogen and the lightbulbs themselves have been problematic as of late 2016. More research should be undertaken in order to determine the appearance of the historic fixture, and possibly to replace the existing with one more suitable. In any case, the light should be retained for the safety of the visitors and for security purposes.

Original Construction and Evolution:
There are no documents that specifically elaborate upon the construction or original design of the garage, but it can be assumed that most of the basic elements of the structure were designed similarly to those of the main house *(Figure 2 provides evidence of early existence)*. Its location had been originally chosen on the advice of Helen Storrow, who owned the land and paid for the construction of the house. Mrs. Storrow suggested that the garage be placed at the foot of the driveway because ñshe had herself been often inconvenienced by high snowfalls which blocked the drive to her mansion on the hillò.[2] The only changes to the building before the interpretive period were roof and door repairs, which did not appear to have changed the garageęs character in any way.[3]

Two letters from 1945 suggest that the garage was almost moved around that time. In April Gropius received a letter stating that ñthe trustees are to have the right to move the garage

[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 6.
[3] Walter Gropius to H.L. Foote, June 15, 1949, Massachusetts. Walter Gropius to Barber-Colman Company, January 10, 1949, Massachusetts.

on to the land which you now lease at any timeò.[4] About a month later Gropius wrote to James Storrow, Mrs. Storrowôs son, that he had been in touch with a contractor about ñthe removal of [his] garage on the other side of the drivewayò.[5] The reason behind these letters is unclear, and a photograph from around 1940 shows that the garage was never actually moved. It is possible that the deliberations had to do with a change in the use or purpose of the garage. However, it is more likely that they were related to the redistribution of land lots after the 1944 death of Mrs. Storrow.[6]

Figure 2: View of the Gropius House with the garage barely visible to the left, circa 1939-41
Historic New England Archives

Character-Defining Traits in the Interpretive Period:

Evidence suggests that the garage had not changed in any fundamental ways by the interpretive period. In its location and other characteristics, the garage reflected the sense of practicality central to Gropiusôs design philosophy. He was well aware that the needs of the average family were changing rapidly during his time, and he sought to incorporate all new necessities into his designs.[7] The proliferation of family-owned cars in the early twentieth century would have made the garage an important aspect in the modern house. Some features of the Gropius garage, such as the white-painted redwood cladding, were very much like those of the house and were significant for similar reasons.

[4] David H. Howie to Walter Gropius, April 17, 1945, Boston, Massachusetts.
[5] Walter Gropius to James Storrow, May 22, 1945, Massachusetts.
[6] Diane White, *The Legacy of Helen Osborne Storrow (1864-1944)* (New York, NY: World Foundation for Girl Guides and Girl Scouts, 2016).
[7] Walter Gropius, 1937, MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library, 7-8.

History of Conservation and Maintenance Practices:
Aside from the period when he considered moving the garage, most of Gropiusôs own involvement with the building was related to the roof. In 1942 he reported that it was leaking, and that the water infiltration became worse in cold weather and better in the hotter seasons.[8] In 1945 flashing repairs were included on a list of necessary repairs, but by 1946 the problem had still not been addressed.[9] It was in 1947 that the roof was ñcompletely curedò.[10] Two years later Gropius reported that one of the garage doors was stuck, and he had it repaired by a contractor.[11]

The next record of work carried out on the garage is from 1985, after the Society for the Protection of New England Antiquities (SPNEA) had acquired the property. SPNEA outfitted the building with modern electrical capabilities by running two 20-amp feeds from the house to the garage, installing two new double 150-watt flood lights on the interior, digging a trench from the structure to two different trees for landscape lighting, and installing two weatherproof GFI outlets to the exterior.[12] During the following year the exterior siding was prepped and painted as part of a Massachusetts Historical Commission project.[13] In 1987 one of the light fixtures on the garage needed attention, large pine branches had settled on the roof, and the overhang was leaking a brown liquid down the front door.[14]

The possibility of converting the garage into a visitor center was proposed in 1987.[15] In 1988 the concept was discussed in more detail, including the possibilities and potential issues relating to design work, budget, and the installation of utilities and exhibitions.[16] The relocation of the resident overseerôs quarters to a new extension behind the garage, which would allow for the display of the houseôs service areas, was also under consideration.[17] There is no evidence of specific planning for the project undertaken in 1989, but a to-do list shows that the development was still under consideration.[18] In 1990 an exterior light needed to be rewired and installed.[19] The first schematic drawings for the conversion of the garage were completed in late 1990, and the following year the steps for their approval by various local groups were outlined.[20] The Town of Lincolnôs Planning Board was

---

[8] Gropius to Foote, June 1949.
[9] Walter Gropius to The Barrett Company, June 13, 1946, Massachusetts.
[10] Gropius to Foote, June 1949.
[11] Walter Gropius to Barber-Colman Company, January 10, 1949, Massachusetts.
[12] William F. Fitzmaurice, Inc. Invoice (Waltham, MA: Historic New England Property Care Files, 1985).
[13] Peter J. Connolly Invoice (Waltham, MA: Historic New England Property Care Files, 1986).
[14] "Gropius House," Christina O'Sullivan to Rob Kret, September 21, 1987, Gropius House, Lincoln, Massachusetts. "Gropius House Observations," Elizabeth Redmond to Peggy Burke, March 10, 1987, Massachusetts.
[15] ñGropius Work Schedule Meetingò (Waltham, MA: Historic New England Property Care Files, 1987).
[16] Peggy Burke to Gay Wagner and Nick Langhart, January 12, 1988, Massachusetts.
[17] ñGropius Garageò (Waltham, MA: Historic New England Property Care Files, 1988).
[18] "Gropius Staffing 1989 Season," Rob Kret to Peter Gittleman and Michele Litant, March 20, 1989, Massachusetts.
[19] "Completion of the Gropius House Restoration," Peter Gittleman to Millie O'Connell, Frank Thompson, and Lisa, July 6, 1990, Massachusetts.
[20] Franklyn M. Thompson to David Ramsey, June 13, 1991, Society for the Preservation of New England Antiquities, Boston, Massachusetts.

approached about issues such as use and plumbing, and a ñvery smallò addition was proposed.[21] However, no physical work was carried out.

Figure 3: Garage framing, circa 1990s
Historic New England, Property Care Binders

During the next few years more routine maintenance was required on the garage. Through 1993 and 1994 the exterior light still needed to be rewired and installed.[22] Roof repairs were included in the 1993 budget for the property, but the roof was not replaced until 1995 *(figure 4 shows pre-replacement building condition)*.[23] In 1996 SPNEA staff reported many problems with this work.[24] The gravel stop was bent to the northeast, and it sat out from the wooden curb all around the building.[25] The curb failed to meet at the southeast corner, and the solder joints were uneven.[26] During the same year a historic photograph showed the location of a light fixture that had originally been on the garage, but was now absent.[27] There is no evidence that these problems were addressed.

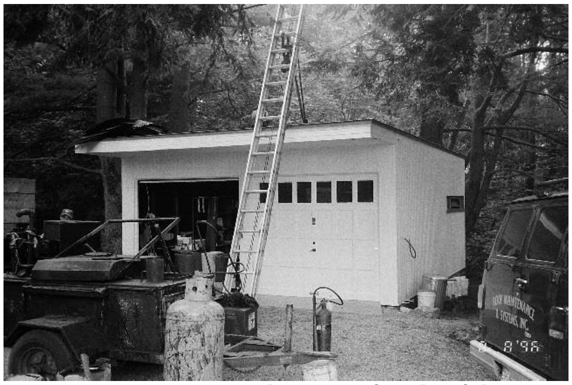
---

[21] ñPresentation at Town of Lincoln Planning Board Meetingò (Waltham, MA: Historic New England Property Care Files, 1991). Thompson to Ramsey, June 1991.
[22] Peter Gittleman, ñGropius Needs Listò (Boston: Historic New England Otis House Files, 1993), 2. Peter Gittleman, ñGropius House Needsò (Boston: Historic New England Otis House Files, 1994), 1.
[23] Frank Thompson, ñMaintenance and Budget Recommendations for 1993ò (Waltham, MA: Historic New England Property Care Files, 1993). ñAgreement between Society for the Preservation of New England Antiquities and Mr. Robert Ellardò (Waltham, MA: Historic New England Property Care Files, 1995).
[24] "Gropius Roof Installation," Linda Willett to Jeff Wallace, August 15, 1996, Massachusetts.
[25] Ibid.
[26] Ibid.
[27] Linda Willett to Jeffry Pond, August 14, 1996, Society for the Preservation of New England Antiquities, Boston, Massachusetts.

Figure 4: Damage to garage façade due to roof damage, 1995
Historic New England, Property Care Binders

The conversion of the garage into a visitor center was finally completed in 1997 *(see figures 5 and 6 and Appendix A)*. The building was insulated and new utilities were installed, including lighting, wiring and baseboard heating.[28] The addition of a handicap bathroom was originally planned, but it was eventually removed from the designs.[29] A new wall containing additional windows was set back from the doors and tracks.[30] The existing doors and windows were repaired, and a dropped ceiling was installed.[31] The interior walls were painted with a ñneutral and lightò white, but the exact color used is unknown.[32] The floor slab was cleaned and then covered with Forboôs sheet linoleum.[33] The painting of the garage exterior was also included in the original budget for the project.[34]

[28] "Gropius Garage," Linda Willett to Tom Donovan, May 15, 1997, Massachusetts.
[29] Ibid.
[30] Linda Willett to Jeffry Pond, August 14, 1996, Society for the Preservation of New England Antiquities, Boston, Massachusetts.
[31] Linda Willett to Alex Slive, May 12, 1997, Society for the Preservation of New England Antiquities, Boston, Massachusetts.
[32] "Gropius Garage Interior Finishes," Linda Willett to Richard, July 8, 1997, Massachusetts.
[33] ñWillett to Slive, May 1997. Forbo Floor Coverings, ñLinoleum Maintenanceò (Waltham, MA: Historic New England Property Care Files, 1997).
[34] ñLabor and Subcontractor Detail: Gropius Visitors Centerò (Waltham, MA: Historic New England Property Care Files, 1996).



Figures 5 and 6: West façade of the garage before and after conversion, 1996 and 2000
Historic New England, Property Care Binders

During the years that followed, work on the visitor center was relatively minor. In 1998 a telephone wire running along the outside of the building was replaced due to frequent shorting.[35] The next year the Head of Fire Prevention for the Town of Lincoln suggested the installation of a smoke alarm in the building, but this work was never carried out.[36] In 2008 an electrical timer was replaced within the structure, and the exterior was cleaned with antifungal solution before being primed and painted.[37] A year later an assessment found holes in the north elevation siding and damage to the northwest flashing, and it is unclear if either was repaired.[38] Split seams on the roof cornice were temporarily patched in 2012, and BIN ceiling stains that had existed since 2009 at the latest were painted in 2014.[39] Finally, a snow plow damaged the siding of the garage in 2015 and was fixed soon after.[40]

---

[35] "Telephone Line at Gropius," Marianne Zephir to Elaine Zopes and Jeff Wallace, November 14, 1998, Massachusetts.
[36] "Knox Box at Gropius," Marianne Zephir to Jeff Wallace, August 20, 1999, Massachusetts.
[37] Butler & Sons Invoice (Waltham, MA: Historic New England Property Care Files, 2008). ñClean House and Garageò (Historic New England Property Care Electronic Database of Historical Projects, 2009). ñPaint Visitor Center/Garageò (Historic New England Property Care Electronic Database of Historical Projects, 2009).
[38] *Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC - GRO.09162009.Garage-VC - Holes North Elevation.208,* September 16, 2009, Resource Space, Historic New England, Lincoln. *Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC - GRO.09162009. Garage-VC - Damage Northwest Corner.206,* September 16, 2009, Resource Space, Historic New England, Lincoln.
[39] *Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC - GRO.09162009.Garage-VC - New Ceiling Staining.217*. September 16, 2009. Resource Space, Historic New England, Lincoln. ñRoof Repairsò (Historic New England Property Care Electronic Database of Historical Projects, 2013). ñCFAD 2014,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.
[40] Peterson, Eric. *GRO 2015 CFAD*. April 08, 2015. Resource Space, Historic New England, Lincoln.

Interventions

2016: Wiring installed behind ñnewò drywall in order to facilitate addition of flat screen TV on east wall. Approximately five ½ò holes drilled through framing members to support route of service.
2014: BIN ceiling stains addressed
2012: Split seams on roof cornice temporarily patched
2008: Exterior cleaned with antifungal solution, then primed and painted. Electrical timer replaced.
1999: Lincoln Fire Departmentôs Head of Fire Prevention suggested installation of smoke alarm within building. As of 2016, still has not been installed.
1998: Telephone wire running along outside of building was replaced after shorting frequently
1997: Conversion into visitor center completed
1996: Photograph showing missing light fixture on exterior was discovered. New roof had been badly installed.
1995: Roof replaced
1994: Lights still needed to be rewired and installed
1993: Lights still needed to be rewired and installed. Roof repairs included in budget.
1991: Planning for conversion into visitor center continues and includes suggestion of small addition
1990: Exterior light needed to be rewired and installed. Schematic drawings developed for conversion to visitor center.
1989: Conversion into visitor center still under consideration
1988: Planning and cost estimations for conversion into visitor center begin. Discussion of making addition on garage for resident overseer quarters.
1987: Light needed attention, and conversion into visitor center was under consideration. Large pine branches on roof. Overhang leaking brown liquid down front door.
1986: Exterior prepped and painted
1985: Electrical work included running of two 20-amp feeds from house to garage, installation of two double 150-watt flood lights on interior, digging of trench from garage to two trees for landscape lighting, and installing two weatherproof GFI outlets to exterior
1949: Door broken; repaired
1947: Roof repairs completed
1946: Roof leakages reported in 1942 had not been repaired
1945: Gropius and James Storrow considered moving garage from one side of driveway to the other. Flashing repairs to roof included on to-do list.
1942: Roof leakages reported, becoming worse in cold weather and improving in warm weather

BIBLIOGRAPHY

ñAgreement between Society for the Preservation of New England Antiquities and Mr. Robert Ellard.ò Waltham, MA: Historic New England Property Care Files, 1995.
Butler & Sons Invoice. Waltham, MA: Historic New England Property Care Files, 2008.
ñCFAD 2014.ò Historic New England Property Care Electronic Database of Historical Projects. 2015.
ñClean House and Garage.ò Historic New England Property Care Electronic Database of Historical Projects, 2009.
"Completion of the Gropius House Restoration." Peter Gittleman to Millie O'Connell, Frank Thompson, and Lisa. July 6, 1990. Massachusetts.
David H. Howie to Walter Gropius. April 17, 1945. Boston, Massachusetts.
Forbo Floor Coverings. ñLinoleum Maintenanceò Waltham, MA: Historic New England Property Care Files, 1997.
Franklyn M. Thompson to David Ramsey. June 13, 1991. Society for the Preservation of New England Antiquities, Boston, Massachusetts.
Gittleman, Peter. ñGropius House Needs.ò Boston: Historic New England Otis House Files, 1994.
Gittleman, Peter. ñGropius Needs List.ò Boston: Historic New England Otis House Files, 1993.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Walter. 1937. MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library.
"Gropius Garage." Linda Willett to Tom Donovan. May 15, 1997. Massachusetts.
ñGropius Garage.ò Waltham, MA: Historic New England Property Care Files, 1988.
"Gropius Garage Interior Finishes." Linda Willett to Richard. July 8, 1997. Massachusetts.
"Gropius House." Christina O'Sullivan to Rob Kret. September 21, 1987. Gropius House, Lincoln, Massachusetts.
"Gropius House Observations." Elizabeth Redmond to Peggy Burke. March 10, 1987. Massachusetts.
"Gropius Roof Installation." Linda Willett to Jeff Wallace. August 15, 1996. Massachusetts.
"Gropius Staffing 1989 Season." Rob Kret to Peter Gittleman and Michele Litant. March 20, 1989. Massachusetts.
ñGropius Work Schedule Meeting.ò Waltham, MA: Historic New England Property Care Files, 1987.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
"Knox Box at Gropius." Marianne Zephir to Jeff Wallace. August 20, 1999. Massachusetts.
ñLabor and Subcontractor Detail: Gropius Visitors Center.ò Waltham, MA: Historic New England Property Care Files, 1996.
Linda Willett to Jeffry Pond. August 14, 1996. Society for the Preservation of New England Antiquities, Boston, Massachusetts.
Linda Willett to Alex Slive. May 12, 1997. Society for the Preservation of New England Antiquities, Boston, Massachusetts.

ñPaint Visitor Center/Garage.ò Historic New England Property Care Electronic Database of Historical Projects, 2009.

Peggy Burke to Gay Wagner and Nick Langhart. January 12, 1988. Massachusetts.

Peter J. Connolly Invoice. Waltham, MA: Historic New England Property Care Files, 1986.

Peterson, Eric. *GRO 2015 CFAD*. April 08, 2015. Resource Space, Historic New England, Lincoln.

ñPresentation at Town of Lincoln Planning Board Meeting.ò Waltham, MA: Historic New England Property Care Files, 1991.

Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC ï GRO.09162009.Garage-VC - Damage Northwest Corner.206. September 16, 2009. Resource Space, Historic New England, Lincoln.

Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC ï GRO.09162009.Garage-VC - Holes North Elevation.208. September 16, 2009. Resource Space, Historic New England, Lincoln.

Property Care - Gropius - 2009.PMF Assessment Photos - Garage-VC ï GRO.09162009.Garage-VC - New Ceiling Staining.217, September 16, 2009, Resource Space, Historic New England, Lincoln.

ñRoof Repairs.ò Historic New England Property Care Electronic Database of Historical Projects, 2013.

"Telephone Line at Gropius." Marianne Zephir to Elaine Zopes and Jeff Wallace. November 14, 1998. Massachusetts.

Thompson, Frank. ñMaintenance and Budget Recommendations for 1993.ò Waltham, MA: Historic New England Property Care Files, 1993.

Walter Gropius to Barber-Colman Company. January 10, 1949. Massachusetts.

Walter Gropius to H.L. Foote. June 15, 1949. Massachusetts.

Walter Gropius to James Storrow. May 22, 1945. Massachusetts.

Walter Gropius to The Barrett Company. June 13, 1946. Massachusetts.

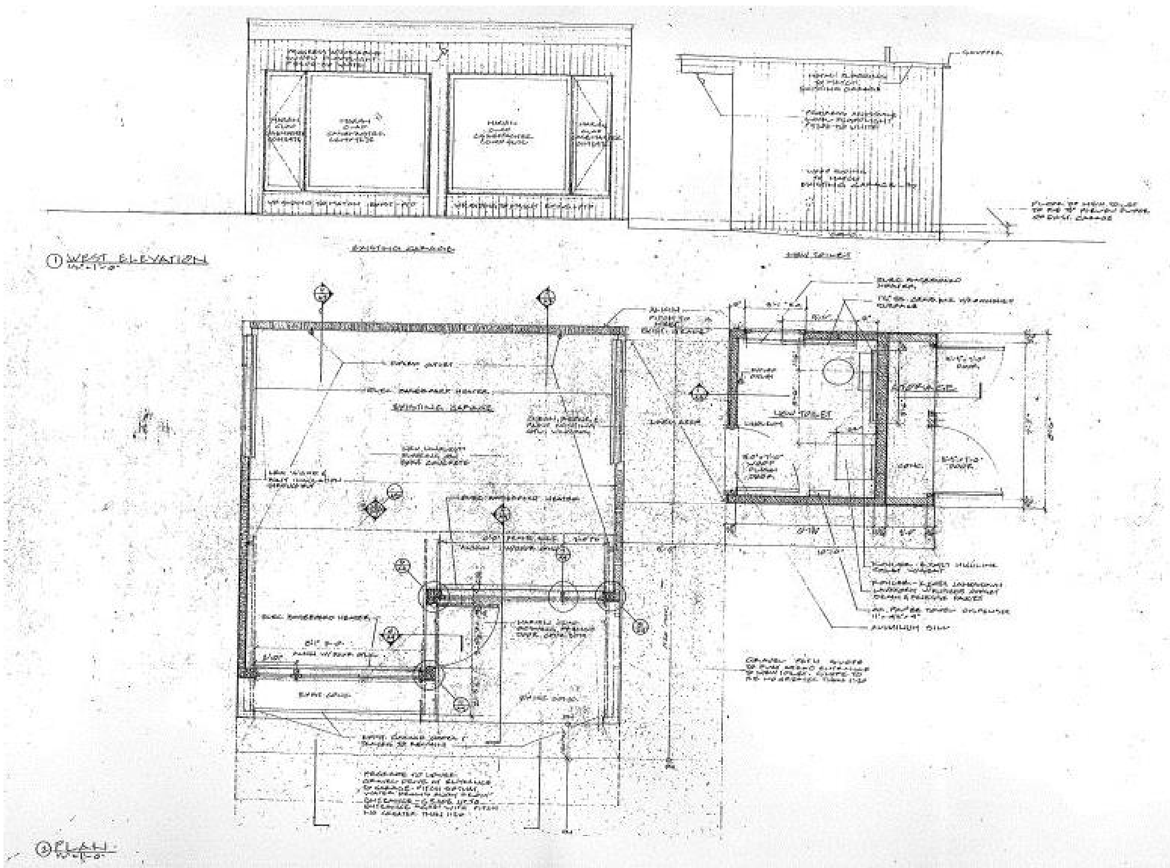
"Walter Gropius House, 68 Baker Bridge Road, Lincoln, MA Preservation Restriction Review (M.G.L. Ch.184, Ss 31-33)." Elsa Fitzgerald to Linda Willett. April 18, 1997. Massachusetts Historical Comission, Boston, Massachusetts.

White, Diane. *The Legacy of Helen Osborne Storrow (1864-1944)*. New York, NY: World Foundation for Girl Guides and Girl Scouts, 2016.

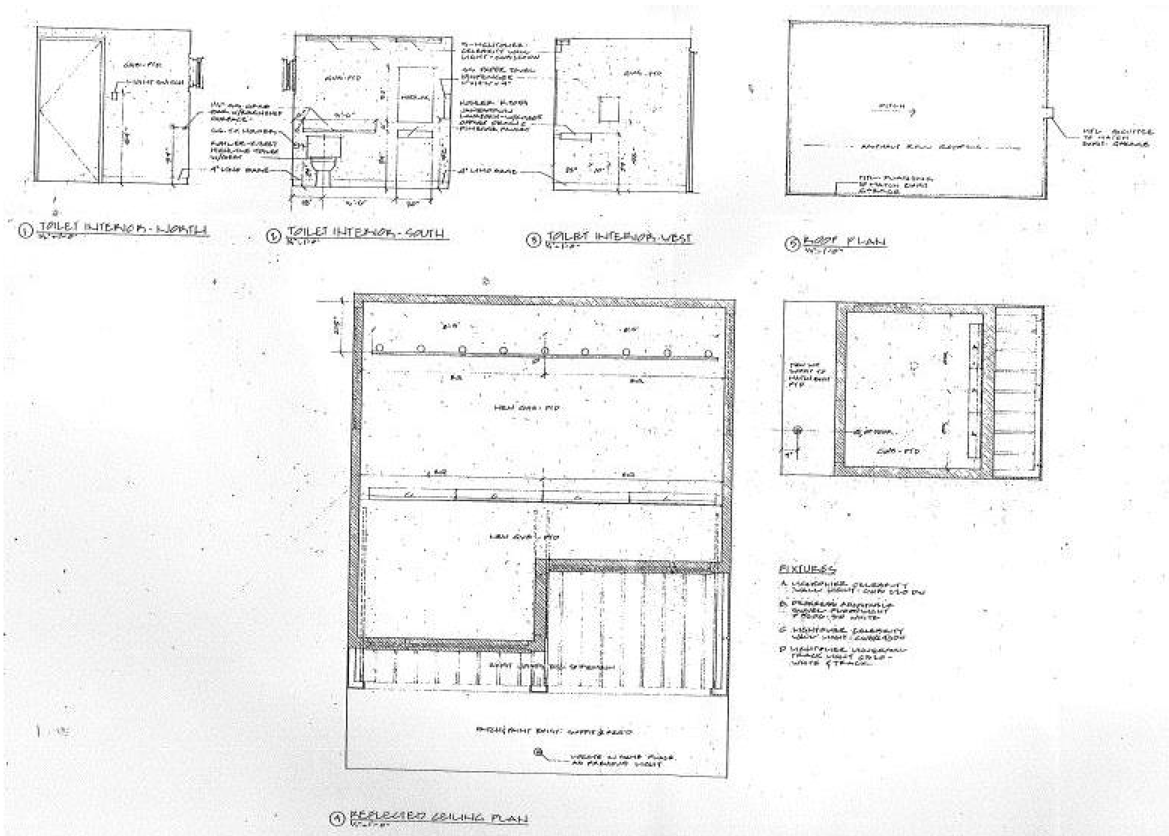
William F. Fitzmaurice, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1985.

APPENDIX A: Draft Garage Conversion Plans

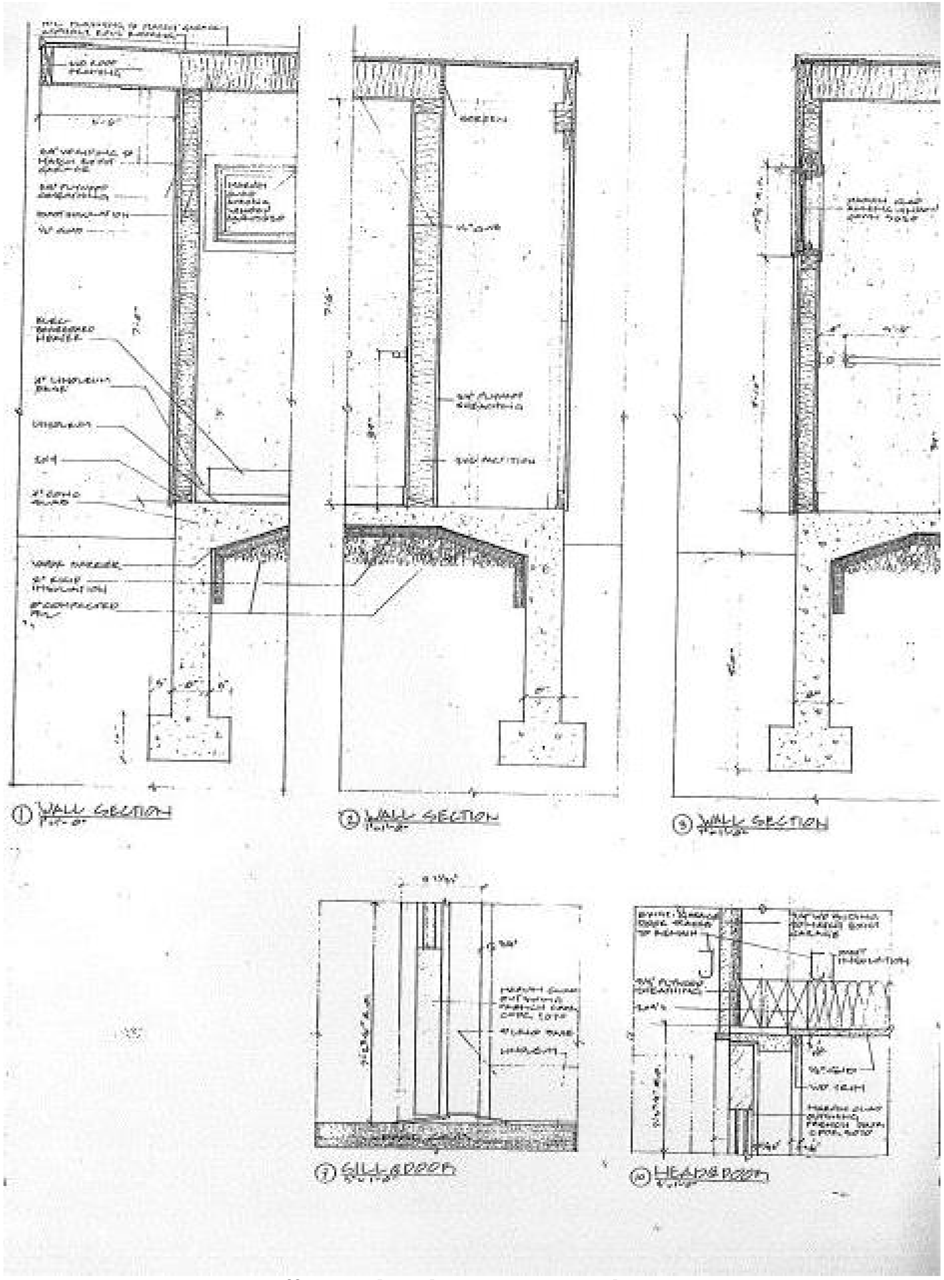
The following are the only drawings on record for the garage conversion. Old correspondence suggests that the doors were not retained in an early version of the drawings, while they do remain in place today. In addition, no bathroom was ever installed in the building. For these reasons the drawings are unlikely to be either the first or the last version of the design.



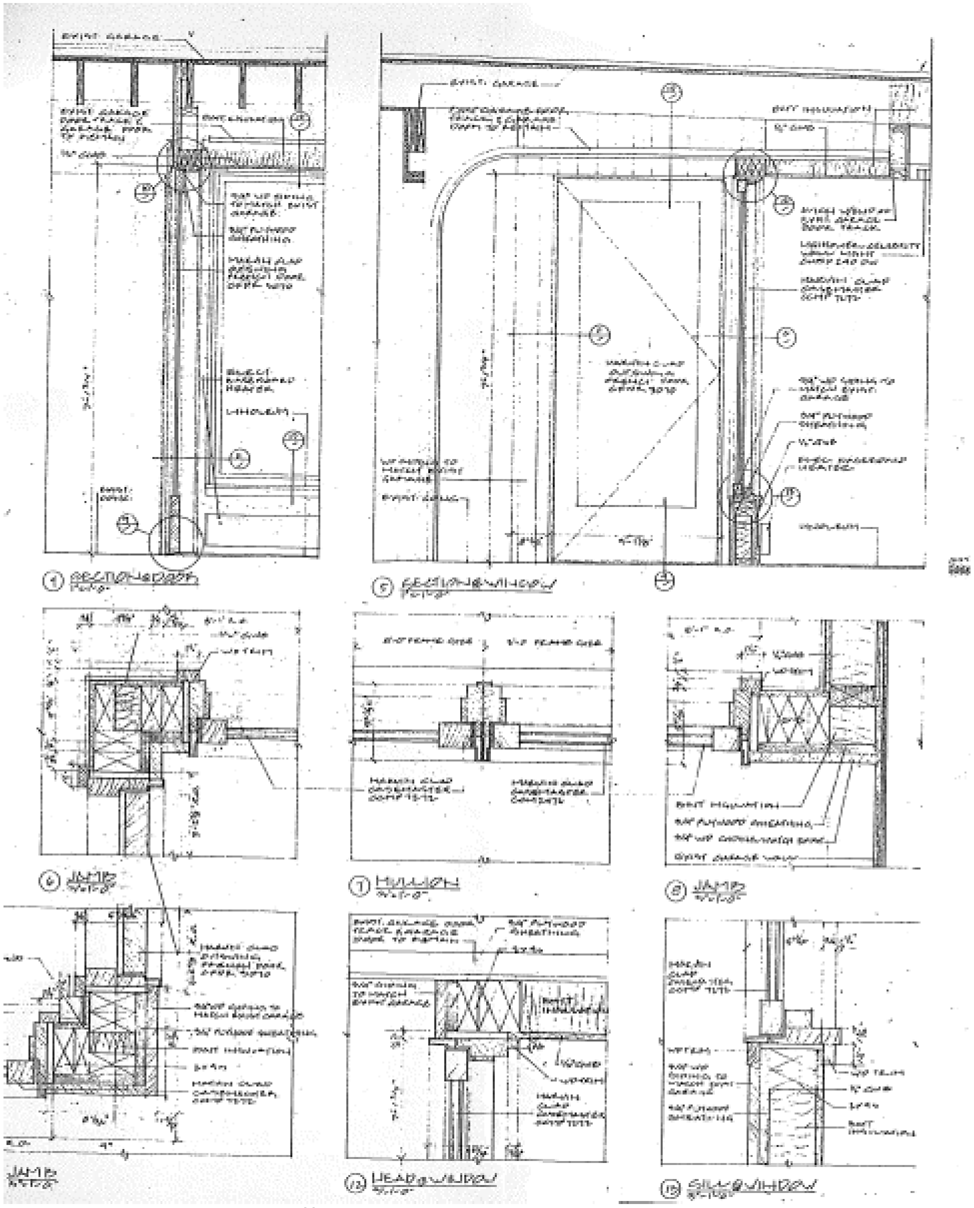
Jeffry Pond Architect, Inc., March 1997



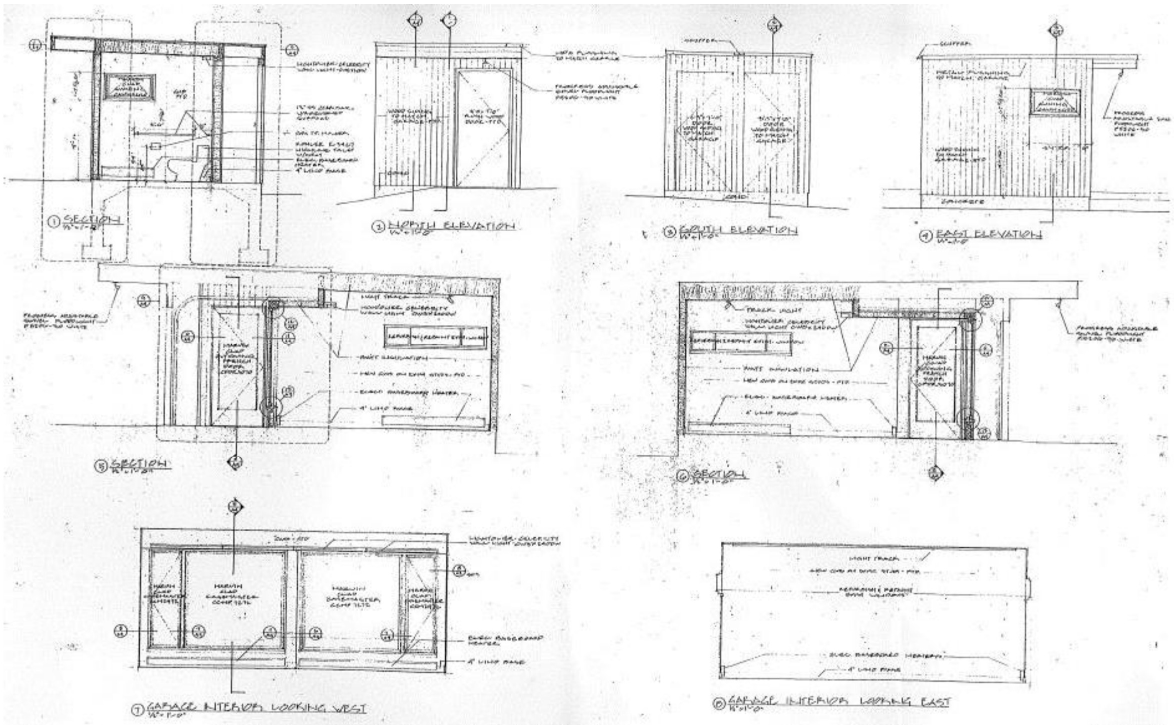
Jeffry Pond Architect, Inc., March 1997



Jeffry Pond Architect, Inc., March 1997



Jeffry Pond Architect, Inc., March 1997



Jeffry Pond Architect, Inc., March 1997

GROPIUS HOUSE OVERALL INTERIORS

Property Name: Gropius
Structure: Gropius House
Feature: Overall Interiors
Original Material: Gypsum plaster; ¾ò x 3 ¾ò white pine sheathing; primer, lead, watercolor, and oil paint, and a semi-gloss finish (including but not limited to Velumina Wallhide First Coater and Benjamin Mooreôs Moresco); watercolor paint; linen wallpaper; Armstrong Stedman reinforced rubber tile, 5/16ò thick; pine (or plywood?), fir, bronze,steel; acoustical plaster; cork; brick; stainless steel; cement mortar; cement plaster; slate; terracotta; fireclay mortar; sheet iron; linoleum; white oak.

RS ID #270538, 2016

Original Color: Off-whites, beiges, creams, pale yellow, grays, and red-brown
1965-1969 Material: Gypsum plaster; ¾ò x 3 ¾ò white pine sheathing; oil and watercolor paints; linen wallpaper; Armstrong Stedman reinforced rubber tile, 5/16ò thick; pine (plywood?); fir, bronze; steel; acoustical plaster; cork; brick; stainless steel; cement mortar; cement plaster; slate; terracotta; fireclay mortar; sheet iron; linoleum; white oak.
1965-1969 Color: Paints: off-white matched to Benjamin Moore Dove Wing (#960) in 2001; pink matched to Benjamin Moore Love Story (#1213) in 1999; beiges matched to Benjamin Moore Berber White (#955) and Albany White (#944) in 2001; and light and medium grays matched to Benjamin Moore Silver Lake (#1598) and Englewood Cliffs (#1607) in 2000. Other colors: white, brown.

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

A balance must be struck between preserving the original finishes and presenting them in the crisp style that they were designed. There is a cascade effect on collections after restoration of wall finishes; if the walls look perfect, patina on the objects will stand out. Overall, however, an effort must be made to keep the interior finishes of the Gropius House in good repair so that the simplicity and clean lines fundamental to their design are maintained. There has been much discussion over the color treatments in the house, so paint studies should be carried out regularly at the site in order to utilize the latest technology. If successive analyses convincingly show that the color matches previously thought to represent the interpretive period were wrong, new color matches should be made and repainting should take place.

Maintenance and Repair Protocols:
There are many finishes within the Gropius House interior, so the following are broad treatment guidelines.

- Finishes should be kept in good repair in order to maintain clean aesthetic of house. However, condition of all elements in space should be considered in discussions about treatment options. There is a cascade effect on collections after restoration of wall finishes; if walls look perfect, patina on objects will stand out.
- Treatment decisions for interior finishes will most likely require interpretive review by preservation task force.
- 1999-2001 paint analysis dictated the current color palette for interior walls, but color matches should be compared and matched to actual appearance of surfaces.
- See Acoustical Plaster, Cork Floor, Hardware and Doors, and Interior Wall and Ceiling Finishes sections of this document for further information on maintenance of Gropius House interiors.

Original Construction and Evolution:
Some of the doors in the Gropius House were glass, while wooden ones were plain in style and fitted with locally-made stock hardware.[2] This plainness was reflected in the interiors generally, including the predominantly off-white wall finishes.[3] These were mostly oil paints on gypsum plaster, with the exception of some areas where tile, linen wallpaper,

---

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 23 and 21. Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 24. Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 15.
[3] "Gropius Interior Paint," letter from Jeff Wallace, March 27, 2001, Massachusetts.

acoustical plaster, and pine sheathing were installed.[4] Watercolor was used on the ceiling as a tint.[5] Paint studies have suggested that the wall color and paint type differed in a few select rooms. For example, the walls of the second floor guest bathroom may have originally be finished with a yellow calcimine paint, the paint on the window sill in the same room was lead-based, the maidôs room was first coated with a beige latex paint, the kitchen ceiling was pink, and the master bedroom and dressing room were originally a brown-gray color.[6] Sometime before the late 1960s these last rooms were repainted in shades of gray.[7]

In addition to the wall finishes, the cork floor tiles in the main hall and the fireplace in the living room were other important features of the interior.[8] Gropiusôs specifications also called for 3/4ò white pine shelves from the floors to the ceilings of each bedroom closet and 10ò x ¾ò continuous white oak bookshelves in the living room and study.[9] The kitchen and pantry floors were to be finished with ñU.S. Gov. standard, medium weight, first quality Battleship linoleumò, and maintenance instructions for the material included two coats of floor wax and electric polishing.[10] Tiles were laid in the bathrooms, and the maidôs room had hardwood parquet flooring.[11] Finally, there were Filipino hemp mats in the Gropiusô daughterôs room and wall-to-wall carpets in the living, dining, study, and bedrooms.[12]

---

[4] Susan L. Buck, *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*, report, Art History, University of Delaware (Newark, DE, 1997). Gropius, ñGropius House,ò 8. Gropius and Breuer, ñSpecifications,ò 44, 45 and 36.
[5] Gropius and Breuer, ñSpecifications,ò 45.
[6] Andrea M. Gilmore, *Gropius House, Lincoln, Massachusetts: Paint Study, Second Floor - Guest Bathroom*, report (Waltham, MA: Society for the Preservation of New England Antiquities, 1987), 1. Susan L. Buck, *Gropius House Maid's Room and Bath: Lincoln, MA Cross Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 2001), 3 and 13. Buck, *Interior and Exterior Aesthetic*, 33-34. Buck, *Gropius House*, 18. Susan L. Buck, *The Walter Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 1999), 5.
[7] Buck, *Cross-Section Microscopy Report*, 5.
[8] Gropius and Breuer, ñSpecifications,ò 37.
[9] Ibid.
[10] Ibid., 42.
[11] Gropius, ñGropius House,ò 15.
[12] Ibid.

Figure 2: Guest Room, undated
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:

The interior of the Gropius House was designed to be bright and open, which is reflected in the fact that it had fewer doors and hallways than most traditional houses.[13] The glass doors facilitated the link between indoor and outdoor spaces that Gropius sought to incorporate into his designs, while the plain style of the wooden ones was indicative of his aversion for ornamentation.[14] The houseĉs hardware was similarly plain, and it could be purchased cheaply from the stock catalogue of the local W.C. Vaughan company.[15] Gropiusĉs choice of this company is logical given his aversion to expensive custom-made features; he wanted to ñprove that the mass produced output of American industry was quite capable of producing a sophisticated house of contemporary designò.[16] The acoustical plaster used to finish the walls and ceilings of the living room, dining room, and study was from a stock catalogue as well.[17] It was also one of the many innovative materials that Gropius selected for his home, as Bauhaus architecture tended to be experimental in nature.[18]

---

13 Anthony, ñThe Massachusetts Home,ò 23.
14 Ibid. Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 269. Gropius and Breuer, ñSpecifications,ò 24. Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
15 Anthony, ñThe Massachusetts Home,ò 21.
16 Gropius, ñGropius House,ò 5.
17 *Conservation Plan: Architectural Glass and Acoustical Plaster*, report, Property Care, Historic New England, Report, Gropius House: Lincoln, MA [New York, NY: Jablonski Building Conservation, 2016], 30.
18 Gropius, "The Small House," 273.

Another example of a unique wall finish in the Gropius House was the pine clapboards in the entrance hall. In this material Gropius was paying homage to the traditional exterior cladding of New England architecture, but using it in an entirely new way.[19] While the painted gypsum plaster of the other interior spaces is not as innovative, the plain white color in most of the rooms is typical of Gropiusôs avoidance of ornament.[20] The differing colors of select rooms may be explained by the practicality often found in Gropiusôs work.[21] For example, he might have selected darker colors for his own bedroom due to the fact that he was a famously light sleeper.[22] While it is unknown exactly why Gropius chose to finish the entryway floor with cork, it is likely that this decision was motivated by functionalism. He had originally specified white oak for the finish in this area, but cork would be much better at hiding any dirt tracked into the house.[23] In addition, cork was cheaper than white oak and Gropiusôs designs were intended to reflect changing family finances in an era when wars and economics were crippling many households.[24] However, the utilitarian nature of modern architecture was more nuanced than often assumed; the fireplace was included in the living room because the ñpsychological needs of human beingsò were an important aspect of a houseôs practicality.[25]

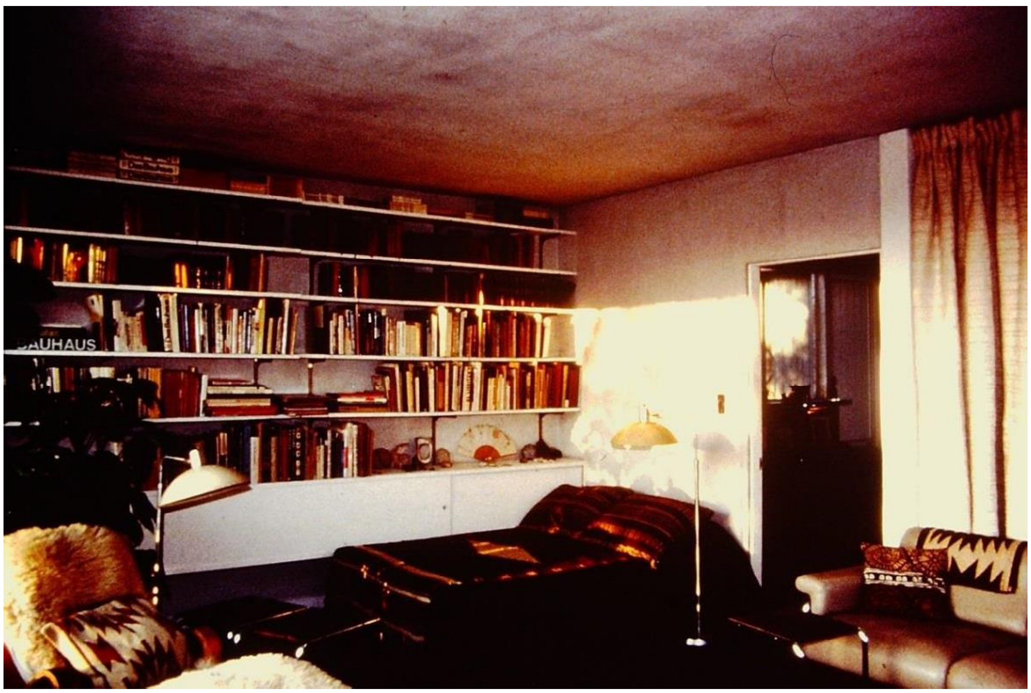


Figure 3: Living room, undated
Historic New England Archives, Binder of Slides

[19] Walter Gropius, ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar], *Bauhausverlag* (1923): 23.
[20] Gropius, "The Small House," 269. Gropius, ñGropius House,ò 7.
[21] Ibid.
[22] Ati Johansen, "Interview about the Use of the Second Floor Rooms in the Gropius House," interview by Peter Gittleman, March 14, 1991, 12. Gropius, ñGropius House,ò 12.
[23] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 40.
[24] Walter Gropius, 1937, MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library.
[25] Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, 6.

History of Conservation and Maintenance Practices:
The manner in which the houseôs interiors were used by the Gropiuses is significant in an analysis of the maintenance history. In 1944 Gropius requested ñan additional 400 gallons of oilò from the Rationing Board for his family.[26] He wrote that they closed up the living room and lived out of ña small upstairs roomò in the winter.[27] He also reported that each member of the family took only one bath per week.[28]

One of the early repairs to the house was the installation and finishing of oak flexwood to replace an earlier counterpart that had developed brown streaks.[29] It is not clear where the wood was used, and the cause of the damage was a ñmysteryò to the contractor.[30] Repairs to toilets were necessary by 1957, when Gropius described the pieces he had originally installed as ñentirely rounded out, soft form without any profilesò.[31] He wrote that only a ñflushing deviceò had to be repaired in earlier years, but he now needed replacements for two springs, two cock stoppers, two right-hand rods, and two left-hand rods.[32] Two toilets seats were replaced in 1962.[33] The final project recorded in Gropiusôs lifetime was the 1969 installation of a counter in an unspecified location.[34]

Figure 4: Toilet, undated
Historic New England Archives, Binder of Slides

[26] Walter Gropius to Rationing Board, April 24, 1944, Gropius House, Lincoln, Massachusetts.
[27] Ibid.
[28] Ibid.
[29] Neil H. Powell to Walter Gropius, February 6, 1947, Edwin L. Powell & Company, Boston, Massachusetts.
[30] Ibid.
[31] Walter Gropius to Briggs Manufacturing Company, February 7, 1957, The Architects' Collaborative, Cambridge, Massachusetts.
[32] Ibid.
[33] Briggs Manufacturing Company Invoice, (Waltham, MA: Historic New England Property Care Files, 1962).
[34] Henley Woodworking Co., Inc. Invoice (Waltham, MA: Historic New England Property Care Files, 1969).

In 1983, as part of their preparations to take over the property from Gropiusôs aging wife, the Society for the Preservation of New England Antiquities (SPNEA) hired a resident overseer to care for the house.[35] He would live in the maidôs quarters and have ñminimal useò of the living room, and the screen porch would serve as his ñsummer ôliving roomôò.[36] His duties included general ñsecurity caretakingò.[37] The 1980s also saw the need for several small-scale repairs to interior features, such as the kitchen exhaust fan and the glass towel bar in the master bathroom.[38] In 1988 the Gropiusô daughter, Ati Johansen, argued that the linoleum floors in the kitchen and pantry needed to be glossier.[39] She repeated her request in 1991.[40] Problems plagued the basement throughout the 1990s, beginning in 1991 when a draft was observed in the area.[41] In 1992 mortar work was required in the crawl space, but it is unclear if the repairs were actually carried out.[42] In 1999 there was water on the basement floor, and it appeared to be connected with a damp chimney base.[43]

Figure 5: Living room, 1988
Historic New England Archives, Binder of Slides

[35] "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from L. M. S, April 08, 1983.
[36] Ibid.
[37] Ibid.
[38] ñThe Following are Site Visit Report Notes from May 2, 1986 Re: Gropius,ò (Waltham, MA: Historic New England Property Care Files, 1986), 3. "Gropius House List," Marla Sullivan to Peter Gittleman, Brock Jobe, Jim Moisson, Richard Nylander, Wizzie Redmond, Lynne Spencer, October 22, 1986, Massachusetts.
[39] "Gropius House: Recommendations for Plants, Lighting, Furnishing, and Object Maintenance," letter from Ati Johansen, October 5, 1988, Brooklyn, New York.
[40] Ati Johansen to Millie O'Connell, April 7, 1991, Brooklyn, New York.
[41] ñSociety for the Preservation of New England Antiquities Room-by-Room SWAT Evaluation,ò (Waltham, MA: Historic New England Property Care Files, 1991), 17.
[42] "Gropius Extermination," Millie O'Connell to Tess and Frank Thompson, January 29, 1992, Massachusetts.
[43] Marianne Zephir, ñRepair Request Form,ò (Waltham, MA: Historic New England Property Care Files, 1999).

Interventions

1999: Water on basement floor; appeared to be connected to damp base of chimney
1992: Mortar work needed in basement crawl space
1991: Ati Johansen recommended that linoleum floors in bathrooms and kitchen be kept shinier. Draft observed in basement.
1988: Johansen noted that linoleum floors were not glossy enough
1986: Kitchen exhaust fan motor not working. Installation of glass towel bar in master bathroom requested by Johansen.
1983: Resident overseer hired for property. He would live in maidôs quarters and have minimal use of living room; porch would serve as summer living room. Duties included general security caretaking.
1969: Counter furnished and installed in unspecified location
1962: Two new toilet seats purchased
1957: Spare parts for toilet hardware purchased
1947: Oak flexwood furnished, installed, and finished to replace damaged predecessor in unspecified location
1944: Gropius requested more oil from Rationing Board. Wrote that living room was boarded up in winter and family used an unspecified small room upstairs in its place. Each inhabitant took only one bath per week.

BIBLIOGRAPHY

Ati Johansen to Millie O'Connell. April 7, 1991. Brooklyn, New York.

Briggs Manufacturing Company Invoice. Waltham, MA: Historic New England Property Care Files, 1962.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

Buck, Susan L. *Gropius House Maid's Room and Bath: Lincoln, MA, Cross Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 2001.

Buck, Susan L. *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*. Report. Art History, University of Delaware. Newark, DE, 1997.

Buck, Susan L. *The Walter Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 1999.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

Conservation Plan: Architectural Glass and Acoustical Plaster. Report. Property Care, Historic New England. Report. Gropius House: Lincoln, MA. New York, NY: Jablonski Building Conservation, 2016.

Gilmore, Andrea M. *Gropius House, Lincoln, Massachusetts: Paint Study, Second Floor – Guest Bathroom*. Report. Waltham, MA: Society for the Preservation of New England Antiquities, 1987.

Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.

"Gropius Extermination." Millie O'Connell to Tess and Frank Thompson. January 29, 1992. Massachusetts.

"Gropius House List." Marla Sullivan to Peter Gittleman, Brock Jobe, Jim Moisson, Richard Nylander, Wizzie Redmond, Lynne Spencer. October 22, 1986.

"Gropius House: Recommendations for Plants, Lighting, Furnishing, and Object Maintenance." Letter from Ati Johansen. October 5, 1988. Brooklyn, New York.

"Gropius Interior Paint." Letter from Jeff Wallace. March 27, 2001. Massachusetts.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. 1937. MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library.

Gropius, Walter. "The Small House of To-day." The Architectural Forum, March 1931, 266-78.

Gropius, Walter. ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar]. *Bauhausverlag* (1923): 22-31.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

Henley Woodworking Co., Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1969.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Johansen, Ati. "Interview about the Use of the Second Floor Rooms in the Gropius House." Interview by Peter Gittleman. March 14, 1991.

Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997.

Neil H. Powell to Walter Gropius. February 6, 1947. Edwin L. Powell & Company, Boston, Massachusetts.

ñSociety for the Preservation of New England Antiquities Room-by-Room SWAT Evaluation,ò Waltham, MA: Historic New England Property Care Files, 1991.

"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from L. M. S. April 08, 1983.

Walter Gropius to Briggs Manufacturing Company. February 7, 1957. The Architects' Collaborative, Cambridge, Massachusetts.

Walter Gropius to Rationing Board. April 24, 1944. Gropius House, Lincoln, Massachusetts.

Zephir, Marianne. ñRepair Request Form.ò Waltham, MA: Historic New England Property Care Files, 1999.

GROPIUS HOUSE INTERIOR WALL AND CEILING FINISHES

Property Name: Gropius
Structure: Gropius House
Feature: Interior Wall and Ceiling Finishes
Original Material: Gypsum plaster; ¾ò x 3 ¾ò white pine clapboards; primer, two coats of oil paint, and a semi-gloss finish (including but not limited to Velumina Wallhide First Coater, lead and oil paint, And Benjamin Mooreôs Moresco); watercolor paint; linen wallpaper; Armstrong Stedman reinforced rubber tile, 5/16ò thick
Original Color: Off-whites, beiges, creams, pale yellow, grays, and red-brown according to various paint analyses
1965-1969 Material: Gypsum plaster; ¾ò x 3 ¾ò white pine clapboards; oil and Watercolor paints; linen wallpaper; Armstrong Stedman reinforced rubber tile, 5/16ò thick

RS ID #270481, 2016

1965-1969 Color: Off-white matched to Benjamin Moore Dove Wing (#960) in 2001; Pink matched to Benjamin Moore Love Story (#1213) in 1999; beiges matched to Benjamin Moore Berber White (#955) and Albany White (#944) in 2001; and light and medium grays matched to Benjamin Moore Silver Lake (#1598) and Englewood Cliffs (#1607) in 2000.

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

A balance must be struck between the retention of the original finishes and presenting them as a crisp modern house. The cascade effect on collections after the restoration of wall finishes must also be considered; if the walls look perfect, patina or finish issues on the objects will stand out. Overall, effort must be taken to keep the interior finishes of the Gropius House in good repair so that the simplicity and clean lines fundamental to their design are maintained. There has been much discussion over the color treatments in the house, and therefore paint studies should be carried out regularly at the site so that the features benefit from the latest technology. If successive analyses convincingly show that the paint generations previously thought to represent the interpretive period were actually a different color or are from a different era of the houseôs history, new color matches should be made and repainting should take place.

Maintenance and Repair Protocols:
There are many finishes within the Gropius House interior, so the following are broad guidelines for treatment:

- Finishes should be kept in good repair to match clean aesthetic of house. However, overall condition of all elements in space should be considered in discussions of treatment options. There is a cascade effect on collections after restoration of walls: if wall finishes look perfect, patina on objects will stand out.
- Treatment decisions for interior finishes will most likely always require interpretive review by preservation task force
- Treatment of acoustical plaster is detailed in separate section
- 1999-2001 paint analysis developed the current color palette for interior walls, but color matches should be compared and matched to actual appearance of surfaces

Original Construction and Evolution:
The original wall and ceiling finishes in the Gropius House varied, and their exact nature is unknown in some cases. Gropiusôs specifications called for galvanized, slit and expanded metal sheets of lathe with no ribs on all ceilings of both floors, the soffit of the main stair, and the walls of all the bathrooms.[2] Elsewhere the lathe was to be gypsum, and gypsum plaster was specified throughout the building.[3] Gropiusôs instructions indicated that the scratch coat should be applied firmly to the lathe before being covered with the brown coat, which should be left slack ñso as not to fatten upò.[4] The walls of the first floor hall, coat

---

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 39.
[3] Ibid., 40.
[4] Ibid., 40-41.

room, entrance vestibule, second floor hall, and sewing room would be finished with ¾ò x 3 ¾ò white pine clapboards.[5] Walls in the bathroom would be covered with 5/16ò Armstrong Stedman reinforced rubber tiles from the floors to a height of four feet, and above that they would be plaster finished with primer, a coat of Velumina Wallhide First Coater, and two coats of glossy finish.[6] Wallpaper was to be hung in the living room, dining room, study, maidôs room, and all the bedrooms. Benjamin Mooreôs Moresco was the brand of paint selected for the ceilings, along with white watercolor paint used as a tint.[7] All other plaster, metal, wood, and masonry surfaces were to be finished with primer, two coats of oil paint, and a semi-gloss finish.

It is clear that the specifications were not always followed during the actual construction of the house. For example, the living room, dining room, study, and the ceilings of the halls were all finished with a modern material called acoustical plaster, which is analyzed separately in this report.[8] In addition, ceramic tiles were used in place of the rubber ones specified for the bathrooms. The author of a 1939 article about the house writes that the master bedroom and at least one other room in the master suite were covered with a ñneutralò linen wallpaper.[9] Neither Gropiusôs wife Ise nor his daughter Ati Johansen ever mentioned wallpaper in these rooms, but they both described the walls as gray.[10] A 1977 invoice for the stripping of wallpaper from *two* bedrooms suggests that at least one other room listed in the specifications was originally finished with the material.[11] In her 2000 paint study Susan Buck asserted that the two bedrooms referenced in the invoice were the guest room and Atiôs room.[12] She also found traces of canvas wall coverings in all of the upstairs bedrooms and the parts of the central stair hall.[13]

There has been much dissension about the original colors of the paint used on the interior walls. Seven paint studies have been undertaken at the house since it was acquired by the Society for the Preservation of New England Antiquities (SPNEA), and the conservators involved found most of the paint generations to be different off-whites. However, the original shades of some rooms seem to have been more varied. For example, in 1987 Andrea Gilmore asserted that the second floor guest bathroom had originally been finished with a pale yellow calcimine paint.[14] The master bedroom and dressing room are even more complex; SPNEAôs 1986 study found that the wall coverings in the dressing room had been

---

[5] Ibid., 36.
[6] Ibid., 44.
[7] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 31. Gropius and Breuer, ñSpecifications,ò 45.
[8] Anthony, ñThe Massachusetts Home,ò 23.
[9] Ibid., 24.
[10] Ati Johansen, "Interview about the Use of the Second Floor Rooms in the Gropius House," interview by Peter Gittleman, March 14, 1991, 12. Gropius, ñGropius House,ò 11.
[11] Jerome T. Belcastro Invoice, (Boston, MA: Historic New England Archives, Family Papers, Section IV, 1977).
[12] Susan L. Buck, *Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 2000), 22 and 26.
[13] Ibid., 2.
[14] Andrea M. Gilmore, *Gropius House, Lincoln, Massachusetts: Paint Study, Second Floor - Guest Bathroom*, report (Waltham, MA: Society for the Preservation of New England Antiquities, 1987), 1.

beige at first, which contradicts Johansenôs statement that they were gray.[15] Buck offered yet another opinion in 1997 and 2000, when she argued that the original color of the wall canvas was a dark red-brown.[16] Finally, in 1999 Buck found that the kitchen ceiling had been a light pink matching Benjamin Mooreôs Love Story (#1213), and in 2001 she asserted that the maidôs room and bathroom were pale beiges similar to Benjamin Moore Berber White (#955) and Albany White (#944).[17]

Figure 1: Mrs. Gropiusôs dressing room used to be dark, undated
Historic New England Archives, Binder of Slides

There is debate over the original types of paint used as well. In the 1986 study mostly calcimine paints were identified, but later paint studies all tend to suggest that the original type was oil.[18] One notable exception to this rule was in a 2001 study of the wooden elements in the maidôs room, where the earliest layers of paint were identified as latex-based.[19] In addition, Gilmore wrote in 1987 that the window sill and sash of the guest bathroom were lead and oil based, respectively.[20]

---

[15] Sara B. Chase and Kathryn M. Carey, *Gropius House Paint Study*, report (Waltham, MA: Society for the Preservation of New England Antiquities, 1986), 8.
[16] Susan L. Buck, *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*, report, Art History, University of Delaware (Newark, DE, 1997), 33-34. Buck, *Gropius House*, 18.
[17] Susan L. Buck, *The Walter Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 1999), 5. Susan L. Buck, *Gropius House Maid's Room and Bath: Lincoln, MA Cross Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 2001), 13.
[18] Chase and Carey, *Paint Study*. Buck, *Walter Gropius House*. Buck, *Gropius House*. Buck, *Maid's Room and Bath*.
[19] Buck, *Maid's Room and Bath*, 3.
[20] Gilmore, *Paint Study*, 1.

Evidence from the paint analyses and historical documents both suggest that several repainting projects were undertaken on the interior of the house before the interpretive period. Repainting was proposed in 1955 and carried out in 1960 and 1967.[21] The documents do not offer any details about the paint types or colors used, but from the analyses it seems likely that the only shades significantly altered by the late 1960s were those in the master bedroom and dressing room. In these spaces the original dark brown-red was changed to medium gray walls matching Benjamin Mooreês Silver Lake (#1598), with light gray ceilings and trim matching Benjamin Mooreês Englewood Cliffs (#1607).[22] According to the results of the 1986 study, the type of paint used in the master bathroom may have shifted to aluminum during this time.[23]

Character-Defining Traits in the Interpretive Period:
While the exact color or colors of the walls has been debated for decades, it is likely that most of the interior was some shade of white during the interpretive period. In 2001, Benjamin Mooreês Dove Wing (#960) was found to be a good representative of the overall wall color in the late 1960s.[24] The simplicity and plainness of white reflects Gropiusês Bauhaus philosophy that homes should be ñfreed from unnecessary ornaments and meaningless trashò.[25]

Some of the more unique wall and ceiling finishes in the house are indicative of Gropiusês design intentions in other ways. For example, the gray color scheme of his own bedroom may have been a reflection of his own taste and the fact that he was a famously light sleeper; Johansen said that he kept the master bedroom ñquite darkò in both color and light, and that his ñpersonal palette was brown and grayò.[26] The pine clapboards in the entry hall is another distinctive wall finish of the Gropius House. The boards are evidence of Gropiusês attention to materials used in traditional New England houses, while their innovative location and installation reflects his experimental style.[27]

History of Conservation and Maintenance Practices:
The first written record of work on the interior finishes is from 1947, when unidentified plaster ceilings were damaged by leaks in the roof.[28] The leaks were eventually repaired, but whether work was carried out on the ceilings is unclear.[29] In 1955 Gropius requested a quote for the painting of the maidês room and bathroom, the stair hall, the window sills in the study, the windows and dado in the living room, the woodwork and plaster in the

[21] Howard E. Constance to Walter Gropius. April 11, 1955. Custance Brothers, Inc., Lexington, Massachusetts. Walter Gropius to John H. Kennedy, August 8, 1960, Massachusetts. A. Belanger & Sons Invoice, (Waltham, MA: Historic New England Property Care Files, 1967).
[22] Buck, *Gropius House*, 18.
[23] Chase and Carey, *Paint Study*, 10.
[24] "Gropius Interior Paint," letter from Jeff Wallace, March 27, 2001, Massachusetts.
[25] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 271.
[26] Johansen, ñUse of Second Floor Rooms," 12.
[27] Walter Gropius, ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar], *Bauhausverlag* (1923): 23.
[28] Walter Gropius to H.L. Foote, April 10, 1947, Massachusetts.
[29] H. L. Foote to Walter Gropius, April 26, 1947, The Barrett Division, Malden, Massachusetts.

kitchen, the master bathroom ceiling and plaster walls, the windows in the guest rooms, the guest bathroom, and the dressing room windows, as well as touch-ups to the dressing room walls.[30] The planning of such a significant project reflects a major need for painting inside the house at the time, but Gropius turned down the proposal because it the price was too high.[31]

It is possible that these areas of the house were addressed in 1960, when Gropius mentioned some interior repainting jobs in a letter addressed to a contractor who had been hired mainly to paint the houseôs exterior.[32] Some interior rooms were also painted after a roof repair in 1967, but no further details about the work is available.[33] The master bedroom and dressing room, the kitchen, and the maidôs bedroom and bathroom are those most likely to have been a part of these 1960s repainting projects, because the paint changes that occurred in these spaces were more complex or more numerous than they were in the rest of the house.[34]

In the 1970s more work took place on the interior finishes, but little detail about the projects is available. In 1972 an interior ceiling was scraped, sanded, washed and painted, but it is unclear where it was located.[35] One year later the guest room ceiling was scraped, washed, patched, sanded, primed and painted, and the ceiling and window of the maidôs room and an unidentified railing were also repainted.[36] In 1974 rain had damaged an area of the foyer, which was subsequently scraped, primed, and painted.[37] In 1976 further paint work was carried out, but it is unclear whether the interior or exterior surfaces were involved.[38] An invoice from the following year indicates that two bedrooms were stripped of wallpaper.[39] While the exact rooms were not identified in the document, Buckôs 2000 paint study suggested that the two spaces in question were the guest room and Atiôs room.[40] Further work was carried out on unspecified interior finishes at the same time, including the washing of calcimine from a ceiling, the sanding of the walls and woodwork, the spackling of cracks, and the painting of ceilings, walls and woodwork.[41] Again, the kitchen and the maidôs bedroom and bathroom are likely to have been a part of this project because they have been so frequently repainted.

In 1980 white paint was purchased for unspecified interior work, and the first major painting project undertaken by SPNEA was carried out in 1986. It included a paint study, which found that the trim and wall color of Atiôs room, the guest room, the living room,

---

[30] Howard E. Custance to Walter Gropius, April 11, 1955, Custance Brothers, Inc., Lexington, Massachusetts.
[31] Walter Gropius to Howard E. Custance, April 20, 1955, Massachusetts.
[32] Walter Gropius to John H. Kennedy, April 18, 1960, Massachusetts.
[33] A. Belanger & Sons Invoice.
[34] Buck, *Interior and Exterior Aesthetic*, 34-35. Buck, *Maid's Room and Bath*, 12.
[35] Haki Zaganjori Invoice, (Boston, MA: Historic New England Archives, family papers, section IV, 1977).
[36] Haki Zaganjori Invoice, (Waltham, MA: Historic New England Property Care Files, 1973).
[37] Jerome T. Belcastro Invoice, (Waltham, MA: Historic New England Property Care Files, 1974).
[38] Jerome T. Belcastro Invoice, (Waltham, MA: Historic New England Property Care Files, 1976).
[39] Jerome T. Belcastro Invoice, (Waltham, MA: Historic New England Property Care Files, 1977).
[40] Buck, *Gropius House*, 22 and 26.
[41] Jerome T. Belcastro Invoice, 1977.

and the upstairs hallway had always been calcimine paints in varying shades of off white.[42] In contrast, the conservators identified browns and beiges in the master bedroom and blues and grays in the dressing room, and later aluminum paints on the trim of the master bathroom.[43] With the results of the paint analysis in mind, the repair of the detached wallpaper in the master bedroom and all damaged gypsum plaster ceilings and walls was carried out in preparation for repainting *(Figure 2)*.[44] Painted areas included the upstairs rooms as well as the stair hall, the walls and ceilings of the pantry, all areas of the living room, dining room, and study that were not finished with acoustical plaster, the interior sashes, and all surfaces of the maidôs quarters and the kitchen.[45] In the same year moisture problems caused several issues with the interior finishes, including the development of a residue above the fireplace in the living room.[46] In addition, the peeling of the new paint applied in the maidôs bathroom was attributed to moisture resulting from the spaceôs poor ventilation.[47]

Figure 2: Interior plaster damage near window, 1985
Historic New England, Property Care Binders

In 1987 a paint analysis was carried out in the second floor guest bathroom. It found that the walls had originally been finished with a pale yellow calcimine paint, followed by

[42] Chase and Carey, *Paint Study*, 15-20.
[43] Ibid., 3-8, 11-14, and 10.
[44] Society for the Preservation of New England Antiquities Conservation Center Invoice, (Waltham, MA: Historic New England Property Care Files, 1986). *Gropius House Completion Report: Window Reinstallation*, report (MA: Society for the Preservation of New England Antiquities, 1986).
[45] Peter J. Connolly Invoice, (Waltham, MA: Historic New England Property Care Files, 1986).
[46] "Gropius House," Peggy Burke to Jim Moisson, October 3, 1986, Massachusetts.
[47] "Gropius House Maid's Bathroom," James Moisson to Thom Lingel, December 22, 1986, Massachusetts.

different off-whites.[48] Despite all of the recent work on the interior finishes, many issues with the features were noted that year. Paint was peeling on both floors of the stair hall and around the door jamb of the second floor guest bathroom, and it was bubbling around the windows in the dressing room.[49] There was also fungus around the windows in the master bedroom, a leak in the kitchen ceiling near the window, and holes in the plaster walls.[50] Similar problems continued in 1988, such as rainwater leaks in the maidôs room and the east kitchen, and plaster damage from window leaks in the master bedroom and the maidôs room.[51] Another paint analysis and repainting was proposed the same year, but there is no evidence that the work was carried out.[52] In 1990 Atiôs room needed to be repainted because a furnace ñpuff-backò had stained a wall, and the painting of the second floor guest bathroom was also requested in order to restore it to its ñcorrectò color.[53] Plaster repairs were also completed, but no further details on their nature or location are available.[54]

In 1991 Johansen suggested that the interior be repainted, because she found the current variation in whites to be ñtotally at variance with the policy of [her] parentsò.[55] She said that if the white wall color were to have any tone it should be slightly warm, and that ñone color white was used throughout the house as a matter of design principleò.[56] There were also other issues with the interior finishes, including peeling paint on a wall of the guest room and the continued presence of the puff-back stains in Atiôs bedroom.[57] Plaster was also damaged in the maidôs bathroom due to moisture, but it was repaired along with other plaster issues later in the year.[58]

By 1993 the puff-back wall in Atiôs room had still not been repainted, paint on the walls in the master bathroom and the guest room continued to peel, and the second floor guest bathroom still needed to be restored to its correct color.[59] Paint was also peeling on the

---

[48] Gilmore, *Paint Study*, 2.
[49] "Gropius House," Christina O'Sullivan to Rob Kret, September 21, 1987, Gropius House, Lincoln, Massachusetts. Untitled note, (Waltham, MA: Historic New England Property Care Files, 1987), 1 and 3.
[50] Untitled note, (Waltham, MA: Historic New England Property Care Files, 1987), 3 and 4. "Gropius House," Christina O'Sullivan to Nick Langhart, April 06, 1987, Gropius House, Lincoln, Massachusetts.
[51] ñQuarterly Report and Conditions,ò (Waltham, MA: Historic New England Property Care Files, 1988), 3, 7, and 11.
[52] "Gropius House Campaign Budget," Peggy Burke to Nancy Coolidge, Ellen Garbarino, Peter Gittleman, Brock Jobe, Arvin Murch, Cheryl Peterson, Elizabeth Redmond, and Gay Wagner, March 17, 1988, Massachusetts.
[53] "Completion of the Gropius House Restoration," Peter Gittleman to Millie, Frank, Lisa, July 06, 1990, Massachusetts.
[54] ñMuseums Department Purchase Orders 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).
[55] Ati Johansen to Millie, April 07, 1991, Brooklyn, New York.
[56] Ati Johansen, "Room-by-Room Discussion and Refurbishment," interview by Peter Gittleman, March 13, 1991, 26. Johansen to Millie.
[57] ñSociety for the Preservation of New England Antiquities Room-by-Room SWAT Evaluation,ò (Waltham, MA: Historic New England Property Care Files, 1991), 6. "Gropius SWAT - Summary," Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard, Frank, Joe, Millie, Kathy Francis, Peter Gittleman, March 1, 1991, Massachusetts, 2.
[58] Society for the Preservation of New England Antiquities Interdepartmental Invoice, (Waltham, MA: Historic New England Property Care Files, 1991).
[59] Peter Gittleman, ñGropius Needs List,ò (Waltham, MA: Historic New England Property Care Files, 1993).

ceiling of the master suite, but whether it was in the dressing room or the bedroom is unclear.[60] In 1994 several necessary repairs were executed, including the painting of the puff back wall in Atiôs room, the scraping of peeling paint in the kitchen, and plaster repair and repainting in the guest and maidôs bathrooms.[61] After this work was completed, the crew claimed that the paint analyses had been incorrect and that the colors should be reexamined.[62] In addition, paint was still peeling on the vertical clapboards in the upper stair hall.[63]

Figure 3: Damaged plaster and paint in bathroom, circa 1990s
Historic New England, Property Care Binders

The requested reexamination of historical colors took place in 1997, carried out by Buck. Specifically, the woodwork in the living room, dining room, and study was analyzed along with the walls of the stair hall, first floor bathroom, dressing room, and master bedroom. The results were similar to previous studies, with the additional discovery of a silver color applied to the inner surrounds of the dining room doors.[64] Buck asserted that the purpose of this paint was to ñmake the edges of the door frame visually recede, so that the door and door frame blend very smoothly with the white textured wallò of the dining room.[65] In

[60] Ibid.
[61] *Gropius House, 1994 Work Report: Paint Crew*, report (MA: Society for the Preservation of New England Antiquities, 1994).
[62] Ibid.
[63] ñGropius House Notes,ò (Waltham, MA: Historic New England Property Care Files, 1994).
[64] Buck, *Interior and Exterior Aesthetic*, 21.
[65] Ibid.

addition, the original color of the master bedroom and dressing room walls was defined with more precision as a deep red-brown.[66]

In 1999 Buck carried out a paint study in the kitchen. Results showed that the room had been painted more often than most others, and that the ceiling had always been a pale pink matching Benjamin Mooreÿs Love Story (#1213).[67] In this room the inner door surrounds had been painted with the same silver color as the dining room doorway.[68] Buck also found that the walls had always been an off-white color similar to Benjamin Mooreÿs Dove Wing.[69] A 2001 memo says that the kitchen was repainted with Dove Wing in the 1990s, so it is possible that this work took place immediately after the 1999 paint analysis.[70]

Buck conducted more paint studies in 2000 and 2001 as part of a Save Americaÿs Treasures grant project, and her findings were similar to those that resulted from the 1997 analysis.[71] An additional, more focused analysis of the maidÿs room and bathroom found that the spaces had always been shades of beige matching Benjamin Mooreÿs Berber White (#955) and Albany White (#944).[72] In all of her work at the Gropius House, Buck tended to find that the paints were mostly oil.[73] Several interior spaces, including Atiÿs room and the guest room, were repainted with the off-whites that were found in the more comprehensive paint study.[74] However, Johansenÿs reaction to their variation and shading was very negative.[75] For this reason the house was repainted again with only one white in order to ñreflect the Bauhaus ethicò.[76] The chosen color was Benjamin Mooreÿs Dove Wing, which was similar to the houseÿs exterior shade.[77] It was acceptable in reference to both the paint analysis and to Johansen.[78] The interior woodwork had to be scraped and repainted during the same project due to the failing early latex primer that Gropius had used.[79]

One of the final documents possibly relevant to the interior finishes is a 2002 invoice for the purchase of plaster and paint, but it is unclear whether the materials were used on the interior or exterior.[80] Photographs also show staining in the maidÿs bathroom. There is a crack in the tile of the master bathroom which should be monitored.

---

[66] Ibid., 33.
[67] Buck, *Walter Gropius House*, 5.
[68] Ibid., 9.
[69] Ibid., 11.
[70] Wallace, "Gropius Interior Paint.ò
[71] Buck, *Gropius House*.
[72] Buck, *Maid's Room and Bath*, 13 and 14.
[73] Buck, *Walter Gropius House*. Buck, *Gropius House*. Buck, *Maid's Room and Bath*.
[74] Ati Gropius Johansen, "Ati Gropius Johansen and Peter Gittleman," interview by Peter Gittleman, March 2, 2001, 1. Before Johansen rejected the varying off-whites, they were matched with Benjamin Moore colors: Buck, *Gropius House*, 35.
[75] Johansen, ñJohansen and Gittleman,ò 1.
[76] Wallace, "Gropius Interior Paint.ò
[77] Jeff Wallace, "Gropius Interior Paint," e-mail to Zana Wolf, March 27, 2001.
[78] Ibid.
[79] *Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002), 2-3.
[80] Phillips Fine Paint & Wallcoverings, Inc. Invoice, (Waltham, MA: Historic New England Property Care

Figure 4: Stained bathroom walls, 2009
RS ID #56596

Files, 2003).

Interventions

2003: Paint and plaster purchased; unclear if used on interior or exterior

2001: Paint analysis carried out in maidôs room and bathroom. Interior repainted with Benjamin Mooreôs Dove Wing (#960) after previously chosen off-whites rejected by Ati Johansen. Paint on woodwork failing due to early latex primer; scraped and repainted.

2000: Paint analysis carried out throughout house. Some interiors repainted, including Atiôs bedroom and guest room.

1999: Paint analysis carried out in kitchen

1994: Project included painting of the puff-back wall in Atiôs bedroom as well as areas where paint peeled in kitchen, and repair of damaged plaster in maid and second floor guest bathrooms. Guest bathroom was restored to correct color. Paint crew noted that all colors should be reexamined and better identified. Paint still peeling on vertical clapboards in upper hall.

1993: Puff-back wall in Atiôs room still needed to be repainted. Paint peeling in master bedroom and guest room. Second floor guest bathroom was still wrong color.

1991: Plaster damage in first floor bathroom repaired. Paint peeling in guest room. Puff-back wall in Atiôs still room needed to be repainted. Johansen said that variation in off-whites throughout house was wrong, and that the interiors should be uniform white. She added that the white should be warmer rather than cooler.

1990: Puff-back wall needed to be repainted in Atiôs room. Second floor guest bathroom needed to be restored to correct color. Plaster repair completed; no details available.

1988: Paint analysis and restoration to interpretive period suggested. Rainwater leaks causing damage to plaster above window in maidôs room and east kitchen window.

1987: Paint analysis carried out in second floor guest bathroom. Problems included peeling paint on both floors of stair hall and around door jamb of second floor guest bathroom, bubbling paint around windows in dressing room, fungus around windows in master bedroom, ceiling leak near kitchen window, and holes in walls.

1986: Paint analysis carried out and used in interior repainting that started with patching of all damaged gypsum plaster ceilings and walls. Detached canvas wallpaper in master bedroom replaced with vinyl material. Within the year the new paint in maidôs bathroom started peeling due to lack of ventilation. Residue reported above fireplace, suggesting moisture problems.

1980: White paint purchased for interior work

1977: Two bedrooms stripped of wallpaper, and work carried out in unspecified rooms included washing of calcimine on ceiling, sanding of walls and woodwork, spackling of cracks, and painting of ceiling, walls and woodwork.

1976: Painting carried out. Likely interior, but no details given.

1974: Rain-damaged foyer scraped, primed and painted

1973: Guest room ceiling work included removal of paint and scraping to bare plaster, washing and patching of cracks, and sanding, priming and painting. Maidôs room ceiling and window repainted. Railing stripped of paint and repainted.

1972: Old paint scraped off unspecified interior ceiling, which was then sanded, washed and painted

1968: Unspecified interior rooms painted

1960: Paint work completed; no details available

1955: Interior painting work proposed and turned down by Gropius
1947: Unspecified plaster ceilings damaged due to roof issues

BIBLIOGRAPHY

A. Belanger & Sons Invoice. Waltham, MA: Historic New England Property Care Files, 1967.

Ati Johansen to Millie. April 07, 1991. Brooklyn, New York.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

Buck, Susan L. *Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 2000.

Buck, Susan L. *Gropius House Maid's Room and Bath: Lincoln, MA, Cross Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 2001.

Buck, Susan. "Material Evolution of the Gropius House: Planning to Preserve a Modern Masterpiece." *The Association for Preservation Technology International Bulletin*, 4th ser., 28 (1997): 65-68.

Buck, Susan L. *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*. Report. Art History, University of Delaware. Newark, DE, 1997.

Buck, Susan L. *The Walter Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 1999.

Chase, Sara B., and Kathryn M. Carey. *Gropius House Paint Study*. Report. Waltham, MA: Society for the Preservation of New England Antiquities, 1986.

"Completion of the Gropius House Restoration." Peter Gittleman to Millie, Frank, Lisa. July 06, 1990. Massachusetts.

Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2002.

Gilmore, Andrea M. *Gropius House, Lincoln, Massachusetts: Paint Study, Second Floor – Guest Bathroom*. Report. Waltham, MA: Society for the Preservation of New England Antiquities, 1987.

Gittleman, Peter. ñGropius Needs List.ò Waltham, MA: Historic New England Property Care Files, 1993.

Gropius, Walter. "The Small House of To-day." The Architectural Forum, March 1931, 266-78.

Gropius, Walter. ñThe Theory and Organization of the Bauhausò [Idee und Aufbau des Staatlichen Bauhauses Weimar]. *Bauhausverlag* (1923): 22-31.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

"Gropius House." Christina O'Sullivan to Nick Langhart. April 06, 1987. Gropius House, Lincoln, Massachusetts.

"Gropius House." Christina O'Sullivan to Rob Kret. September 21, 1987. Gropius House, Lincoln, Massachusetts.

"Gropius House." Peggy Burke to Jim Moisson. October 3, 1986. Massachusetts.

Gropius House, 1994 Work Report: Paint Crew. Report. MA: Society for the Preservation of New England Antiquities, 1994.

"Gropius House Campaign Budget." Peggy Burke to Nancy Coolidge, Ellen Garbarino, Peter Gittleman, Brock Jobe, Arvin Murch, Cheryl Peterson, Elizabeth Redmond, and Gay Wagner. March 17, 1988. Massachusetts.

Gropius House Completion Report: Window Reinstallation. Report. MA: Society for the Preservation of New England Antiquities, 1986.

"Gropius House Maid's Bathroom." James Moisson to Thom Lingel. December 22, 1986. Massachusetts.

ñGropius House Notes.ò Waltham, MA: Historic New England Property Care Files, 1994.

"Gropius Interior Paint." Letter from Jeff Wallace. March 27, 2001. Massachusetts.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius Johansen, Ati. "Ati Gropius Johansen and Peter Gittleman." Interview by Peter Gittleman. March 2, 2001.

"Gropius SWAT - Summary." Nancy Carlisle to Nancy Coolidge, Tess, Marty, Richard,
Frank, Joe, Millie, Kathy Francis, Peter Gittleman. March 1, 1991. Massachusetts.

Haki Zaganjori Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV, 1977.

Haki Zaganjori Invoice. Waltham, MA: Historic New England Property Care Files, 1973.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

H. L. Foote to Walter Gropius. April 26, 1947. The Barrett Division, Malden, Massachusetts.

Howard E. Constance to Walter Gropius. April 11, 1955. Custance Brothers, Inc., Lexington, Massachusetts.

Jerome T. Belcastro Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV, 1977.

Jerome T. Belcastro Invoice. Waltham, MA: Historic New England Property Care Files, 1974.

Jerome T. Belcastro Invoice. Waltham, MA: Historic New England Property Care Files, 1976.

Jerome T. Belcastro Invoice. Waltham, MA: Historic New England Property Care Files, 1977.

Johansen, Ati. "Interview about the Use of the Second Floor Rooms in the Gropius House." Interview by Peter Gittleman. March 14, 1991.

Johansen, Ati. "Room-by-Room Discussion and Refurbishment." Interview by Peter Gittleman. March 13, 1991.

ñMuseums Department Purchase Orders 1990.ò Waltham, MA: Historic New England Property Care Files, 1990.

Peter J. Connolly. Waltham, MA: Historic New England Property Care Files, 1986.

ñQuarterly Report and Conditions,ò Waltham, MA: Historic New England Property Care Files, 1988.

Society for the Preservation of New England Antiquities Conservation Center Invoice Waltham, MA: Historic New England Property Care Files, 1986.
Society for the Preservation of New England Antiquities Interdepartmental Invoice. Waltham, MA: Historic New England Property Care Files, 1991.
ñSociety for the Preservation of New England Antiquities Room-by-Room SWAT Evaluation,ò Waltham, MA: Historic New England Property Care Files, 1991.
Untitled note. Waltham, MA: Historic New England Property Care Files, 1987.
Wallace, Jeff. "Gropius Interior Paint." E-mail to Zana Wolf. March 27, 2001.
Walter Gropius to H.L. Foote. April 10, 1947. Massachusetts.
Walter Gropius to Howard E. Custance. April 20, 1955. Massachusetts.
Walter Gropius to John H. Kennedy. August 8, 1960. Massachusetts.
Walter Gropius to John H. Kennedy. April 18, 1960. Massachusetts.

GROPIUS HOUSE ACOUSTICAL PLASTER

Property Name: Gropius **Structure:** Gropius House **Feature:** Acoustical Plaster **Original Material:** Acoustical plaster **Original Color:** Grayish white **1965-1969 Material:** Acoustical plaster **1965-1969 Color:** Unknown; likely grayish white	 RS ID #270587, 2016

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

The state of the acoustical plaster during the interpretative period cannot be gleaned with precision from historic photographs, which are mostly undated and mediocre in quality. Other forms of evidence are conflicting. While the Gropiusô daughter Ati Johansen claims that the walls were a crisp, uniform white throughout her parentsô ownership of the building, an article written about the house soon after its construction says that the acoustical plaster was its ñnaturalò ñgrayishò color in 1939.[2] This contradiction may be explained by a ñówashô of white paintò found on the plaster during a paint study in 1997; it is possible that the material has been both white and gray at different periods of the houseôs history.[3] However, it is unclear when and why the white wash was applied to the walls.

It is likely that the white wash was used in order to bring the grayish plaster to a whiter color that matched most of the houseôs other wall finishes. However, a 1997 study found

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated in 2016.
[2] Ati Johansen, "Room-by-Room Discussion of Refurbishment," interview by Peter Gittleman, March 13, 1991, 26. Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 23. According to Anthony, the reason that the plaster was unpainted was to prevent scarring in the case of chips or scratches.
[3] Susan L. Buck, *Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*, report (Newton Centre, MA: Historic Paint and Architectural Services, 2000), 8. While the wash is called ñpaintò in Buckôs report, Jablonski Building Conservation, Inc. found it to be limewash in 2016 (*Conservation Plan: Architectural Glass and Acoustical Plaster*, report, Property Care, Historic New England, Report, Gropius House: Lincoln, MA [New York, NY: Jablonski Building Conservation, 2016], 29).

that the white wash had ña mottled grayish appearance which comes from both the depressions in the course plaster and the plaster additives such as vermiculite and wood fibersò.[4] This suggests that the wash, while white, always appeared somewhat gray. In this case, it is possible that Gropius used the material to bring the plaster back to its original cleaner appearance after years of use inevitably coated it in dust and grime. The Gropiuses smoked indoors and used heating techniques that would have soiled the walls, and an appropriate cleaning solution for the plaster has been difficult to determine even with the benefits of modern science.[5]

Whether or not Gropius intended the paint to give the walls the brilliant look that Johansen described, the smoke, soot, regular wear, graying effect of the plasterôs texture, and lack of an ideal cleaning solution makes it unlikely that the plaster had such a bright white appearance by the late 1960s. However, increased use and the passing of time has also almost certainly dirtied the material and darkened its color since the interpretive period. Thus, the plaster should be sprayed with a thin layer of limewash to give it a clean, grayish look.

[4] Susan L. Buck, *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*, report, Art History, University of Delaware (1997), 17.
[5] Jablonski, *Conservation Plan*, 27.

Maintenance and Repair Protocols:
Last updated 2016

<u>Acoustical Plaster</u>

- The plaster ñhas a lime-based binder with aggregate composed of a medium-grained pumice and minor crushed marble constituentò and ña soft and moderately friable material with a textured surface created by the presence of large, interstitial air voidsò.[6]
- Damaged or missing plaster should be replaced in kind with special emphasis on matching texture to surrounding material

<u>Limewash Finish</u>

- Limewash spray appears to be an appropriate finish for the acoustical plaster[7]
- Final approach still requires internal review. Although limewash finish appears to be appropriate, levels of restoration still require study. A second round of testing was recommended by preservation task force in 2016, possibly to be carried out next to the mobile in the living room. Issues that need to be considered include:
    - Exact level of grayness and dirtiness in late 1960s is unclear, but *consistent* grayish white that looks *clean* is desirable
    - There is a cascade effect on collections after restoration of wall finishes; if wall finishes look perfect, patina or finish issues with objects will stand out
- This recommended repair protocol will add moisture to the space, which may have short term impacts on overall relative humidity. Environmental monitoring should take place throughout such a project and any anomalies noted. In order to safely perform work, close coordination with Collections team for temporary removal and storage of objects is required.

  <u>Mixture</u>
    - Limewash should consist of ñthree parts S hydrated lime to eight parts aqueous acrylic solution (Acryl 60 diluted 1:10 with water).ò[8]
    - Mix thoroughly and frequently; and pass through #30 sieve after first mixing in order to remove any large lime particles[9]
    - Natural, light stable pigments may be used to obtain desired color[10]
    - Tinted preparations should be tested in an unobtrusive area to confirm desired color
    - Careful documentation of precise amounts of pigment should be documented in order to consistently develop same color solution

---

[6] Jablonski, *Conservation Plan*, 28 and 29.
[7] Jablonski, *Conservation Plan*, 51.
[8] Ibid., 51.
[9] Ibid., 51-52.
[10] Ibid., 52.

Application

- Plan work so as to complete all contiguous areas (i.e., continuous wall planes) using same prepared batch working continuously without stoppage
- Moisten plaster and pat dry before application of limewash[11]
- Apply wash with HVLP (high volume low pressure) spray equipment, or similar product that produces a fine mist[12]
- Limewash should be regularly stirred or agitated, as lime particles will quickly fall out of suspension
- Care should be taken to minimize number of passes, overlap or coats applied
- Use as few coats as possible. Two is likely enough, but testing should be carried out in order to confirm.[13]
- Do not allow limewash to dry prematurely. If necessary, spray with water or cover with damp cloth.[14]
- Remove test patches with water or white vinegar-dampened sponge before applying final coat in order to avoid an opaque appearance[15]
- Spot-coat darker stains with limewash applied by small artistôs brush[16]

- Maintenance protocol
  - Once the walls have been treated with desired whitewash application, maintenance requirements should be minimal
  - Avoid rubbing or abrading surface in order to remove any spot staining, as this will likely remove applied limewash and possibly the substrate and results of such a cleaning attempt are not likely to be visibly noticeable
  - Areas that require cleaning should be monitored over time
  - It is likely that the ñmaintenanceò will require a re-coating of the entire wall plane

Original Construction and Evolution:

The use of acoustical plaster in the living room, dining room, study, and the ceilings of the halls appears to have been a later change in the design process. The addendum to the specifications for the Gropius House indicates that gypsum plaster was originally intended to be applied to all of the walls on the first floor except for those of the bathroom and entry hall.[17] In reality, however, the more modern material was sprayed directly onto a rough coat of plaster and then ñôknocked downô using a broad float or similar toolò.[18] After a 2016 analysis, Jablonski Building Conservation, Inc. (JBC) described the plaster as ña lime-based mixture with aggregate composed of a medium-grained pumice and minor crushed marble constituentò and ña soft and moderately friable material with a textured surface created by the presence of large, interstitial air voidsò.[19] Cellulose and salts were

[11] Ibid., 52.
[12] Ibid.
[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 40.
[18] Jablonski, *Conservation Plan,* 29.
[19] Jablonski, *Conservation Plan*, 28 and 29.

found in the material, and there appeared to be remnants of a lime paste or limewash on its surface.[20]

Character-Defining Traits in the Interpretive Period:
Between 1965 and 1969 much of the acoustical plasterôs significance still lay in the reasoning behind Gropiusôs choice to use it in his home. It was a short-lived product; it was developed in the early twentieth century, and Gropiusôs wife Ise wrote in 1977 that it was no longer available.[21] For this reason it is unsurprising that Gropius chose it for a wall covering, since he was interested in trying innovative products that were industrial and readily-available.[22] The fact that these are defining values in the Bauhaus movement makes the acoustical plaster a very important feature in the Gropius House.

The condition of the plaster during the interpretive period is harder to define. Johansen repeatedly stressed that the walls of the house were ñone white throughoutò and that ñif the thing doesnôt shine, there is something really wrongò.[23] However, Iseôs claim that the plaster was ñwhite or beigeò contradicts Atiôs statement. Even more significant is the fact that a 1939 article on the house calls the ñnatural colorò of the substance ñfaintly grayish.ò[24] Regardless of the original color of the material, historic documents make it clear that keeping it clean was always a challenge. Gropius himself had the plaster washed as early as 1946, less than ten years after its application.[25] Decades later in 1997, a conservator noted a layer of soiling on its surface.[26] While photographs of the interior are not clear enough to confidently determine the state of the acoustical plaster between 1965 and 1969, it seems likely that it was not perfectly clean at the time. The Gropiuses used an oil-fired heating system and a wood-burning fireplace, and they also smoked indoors.[27] In addition, there is no record of an attempt to clean the plaster after 1946. However, its role as an indicator of Gropiusôs interest in innovative industrial materials for use in domestic settings would certainly still have been significant.

History of Conservation and Maintenance Practices:
Few records of work on the acoustical plaster are available for the years before the mid-1980s. As previously stated, acoustical plaster was sprayed onto a rough plaster surface in the living room, dining room, and hall study where gypsum plaster had originally been specified. In 1945, a to-do list included the cleaning of the walls and ceilings in the living room and the study.[28] An invoice from the following year confirms that this work was completed, but there are no details available concerning the method of cleaning.[29] In 1983

---

[20] Ibid.
[21] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 8.
[22] Gropius, ñGropius House,ò 5.
[23] Johansen, "Discussion of Refurbishment," 2.
[24] Brown Anthony, "The Massachusetts Home,ò 4.
[25] California Stucco Products of New England, Inc. Invoice, (Boston, MA: Historic New England Archives, 1946).
[26] Buck, *Interior and Exterior Aesthetic*, 23.
[27] Jablonski, *Conservation Plan*, 27.
[28] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[29] California, 1946.

an increasingly large area of moisture damage appeared at an unspecified location on the living room ceiling, possibly due to inconsistency in shoveling of the porch roof over the winter.[30] No information is available to explain how this issue was resolved. In 1987 further staining of the ceiling was reported above the west window.[31]

Figure 2: Living room west elevation, undated
Historic New England Archives, Binder of Slides

Between 1986 and 1988, several methods of cleaning the plaster were tested and carried out. Before December 1987, Society for the Preservation of New England Antiquities (SPNEA) staff were under the impression that the material was stucco, since they knew it was purchased from the same company that supplied Gropius with the stucco used on the ceilings of the porch and the marquee.[32] In 1986, two applications of a spray-on product called Ceil-Clean were used on the ñstuccoò.[33] Bleach and other more abrasive cleaners were also tested, but Ceil-Clean proved to provide the best balance between effectiveness and gentleness.[34] It is made up of a mixture of isopropyl alcohol, cleaners, an activator, and potassium hydroxide.[35] The cleaning was relatively successful, but it did not remove lime/cement leech or the most intense soot and water stains.[36]

---

[30] "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from L. M. S, April 08, 1983.
[31] "Gropius House," Christina O'Sullivan to Rob Kret, September 21, 1987, Gropius House, Lincoln, Massachusetts.
[32] "Rob's Meeting with Siliano," letter to Peggy Burke, December 23, 1987.
[33] *Gropius House Development Project*, report, Section III - Narrative Report, Finishes (Boston, MA: Historic New England, 1986), 6.
[34] Ibid.
[35] Ibid.
[36] Ibid.

In 1987, SPNEA staff were searching for an even better cleaning solution. A ñbrush-on, sponge-offò cleaning process was preferred, and an alkaline cleanser was proposed.[37] After it became known that the material was plaster rather than stucco, a steam clean was planned.[38] There is no solid evidence that the work occurred that year, but a 2001 update states that ñthe plaster has been steam-cleaned in the pastò.[39] A cleaning took place in 1988, but the methods used are unclear *(Figure 3)*.[40] In 1999 the plaster near an unspecified door started to expand and flake, due either a draft or a leak in plexiglass installed during window repairs.[41] Weatherproofing was requested, but whether it was carried out is unknown.[42]

Figure 3: Living room, undated but likely 1988
Historic New England Archives, Binder of Slides

In 2000 air brushing was discussed as a possible cleaning method for the plaster, but it was not used in the next major project relating to the feature. In 2001 Orion Analytical analyzed samples of the material to determine its composition. They found that it was made up of ñ(1) a thick, porous off-white layer that contains course minerals and fibers, and (2) a finely

[37] Fire Restoration Services of New England Proposal (Waltham, MA: Historic New England Property Care Files, 1945).
[38] ñSiliano,ò letter, 1987.
[39] *Gropius House: Cleaning of the Acoustical Plaster*, report, Society for the Preservation of New England Antiquities (2001).
[40] International Restorations, Inc. Invoice (Waltham, MA: Historic New England Property Care Files, 1988).
[41] "Gropius/Property Care," Marianne Zephir to Elaine Zopes, January 5, 1999, Massachusetts.
[42] Ibid.

divided white top coatò.[43] The top coat had become gray with dirt and dust, but due to the plasterðs matte, textured nature a water-based cleaner was not recommended for cleaning use.[44] Possible solutions to this problem were considered, including a rubber eraser, a Gonzo sponge, alcohol, Triton X-80 solution, Cementex molding compound, foam carpet cleaners, diluted ammonium hydroxide, baking soda grit blasting, ammonium citrate, acetone, a solvent-surfactant emulsion, a poultice, a gel, and products called ñAbsolute Concentrate,ò Gaylord, Absorene, and Acoustakleen.[45] Vacuuming of the surface was also proposed in order to prevent the dirt from being driven further into the material during the cleaning process.[46] Painting was also considered, especially after a layer of paint was found in the study.[47]

The Gonzo eraser lifted dirt from the plaster and but did not change its overall appearance, and while the application of ammonium citrate with a toothbrush proved effective, it degraded the plaster and created tide lines.[48] The Cementex molding compound achieved significant results after being left to dry for three days.[49] A mist coating of calcium carbonate was originally determined to be the best method after the others proved to drive dirt further into the plaster.[50] However, the final choice involved ñapplying different colors of paint in a stippling fashion to cover only those areas that were most discoloredò, thus making the covered spaces appear clean *(Figure 4)*. The paint was more cost-effective than the calcium carbonate, and it avoided the latterðs potentially negative effects on humidity levels.[51] A photograph of the plasterðs condition in 1988 suggests that it was very badly soiled at the time, even in comparison to its imperfect appearance over the next two decades *(Figure 3)*. This suggests that at least some of the many cleaning techniques tested in the 1990s and 2000s must have been somewhat effective, but the relative success of the individual methods is difficult to ascertain.

---

[43] "Characterization of a Plaster Sample," James Martin to Zana Wolf, June 27, 2001, Orion Analytical, LLC, Williamstown, Massachusetts.
[44] Susan Buck, *Gropius House: Report by Susan Buck on Interior Finishes*, report (2000).
[45] Roy Paget, "RE: WWW Form Submission," e-mail to Zana Wolf, October 28, 2000. Buck, Interior Finishes, 2000. I.C.W.C., Inc. Invoice (Waltham, MA: Historic New England Property Care Files, 2001). Undated, untitled note (Waltham, MA: Historic New England Property Care Files). Cassie Myers, "RE: Hello," e-mail to Zana Wolf, January 29, 2001.
[46] "Gropius House Acoustic Plaster," Susan Buck to Ann Marie DiLucia, January 08, 2001.
[47] *Cleaning of the Acoustical Plaster*.
[48] Ibid.
[49] Ibid.
[50] *SPNEA's Restoration of the Gropius House: Project Report and Revised Budget*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2001).
[51] *Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002).

Figure 4: Acoustical plaster is treated with paint layers, 2002
RS #57099

Yet another round of tests was carried out on the plaster in 2015 by JBC *(Figure 5)*. They used several latex poultices in order to avoid ñwetò solutions that would harm the plaster.[52] Despite the fact that these poultices are normally used with success on acoustical plaster, most of them yellowed the material at the Gropius House to varying degrees.[53] This suggests that there is something specific in the Gropius acoustical plaster that is not common in other materials like it.[54] It is possible that the yellowing came about when the plasterôs metallic particles bonded with the chelating agents in the solutions and were brought to the surface of the material, where they quickly oxidized.[55] The color may also be related to wood fibers in the plaster.[56] However, its precise cause is unknown.[57] The only product tested that did not yellow the substrate was MasonRE Latex 20, but this method degraded a small amount of the material and its effect on subsurface staining was unclear.[58] Thus, JBC recommended that the plaster be treated with a spray-applied limewash.[59]

---

52 Jablonski, Conservation Plan, 31.
53 Ibid, 37.
54 Ibid.
55 Ibid.
56 Ibid.
57 Ibid.
58 Ibid., 51.
59 Ibid.

Figure 5: Ed Fitzgerald of JBC conducts testing on living room acoustical plaster, 2015
RS ID #265454

Interventions

2016: Jablonski Building Conservation, Inc. (JBC) began a study of the acoustical plaster and tested some latex poultices in a corner of the living room

2001: Components of existing plaster analyzed and defined by Orion Analytical. Several cleaning solutions and methods sampled. Final solution involved painting the most discolored areas in a ñstippling fashionò to mask the appearance of dirt and dust.

2000: Air brushing discussed as a possible cleaning method. Unclear whether work was carried out.

1999: Plaster around exterior door frame in study expanded and flaked, due to either a draft or leaking plexiglass installed during window repair. Weatherproofing requested.

1993: Letter sent to NPS requesting funds for wall cleaning. No work appears to have been done.

1988: Walls cleaned, but methods unclear. Steam cleaning likely because a later memo claims that it was carried out at some point in the past, and it was discussed in 1987 and 1988.

1987: Moisture damage reported over west window of living room. Proposal for living room cleaning with alkaline cleaner in records, but no evidence that work was done. Steam clean considered after SPNEA staff realized material was plaster rather than stucco. Product called Sure Kleen purchased but not used.

1986: Bleach and other abrasive cleaners tested, along with a gentler product called Ceil-Clean. Ceil-Clean used to clean living room walls and ceiling with positive results, although some water staining, lime/cement leach and the worst soot stains remained.

1983: Water damage reported on living room ceiling, possibly caused by inadequate shoveling of porch roof during winter
1946: Acoustical plaster cleaned by California Architectural Finishes, methods unknown
1945: Washing of walls and ceilings in study and living room included on list of repairs to be completed
1938: Gypsum plaster originally specified in all areas now finished with acoustical plaster

BIBLIOGRAPHY

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.
Buck, Susan. *Gropius House: Report by Susan Buck on Interior Finishes*. Report. 2000.
Buck, Susan L. *Gropius House, Lincoln, Massachusetts: Cross-Section Microscopy Report*. Report. Newton Centre, MA: Historic Paint and Architectural Services, 2000.
Buck, Susan L. *The Interior and Exterior Aesthetic of the Walter Gropius House in Lincoln, Massachusetts*. Report. Art History, University of Delaware. 1997.
California Stucco Products of New England, Inc. Invoice. Boston, MA: Historic New England Archives, 1946.
"Characterization of a Plaster Sample." James Martin to Zana Wolf. June 27, 2001. Orion Analytical, LLC, Williamstown, Massachusetts.
Conservation Plan: Architectural Glass and Acoustical Plaster. Report. Property Care, Historic New England. Report. Gropius House: Lincoln, MA. New York, NY: Jablonski Building Conservation, 2016.
Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2002.
Fire Restoration Services of New England Proposal. Waltham, MA: Historic New England Property Care Files, 1945.
"Gropius/Property Care." Marianne Zephir to Elaine Zopes. January 5, 1999. Massachusetts.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
"Gropius House." Christina O'Sullivan to Rob Kret. September 21, 1987. Gropius House, Lincoln, Massachusetts.
"Gropius House Acoustic Plaster." Susan Buck to Ann Marie DiLucia. January 08, 2001.
Gropius House: Cleaning of the Acoustical Plaster. Report. Society for the Preservation of New England Antiquities. 2001.
Gropius House Development Project. Report. Section III – Narrative. Finishes. Report. Boston, MA: Historic New England, 1986.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.
I.C.W.C., Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 2001.

International Restorations, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1988.
Johansen, Ati. "Room-by-Room Discussion of Refurbishment." Interview by Peter Gittleman. March 13, 1991.
Myers, Cassie. "RE: Hello." E-mail to Zana Wolf. January 29, 2001.
Paget, Roy. "RE: WWW Form Submission." E-mail to Zana Wolf. October 28, 2000.
"Rob's Meeting with Siliano." Letter to Peggy Burke. December 23, 1987.
SPNEA's Restoration of the Gropius House: Project Report and Revised Budget. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2001.
"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from L. M. S. April 08, 1983.
Undated, untitled note. Waltham, MA: Historic New England Property Care Files.

GROPIUS HOUSE CHIMNEYS AND FIREPLACE

Property Name: Gropius **Structure:** Gropius House **Feature:** Chimneys and Fireplace **Original Material:** Brick, stainless steel, cement mortar, cement plaster, slate, terracotta, fireclay mortar, sheet iron **Original Color:** Gray exterior fireplace chimney, other surfaces unpainted **1965-1969 Material:** Brick, stainless steel, cement mortar, cement plaster, slate, terracotta, fireclay mortar, sheet iron **1965-1969 Color:** Gray exterior fireplace chimney, other surfaces unpainted	 RS ID #280963, 2015

Vision Statement and Treatment:
The Gropius House will reflect the period circa 1965-1969, a time when the house was in good condition and represented the complete span of Walter Gropius's interventions. The house served as a marketing tool for Gropius and it was clearly important to him that it be well maintained and in good repair. As a result, the exterior appearance of the building should be kept in excellent condition and a patina of age or deterioration should be minimized.[1]

The fireplace and its finishes should be carefully maintained for aesthetic purposes, as it is a central feature of both the living room and the west facade. The chimneys *(Figures 1 & 2)* must be kept in good repair for aesthetic and safety reasons.

Maintenance and Repair Protocols:
Last updated 2016
Recent work has not been completed on the chimneys and fireplace, so there is no a precedent for maintenance or repair. In 2016 the chimneys were in excellent condition.

- Maintenance Protocols
  - Both chimneys should be regularly inspected:
    - Monitor chimney for water ingress or signs of dampness
    - Debris falling to hearth may be sign of interior issue
    - Open flue damper of fireplace chimney yearly in order to check for any fallen debris
    - Inspect finishes for signs of degradation that may be caused by underlying issues such as moisture penetration

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.#

- Fireplace should not be used. However, unused chimneys are prone to variety of issues because thermal dynamics within stack change dramatically in this condition.
- Chimney stack used for furnace venting should be checked by professionals annually
- National Fire Protection Association Standard 211 notes that, "Chimneys, fireplaces, and vents shall be inspected at least once a year for soundness, freedom from deposits, and correct clearances. Cleaning, maintenance, and repairs shall be done if necessary."
- Although the Gropius heating system is natural gas, if flue is blocked by bird or other object system would be impaired and carbon monoxide issue could arise

- Repair Protocols

  Finishes
  - Exterior paint should be kept in good condition, in keeping with the Exterior Cladding section of this document
  - Interior finishes should be kept in good condition. Repair is in keeping with that of acoustical plaster.

  Mortar
  - There is no mortar analysis on record for Gropius House. Analysis should be performed to determine physical properties and provenance of mortar in order to make sound management and treatment decisions.
  - Mortar formulas developed for treatment should take into consideration the findings of future analyses

  Brick
  - If a brick is cracking, spalling or is otherwise deformed, treatment should favor restoration of appearance over retention of historic brick. Be sure to address underlying condition that resulted in damage as part of treatment campaign.
  - As any visible brick is covered in a finish, there is more latitude in repair approach. This makes dimensions of brick the critical factor.
  - Underlying cause of damage needs to be understood. Treatment options to be discussed include:
    - Using masonry repair mortar to recreate damaged face of brick, allowing the historic brick to remain in situ
    - Excising brick by flipping it around so interior face is on exterior. Note that excising one brick may result in damage to those surrounding it, and that interior face of brick may need to be cleaned of creosote before new finish can be applied.
    - Replacing damaged brick with new one that matches dimensions of existing. New brick face should be marked subtly with year that it was replaced for documentation. Note that material qualities of new brick and its reaction to surroundings may be different from those of original brick.

Original Construction and Evolution:
The fireplace was made of hard-burned, dark-selected, water-struck brick with ¼ò joints that were struck in exposed areas and cut off flush at interior connections *(Figure 3)*.[2] It had a throat and damper manufactured by Murdock, stainless steel trim, a cement plaster face, and a slate hearth.[3] The flues extended 2ò above the chimney caps, and their lining was hard-burned, 8ò x 12ò and 12ò x 12ò terracotta with ñclose joints of fire clay mortarò.[4] Metal furrings were installed at all sides of the fireplace, and the smoke pipe was made of sheet iron thimble.[5]

There were two chimneys in the house. One of these was associated with the fireplace and another was connected to the furnace near the center of the house. Both chimneys are painted a green color above the roof line *(Figures 1 and 2)*, but it is unclear when and why the color was applied. The exposed brick of the fireplace chimney on the west elevation is painted gray. It is possible that the work was part of the rebuilding of the chimneys that took place in 1967.[6]

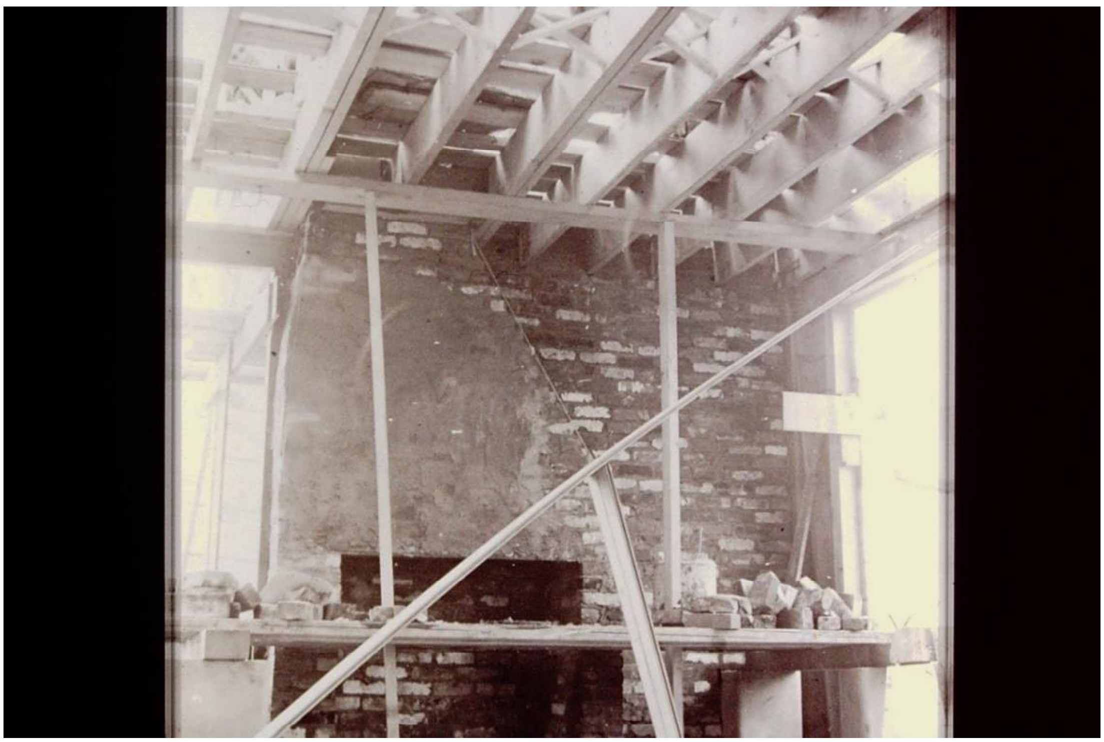


Figure 3: Fireplace during construction, 1938
Historic New England Archives, Binder of Slides

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 15 and 16.
[3] Gropius and Breuer, ñSpecifications,ò 15.
[4] Ibid.
[5] Ibid., 23.
[6] A. Belanger & Sons, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1967).

Character-Defining Traits in the Interpretive Period:
The fireplace was a surprising feature to many guests who visited the Gropius House; they wondered why it was necessary in a building with modern heating.[7] Gropius answered that ñhe always liked to provide a house with the basic means to keep things going even in emergenciesò, which reflects the functionalism important in so many Bauhaus buildings.[8] However, his wife Ise identified a second reason for the featureês existence when she said that ñópeople make the mistake of thinking that the modern school cares nothing for beauty but only for economy and practicalityôò.[9] The fireplace gave the Gropiuses ñsheer psychological satisfactionò in addition to a reliable source of heat.[10]

Figure 4: Fireplace, undated
RS ID #17348

[7] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 8.
[8] Ibid. Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 270.
[9] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 25.
[10] Ibid.

History of Conservation and Maintenance Practices:
In 1967 the flue linings were reinstalled, and both chimneys were rebuilt with new red brick and recast concrete tops.[11] The extent of this work is unclear, but the fact that there are no invoices for simultaneous repairs to the interior finishes suggests that only the upper parts of the chimneys were repaired. In 1974 16 oz. lead-coated copper chimney caps were furnished and installed.[12] By 1986 the chimneys required cleaning, and the far side of the fireplace damper needed to be cleared.[13] The chimneys still needed to be cleaned the following year.[14] In 1999 a leak was discovered in the upstairs hallway.[15] After the Society for the Preservation of New England Antiquities (SPNEA) staff found that the furnace chimney was damp at its base, they attributed both damp spots to a leak occurring higher up on the chimney.[16] Finally, a new stainless steel flue liner was installed in the furnace chimney in 2002 when the heating system was converted from oil to natural gas.[17]


Figures 1 and 2: Furnace chimney and fireplace chimney, 2009
RS ID #56743 and #56765

Interventions
2002: New stainless steel flue liner installed in furnace chimney
1999: Water leak in upstairs hallway attributed to chimney that was wet at its base in the cellar
1987: Chimney cleaning required
1986: Cleaning of chimney and clearing of fireplace damperôs far end requested
1974: New 16 oz. lead-coated copper chimney cap furnished and installed
1967: Two chimneys rebuilt with red brick and recast concrete tops. Flue linings installed.

---

11 A. Belanger & Sons, Inc. Invoice.
12 Penshorn Roofing Company, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1973).
13 ñThe Following are Site Visit Report Notes from May 2, 1986 Re: Gropius,ò (Waltham, MA: Historic New England Property Care Files, 1986), 3.
14 ñBudget, 1987,ò (Waltham, MA: Historic New England Property Care Files, 1987).
15 Marianne Zephir, ñRepair Request Form,ò (Waltham, MA: Historic New England Property Care Files, 1999).
16 Ibid.
17 Stephen Striebel Invoice, (Waltham, MA: Historic New England Property Care Files, 2002).

BIBLIOGRAPHY

A. Belanger & Sons, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1967.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

ñBudget, 1987.ò Waltham, MA: Historic New England Property Care Files, 1987.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Penshorn Roofing Company, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1973.

Stephen Striebel Invoice. Waltham, MA: Historic New England Property Care Files, 2002.

ñThe Following are Site Visit Report Notes from May 2, 1986 Re: Gropius.ò Waltham, MA: Historic New England Property Care Files, 1986.

Zephir, Marianne. ñRepair Request Form.ò Waltham, MA: Historic New England Property Care Files, 1999.

GROPIUS HOUSE CORK FLOOR

Property Name: Gropius **Structure:** Gropius House **Feature:** Cork floor **Original Material:** Cork tiles, 5/16ò thick **Original Color:** Brown **1965-1969 Material:** Cork tiles, 12ò x 12ò and 5/16ò thick **1965-1969 Color:** Brown	 RS ID #270622, 2016

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

Historical photographs of the Gropius House do not show the cork floor clearly enough to determine its condition during the interpretive period *(Figure 1)*. The precision of Bauhaus design means that the floor was probably at least intended to be kept in exquisite condition, but there is only one written record of cork maintenance from Gropiusôs lifetime. On the other hand, the Gropiusô daughter Ati Johansen said that her mother had the cork machine-waxed regularly.[2] While there is a lack of physical evidence for this assertion, it does seem like a very plausible claim. Floor waxing would have been extremely basic maintenance for the owners of a house that was described by a temporary inhabitant as ñvery austereò and like a ñmuseumò ten years earlier.[3] For this reason the cork floors should kept as clean, even, and shiny as possible without becoming too slippery for the safety of visitors and staff.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] ñNotes from Visit of Ati Johansen to Gropius House,ò (Boston, MA: Historic New England files, 1988).
[3] Annette Cottrell, ñThe Gropius House,ò (Boston, MA: Historic New England files, 1993).

Maintenance and Repair Protocols:
Last updated 2016

- Original tiles were 5/16ò thick. Current tiles are 12ò x 12ò and 2/16ò thick with an underlayment.
- Original tiles were a consistent brown color. Color match can be found in an original tile located in the cage room of the Codman Carriage Barn.
- Maintenance Protocol[4]
    - When cleaning, use mild detergent with damp mop
    - Do not flood as excess water causes damage
    - Clean daily with dry or damp mop, occasionally using a liquid solvent wax
    - For major cleaning on Standard Cork Tile, use electric buffing with 00 steel wool discs, then apply several thin coats of paste wax, buffing each with lambôs wool pads
    - For major cleaning on Polyurethane Coated Tile, use liquid wax and buffing. Paste is NOT to be used on Polyurethane Coated Tile.
    - To refinish Polyurethane Tile, use a power floor machine with 00 steel wool discs and apply urethane as directed on container labels.
    - Avoid abrasive, alkaline or cheap cleaners
    - Keep surface free of grit, sand and cinders
    - Use an entrance mat to prevent the floor from getting dirty and wet.[5] Do not allow a soaking mat to sit on the cork for extended periods of time.[6]
- Repair Protocol
    - The current floor is a replacement from 1988 and therefore not original fabric.
    - Tiles should be carefully maintained in order to make replacement as infrequent as possible. If the tiles become discolored or otherwise damaged, however, it is acceptable to consider the replacement of the non-historic cork tiles. This decision should be agreed upon by Historic New Englandôs internal interpretation task force PPIP.
    - When replaced, the colors of the tiles should be consistent.
    - The trim on the stairs must be flush with the treads.

Original Construction and Evolution:
25/32ò x 2 ¼ò white oak of ñthe best qualityò was the original intended finish of the hall floors and stair risers while 5/16ò cork tile, ñArmstrongôs or equal,ò was specified for the stair treads due to its excellent sound-absorbing qualities.[7] However, the cork took the place of the white oak when the house was actually constructed.

---

[4] Taken from ñInstallation and Maintenance Instructions: Dodge Polyurethane Coated Tile/Dodge Standard Cork Tileò (Waltham, MA: Historic New England Property Care Files, 1987).
[5] Ibid.
[6] Ibid.
[7] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 37. Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 40.

Figure 1: First floor entry hall, undated
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
There are very few records of any changes or maintenance work carried out on the cork floors between the houseǿs construction and the interpretive period, so the intentions behind the featureǿs original installation still defined its character by 1965-69. We cannot know these intentions for sure due to the lack of information about Gropiusǿs decision to use cork instead of white oak in the hallway, but several theories have been put forward.

A visitor to the Gropius House in the 1980s claimed to have been on the original construction team for the building, and said that one of the other workmen had warned Gropius of the massive amounts of soil that would show up on the white oak as residents and visitors tracked dirt in from the fields surrounding the house.[8] In contrast, corkǿs speckled appearance would mask much of the grime.[9] Obviously this information is from an indirect source, but it is plausible because it relates to important Bauhaus principles. Gropius believed that all architectural features and finishes should be ñtime-saving, economical and useful to the last degreeò.[10] Thus, the practicality of cork would have been more significant to him than the beauty of white oak. Another concern of Gropius was finances. Not only was he operating on a small budget himself, but all of his designs were intended to reflect changing family finances in an era when wars and economies were

[8] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 40.
[9] Ibid.
[10] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 269.

crippling many households.[11] In these ways the cork floor was symbolic of philosophies that guided the design of the house as a whole between 1965 and 1969.

History of Conservation and Maintenance Practices:
As previously mentioned, cork tiles had always been specified for the stair treads but eventually also replaced the white oak that was originally intended to finish the halls and stair risers. The only hint of maintenance work carried out on the cork during Gropiusôs lifetime comes from a 1945 list of repairs to be completed, which includes ñgrind and wax cork floorsò.[12] However, Johansen claimed that Gropiusôs wife Ise had the floors waxed on a regular basis using a machine, and that Johansen herself waxed it for the last time during her preparations for Iseôs funeral in 1983.[13]

The first major project involving the cork floor began in 1986. By this time the tiles at the main entry were deteriorating from wear, water spillages related to an indoor plant nearby, and UV damage from the adjacent glass block wall.[14] The floor as a whole had also become duller and lighter in color, and it was scratched by a resident overseer when he dragged a refrigerator upstairs from the basement.[15] At first Society for the Preservation of New England Antiquities (SPNEA) staff decided to replace only the tiles near the entry, which had sustained the worst damage.[16] They were able to find a company that carried 12ò x 12ò cork tiles.[17] The new material was 2/16ò, or 3/16ò thinner than the original, so a felted underlayment was installed under the replacement cork.[18] However, as the work finally progressed in late 1987 it became clear that previous sanding and dents from furniture were making the new finish appear uneven.[19] For this reason the rest of the cork was replaced early in 1988 *(Figure 2)*.[20] In order to make the color of the material closer to the way it was originally, the factory-made surface of the new tiles was removed with abrasives and steel wool before being dyed and stained.[21]

---

[11] Ati Johansen, "Interview with Ati Johansen, daughter of Walter Gropius, interviewed about the use of the first floor rooms in the Gropius House," interview by Peter Gittleman, March 14, 1991, 11. Walter Gropius, 1937, MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library.
[12] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[13] "Gropius House Observations," Elizabeth Redmond to Peggy Burke, March 10, 1987, Massachusetts.
[14] Gropius House Development Project, report, Section III - Narrative Report, Finishes (Boston, MA: Historic New England, 1986), 7.
[15] "Gropius House Cork Floor Refurbishment," Peggy Burke to Thom Lingel, December 31, 1986, Massachusetts. "Gropius House," Christina O'Sullivan to Nick Langhart, April 06, 1987, Gropius House, Lincoln, Massachusetts.
[16] Development Project, report, 7.
[17] Ibid.
[18] Ibid., 8.
[19] "Gropius Floor Report," Nick Langhart to Peggy Burke, Rob Kret, and Elizabeth Redmond, December 18, 1987, Massachusetts.
[20] "Gropius House Fund-Raising Budget," Peggy Burke to Nancy Coolidge, Ellen Garbarino, Peter Gittleman, Brock Jobe, Arvin Murch, Cheryl Peterson, Elizabeth Redmond, and Gay Wagner, March 17, 1988, Massachusetts.
[21] "Gropius Floor Tile Cleaning," Nick Langhart to Peggy Burke and Rob Kret, October 13, 1987, Massachusetts.

Figure 2: Stair and hall during cork floor replacement, 1988
Historic New England Archives, Binder of Slides

During the next few years several notes were made about the maintenance of the new floors, mostly to do with the need for consistent waxing and monitoring.[22] In 1992 extra concern was again expressed about the tiles near the entry, which were becoming gray and worn with marble dust tracked in by visitors from the gaps between the flagstones outside.[23] All of the cork was cleaned, waxed and buffed after this observation was made, and the entry area was given extra wax.[24] SPNEA staff recommended a sanding and a coat of polyurethane for the entry and a general waxing two to three times a year.[25] By 1993 a letter was written to the National Park Service requesting funds for more work on the cork.[26] A 1995 memo reveals that the cork was badly abraded by food traffic, and that it had been waxed only once a year since its installation.[27] A maintenance guide for cork was obtained and resetting the tiles was considered, but there is no evidence of any of this work actually happening.[28]

After major interior renovations were completed in 2001 as part of the Save Americaôs Treasures grant project, the cork floors were sanded, scraped, coated with an oil finish and

---

[22] "Gropius List," Peter Gittleman to Toni, January 1, 1989, Massachusetts. SPNEA Room-by-Room SWAT Evaluation, report, Gropius House, Upper Hall (Lincoln, MA, 1991).
[23] "Gropius," Millie to Peter Gittleman and Frank, March 10, 1992, Massachusetts.
[24] "Gropius," Millie to Tess, Frank, Nancy Carlisle and Peter Gittleman, March 17, 1992, Massachusetts.
[25] Ibid.
[26] Untitled note, (Waltham, MA: Historic New England Property Care Files, 1993).
[27] "Gropius," Peter Gittleman to Linda Willett, January 10, 1995, Massachusetts.
[28] *Cork Floor Tile Installation and Maintenance Instructions* (Lancaster, PA: Dodge Regupol Incorporated, 1994). "RE: Tiles in Foyer," letter to Linda Willett, October 06, 1995, Massachusetts.

buffed with a chemically balanced paste wax polish.[29] A dark stain oak transition piece was installed on the stair treads with another three coats of oil finish.[30] A cork floor installation guide can also be found in the files from the same year, but there is no evidence that any of the tiles were actually replaced.[31]

Interventions

2001: Cork floors sanded, scraped, and coated with oil finish. Dark stain oak transition piece installed on stair treads with three coats of oil finish. Cork floor installation guide included in property care files, but no other evidence of tile replacement during that period exists.

1995: Cork badly abraded by constant food traffic, despite yearly waxing since 1988 replacement. Maintenance instructions included in files, but no evidence of actual work carried out. Intention to reset tiles in foyer expressed.

1993: Letter sent to the National Parks Service requesting funds for work on the cork floor

1992: Cork abraded just inside front door by marble dust tracked into house by visitors. All cork cleaned, waxed, and buffed, with extra wax applied to area near entry. Recommendation that waxing should be carried out two to three times a year, and that tiles near entry should be sanded and coated with polyurethane. No evidence that this advice was put to action.

1991: Need for waxing of cork noted

1989: Need for waxing of upper hall cork noted

1988: Replacement and dyeing of entire cork floor completed

1987: Cork floor restoration began with replacement and dyeing of tiles near entry, and partial restoration of other original tiles

1986: Planning for the restoration of the cork floor began. New replacement tiles ordered.

1945: List of necessary repairs included grinding and waxing of cork floors

1938: Cork tiles were installed in the halls and stair risers were white oak was originally specified.

BIBLIOGRAPHY

"Cork Floor Installation." Jelinek Cork. Accessed June 19, 2001. http://www.jelinek.com/install.htm.

Cork Floor Tile Installation and Maintenance Instructions. Lancaster, PA: Dodge Regupol Incorporated, 1994.

Cottrell, Annette. ñThe Gropius House.ò Boston, MA: Historic New England files, 1993.

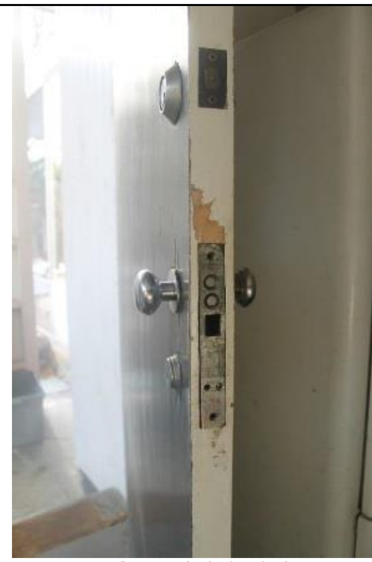
Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2002.

Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.

[29] Goddard Floor Specialists Invoice, (Waltham, MA: Historic New England Property Care Files, 2001). Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002).
[30] Ibid.
[31] Jelinek Cork, "Cork Floor Installation.ò

"Gropius." Millie to Peter Gittleman and Frank. March 10, 1992. Massachusetts.
"Gropius." Millie to Tess, Frank, Nancy Carlisle and Peter Gittleman. March 17, 1992. Massachusetts.
"Gropius." Peter Gittleman to Linda Willett. January 10, 1995. Massachusetts.
Gropius, Walter. 1937. MS 20, Gropius, Walter, 1883-1969, Houghton Library, Harvard College Library.
Gropius, Walter. "The Small House of To-day." *The Architectural Forum,* March 1931, 266-78.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
"Gropius List." Peter Gittleman to Toni. January 1, 1989. Massachusetts.
"Gropius Floor Report." Nick Langhart to Peggy Burke, Rob Kret, and Elizabeth Redmond. December 18, 1987. Massachusetts.
"Gropius Floor Tile Cleaning." Nick Langhart to Peggy Burke and Rob Kret. October 13, 1987. Massachusetts.
"Gropius House." Christina O'Sullivan to Nick Langhart. April 06, 1987. Gropius House, Lincoln, Massachusetts.
"Gropius House Cork Floor Refurbishment." Peggy Burke to Thom Lingel. December 31, 1986. Massachusetts.
Gropius House Development Project. Report. Section III – Narrative. Finishes. Report. Boston, MA: Historic New England, 1986.
"Gropius House Fund-Raising Budget." Peggy Burke to Nancy Coolidge, Ellen Garbarino, Peter Gittleman, Brock Jobe, Arvin Murch, Cheryl Peterson, Elizabeth Redmond, and Gay Wagner. March 17, 1988. Massachusetts.
"Gropius House Observations." Elizabeth Redmond to Peggy Burke. March 10, 1987. Massachusetts.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.
ñInstallation and Maintenance Instructions: Dodge Polyurethane Coated Tile/Dodge Standard Cork Tileò (Waltham, MA: Historic New England Property Care Files, 1987).
Johansen, Ati. "Interview with Ati Johansen, daughter of Walter Gropius, interviewed about the use of the first floor rooms in the Gropius House." Interview by Peter Gittleman, March 14, 1991.
Johansen, Ati. "Room-by-Room Discussion of Refurbishment." Interview by Peter Gittleman. March 13, 1991.
ñNotes from Visit of Ati Johansen to Gropius House.ò Boston, MA: Historic New England files, 1988.
"RE: Tiles in Foyer." Letter to Linda Willett. October 06, 1995. Massachusetts.
SPNEA Room-by-Room SWAT Evaluation. Report. Gropius House, Upper Hall. Lincoln, MA, 1991.
Untitled note. Waltham, MA: Historic New England Property Care Files, 1993.

GROPIUS HOUSE HARDWARE AND DOORS

Property Name: Gropius **Structure:** Gropius House **Feature:** Hardware and Doors **Original Material:** Pine (plywood?), fir, bronze, steel **Original Color:** White (wood), unpainted (metal) **1965-1969 Material:** Pine (plywood?), fir, bronze, steel **1965-1969 Color:** White (wood), unpainted (metal)	 RS ID #281050, 2016

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

The color of the doors should match their surroundings in all instances. If in-kind replacement is not possible for any necessary hardware work, visible elements should match the originals. They would ideally be purchased off the shelf rather than custom-made, in keeping with Gropiusȏs preference for mass-made materials. The doors and hardware must be kept in good working condition for the functionality of the site.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016

Hardware

- Maintenance Protocols
  - Annually tighten set screws in doorknobs and ensure hinges are secured tight to frames
- Repair Protocols
  - As of 2016, some doors have exhibited loose handles that are the result of old age rather than loose-set screws. With hardware now about eighty years old, this condition can be expected to occur more frequently throughout house.
    - Note for future repairs: Spring installed in door D2-01 (see appendices) in 2016 was not as heavy as original, so handle does not spring back to horizontal.
    - Future replacement of internal and possibly of visible hardware may be required in future if parts and qualified technicians cannot be found. Any visible components of hardware should be matched in kind so that the aesthetic appearance is maintained. Use of similar-looking off-the-shelf hardware would follow in Bauhaus spirit of simple and economical updates.

Doors

- Maintenance Protocols
  - Exterior paint should be kept in good condition in keeping with repair protocols in Exterior Siding section of this document
  - Interior finishes should be kept in good repair, but consideration must also be made of surrounding finishes. New paint should not be applied if it will create an imbalance with the patina of nearby objects.
  - Screen doors should be maintained and kept in operational order
- Repair Protocols
  - Extensive door repairs have not occurred at site, so new protocols would need to be established for any new project. In keeping with vision statement for interior, balance would need to be struck between treatment intended to preserve historic fabric and actual replacement of feature. This would be reviewed on case by case basis.

Original Construction and Evolution:
The specifications for the Gropius House call for nearly all the doors (interior and exterior) to be made of white pine, with the exception of glass doors in the living room, study and at the threshold of the deck and a fir basement door.[2] The exterior doors and all frames, as well as Atiôs bedroom door, were to be 1 ¾ò thick.[3] In contrast, the thickness of the screen door frames would measure 1 ¼ò, and the basement and interior doors would be 1 3/8ò thick each.[4] Despite this detailed information, it is possible that the features were eventually made with a different material entirely; Gropiusôs wife Ise wrote that the interior and exterior doors were hollow and solid core plywood, respectively.[5] The glass doors were to be fitted with friction adjusters, outside handles, a push-bar, and a double-grip bolt.[6] Hollow metal imposts were specified for installation between the doors in the living room and study.[7] In a 1939 article on the house, Beulah Brown Anthony wrote that the cabinet doors are made of presswood in the living room and metal in the kitchen and pantry.[8]

Hardware mentioned in the specifications includes curtain tracks, brackets for a glass shelf in the study, a sideboard in the dining room, a dressing table in the master bedroom, and bookcases in the living room and study.[9] The document also includes shoe scrapers, kitchen cabinets, metal T bars in the study and dining room, and poles for shoes, clothes, and closets.[10] The ñtwo-prong bronze-plated hooks with bronze screwsò are the only hardware features specified in a certain material, but Anthony noted that the door hardware was steel.[11]


Figure 2: First floor door, undated
Historic New England Archives, Binder of Slides

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 35, 36, and 24.
[3] Gropius and Breuer, ñSpecifications,ò 35.
[4] Ibid., 35 and 36.
[5] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 15.
[6] Gropius and Breuer, ñSpecifications,ò 24.
[7] Ibid.
[8] Beulah Brown Anthony, "The Massachusetts Home: Dr. and Mrs. Walter Gropius," *The American Home*, July 1939, 23 and 24.
[9] Gropius and Breuer, ñSpecifications,ò 47.
[10] Ibid.
[11] Ibid., 36. Anthony, ñThe Massachusetts Home,ò 23.

Character-Defining Traits in the Interpretive Period:
Since the only alterations to the doors and hardware between their installation and the interpretive period were practical repairs and replacements, the features still held their original significance by the late 1960s. Nicknamed the ñcorridor-less houseò by Gropius himself, the building naturally contains fewer doors than more traditional houses.[12] Gropius preferred ñopen wallsé flooded with sunlight coming throughò, which he considered ñeconomical, flexible, [and] labor-savingò.[13] The doors that he did have installed were ñseverely plainé and painted to match the wallsò, which was consistent with the Bauhaus aversion to architectural ornament.[14] Gropiusôs use of glass doors is also consistent with his design philosophy. Their placement in areas that led to outdoor living spaces, such as the terrace and the second-floor deck, visually provided the connection between indoors and outdoors that Gropius considered so important in a home.[15]

The buildingôs hardware was representative of Gropiusôs belief that ñthe man of this technical age needs uniformity of means and expression in *all* forms of creationò.[16] For this reason he chose many of the products from the stock catalogues of the local W. C. Vaughan Company, which could be bought cheaply.[17] It is significant that Gropius used products manufactured in the region, since he considered uniformity in architectural features and buildings to be representative of their surrounding streets, neighborhoods, cities, and areas.[18] In addition, Ise wrote that ñGropius wanted to prove that the mass produced output of American industry was quite capable of producing a sophisticated house of contemporary designò.[19]

History of Conservation and Maintenance Practices:
In 1942 Gropius requested repairs to the kitchen drawers and doors, including the cabinet door under the sink.[20] The company that manufactured the features sent someone to assess the problems in 1946, but a year later nothing had been fixed.[21] Gropius wrote that ñthe drawers eat themselves into the slidesò and that ñsome of them can be opened only by pulling them out with full strengthò.[22] The door under the sink had been broken for at least five years.[23] There is no evidence of repair work resulting from these communications.

[12] Anthony, ñThe Massachusetts Home,ò 23.
[13] Walter Gropius, ñThe House of New Lives,ò 1933, Busch-Reisinger Museum, Harvard Art Museums.
[14] Anthony, ñThe Massachusetts Home,ò 23. Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 269.
[15] Gropius and Breuer, ñSpecifications,ò 24. Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[16] Gropius, ñSmall House,ò 271.
[17] Anthony, ñThe Massachusetts Home,ò 31. Gropius, ñGropius House,ò 5.
[18] Gropius, ñSmall House,ò 277.
[19] Gropius, ñGropius House,ò 5.
[20] Walter Gropius to Eames Company, September 16, 1942, Massachusetts.
[21] Walter Gropius to A. L. Eames, February 6, 1946, Massachusetts. Walter Gropius to A. L. Eames, May 1, 1947, Massachusetts.
[22] Gropius to Eames, 1947.
[23] Ibid.

In 1958, Gropius requested new screws from the company that manufactured the parts he used in glass bathroom shelving.[24] When they replied by telling him that they no longer produced the screws, Gropius ordered the parts from the Charles Parker Company instead.[25] The houseôs doorbell broke two years later, and W. C. Vaughan Co. sent him a new one.[26]

In 1966 Gropius requested replacements for several defective pieces of hardware from W. C. Vaughan, and he wrote again the following year to say that several door handles ï including that of the front door ï were not working.[27] In 1968 Gropius wrote that he was returning the replacement front door lock they had sent him because its installation would have required a new door and doorframe.[28] One year later an unspecified door switch was replaced, and in 1975 the mortise lock on a rear door was removed, cleaned, lubricated and reinstalled.[29] In 1980 the doorbell was repaired and the screw to the vertical rods on one of the glass doors was replaced.[30]

In 1985, corrosion and sealants were removed from unspecified metal doors before their operating mechanisms were lubricated and repaired.[31] The caulking and screens were also replaced on doors, in addition to badly damaged metal members.[32] The following year, Society for the Preservation of New England Antiquities (SPNEA) staff expressed an intention to research the manufacturer of the houseôs door hardware after several knobs and locks were reported to be broken.[33] The inner knob of the kitchen door was missing an escutcheon, the front door handle needed to be cleaned and properly screwed into place, and a four-foot screen door sag brace was required for the front screen door.[34] The handles on the closet doors in the master bathroom and dressing room also needed to be repaired.[35] It is unclear whether or not these issues were addressed.

---

[24] Walter Gropius to Speakman Company, July 17, 1958, The Architects' Collaborative, Cambridge, Massachusetts.
[25] "Glass Shelves," J. O. Stanaland to Walter Gropius, July 23, 1958, Speakman Company, Wilmington, Delaware. French to Walter Gropius, July 30, 1958, The Charles Parker Company, Meriden, Connecticut.
[26] Lester A. Peabody to Walter Gropius, April 6, 1960, W. C. Vaughan Co., Boston, Massachusetts.
[27] Walter Gropius to Elmer H. Pratt, June 2, 1967, Massachusetts.
[28] Walter Gropius to Elmer H. Pratt, August 1, 1968, Massachusetts.
[29] American Appliance Service, Co. Invoice, (Boston: Historic New England Otis House Files, 1969). Shermanôs Invoice, (Boston: Historic New England Otis House Files, 1975).
[30] Rob A. Brooks Invoice, (Boston: Historic New England Otis House Files, 1980). Shermanôs Invoice, (Boston: Historic New England Otis House Files, 1980).
[31] *Gropius House: Summary Scope of Work*, report (MA: Society for the Preservation of New England Antiquities, 1985).
[32] Ibid.
[33] ñThe Following are Site Visit Report Notes from May 2, 1986 Re: Gropius,ò (Waltham, MA: Historic New England Property Care Files, 1986), 1.
[34] Ibid., 1 and 2.
[35] "Gropius House List," Marla Sullivan to Peter Gittleman, Brock Jobe, Jim Moisson, Richard Nylander, Wizzie Redmond, Lynne Spencer, October 22, 1986, Massachusetts.

Figure 3: Doors leading from dining room into kitchen and entry hall, 1985
Historic New England Archives, Binder of Slides

Similar problems abounded in 1987. Three door handles in the dressing room needed to be repaired, and the handle of the master bedroom closet had come off the door.[36] Neither the basement door nor the screen door leading to the deck from Atiĝs room shut properly.[37] The screen door on the porch needed major repairs, including dismantling, cleaning, repairs, sanding, and painting.[38] There was fungus on the study door, and the wood was spalling.[39] There was a hole in a screen door off the living room, which also needed to be realigned.[40] The basement door needed paint retouching, and the front screen door required spring work and realignment.[41] The doors in the guest room and sewing alcove also needed to be realigned.[42] Once again, there is no definitive evidence that any of these problems were solved.

In 1988, the catch of the closet door under the stairs was out of alignment and a door lock and bath towel bar were missing from the master bathroom.[43] By 1990, the lock on the

[36] "Gropius House Observations," Elizabeth Redmond to Peggy Burke, March 10, 1987, Massachusetts.
[37] Anonymous and untitled note, (Waltham, MA: Historic New England Property Care Files, 1987), 2-3. As of 2016, there is no longer a screen door leading to the deck from Atiĝs room.
[38] Ibid., 4.
[39] Ibid.
[40] Ibid.
[41] Ibid., 1. ñFirst Floor Interior Odd Jobs,ò (Waltham, MA: Historic New England Property Care Files, 1987). As of 2016, there is no longer a screen door off the living room.
[42] *Interior Odd Jobs*, 1987, Massachusetts.
[43] Ron Brown, ñQuarterly Report of Conditions,ò (Waltham, MA: Historic New England Property Care Files, 1988), 7 and 8.

back door needed to be repaired and the bottom screen in the front door fit badly in its frame.[44] Three years later tack holes needed to be filled on the front door, the basement door handle required repairs, and the door leading to the screened porch from the pantry was splintering.[45] In 1995 the basement door was repeatedly coming loose at its top hinge.[46] Failing laminate at the bottom of the door between the porch and the pantry was repaired, and in 2012 a hinge was replaced on the living room screen door *(Figure 4)*.[47] During the same year the front door (D1-01) handle was found to be loose, but no loose screws were revealed when it was partly disassembled and tightening did not fix the issue. By 2014 there had been many issues with the door hardware in the house, including the catch of the closet door under the stairs, so a conditions assessment was carried out.[48] The project included taking an inventory of the interior door hardware and all its related problems (see Appendix A).[49]

In 2015 there was concern about the longevity of the screen door at the kitchen entry, which was rumored to have an original screen. For this reason it was removed, labeled and stored in the basement. In 2016, Historic New England staff found that the door to the roof deck was not latching and unlatching reliably. The springs in the lock mechanism for the door to the roof deck were replaced. At an appropriate time, the springs should be replaced with heavier springs so that the heavy handle springs back to horizontal appropriately. Finally, the installation of thick carpet in the dressing room has made it impossible to open the closet doors properly, which has prompted Historic New England staff to yank on the handles. They have become loose, but their screws on the other side of the door are sealed off and therefore difficult to repair.

---

[44] "Completion of the Gropius House Restoration," Peter Gittleman to Millie, Frank, Lisa, July 06, 1990, Massachusetts. Nancy Mazer, ñMeeting with John Connolly,ò (Waltham, MA: Historic New England Property Care Files, 1990). The mortise lock mechanism for the back door was replaced with a cylinder deadbolt. While the pieces in situ may date to the original hardware, it is unknown when they were installed. In the front door as well as this one there are Medeco cores.
[45] Peter Gittleman, ñGropius Needs List,ò (Waltham, MA: Historic New England Property Care Files, 1993).
[46] "Gropius," Peter Gittleman to Linda Willett, January 10, 1995, Massachusetts.
[47] Rosemary Blau, *Gropius House: Work Report, 1995*, report (MA: Society for the Preservation of New England Antiquities, 1995). ñScreen Door Hinge Repair/Replacement,ò Historic New England Property Care Electronic Database of Historical Projects, 2013.
[48] ñDoor Hardware Conditions Assessment,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.
[49] Ibid.

Figure 4: Living room screen door hinge, 2012 ï D1-03
RS ID #142167

Interventions

2016: Springs in mechanism for door to roof deck replaced with stronger counterparts
2015: Screen door at kitchen entry removed for storage in basement
2014: Many issues with door hardware; conditions assessment carried out throughout house
2012: Screen door hinge replaced
1995: Basement door coming loose from top hinge. Failing laminate on bottom edge of back door to porch repaired.
1993: Tack holes in front door needed to be filled. Door from pantry to screened porch splintering. Basement door handle needed repairs.
1990: Back door lock needed to be repaired. Bottom screen of front door fit badly in frame.
1988: Catch of closet door under stairs out of alignment. Door lock and bath towel bar missing from master bathroom.
1987: Three door handles in dressing room needed repair, and handle on master bedroom closet door fell off. Basement door and screen door between Atiôs room and deck were not shutting properly. Porch door needed to be repaired and repainted. Fungus and spalling wood on study door. Hole in screen door off living room, which also needed to be realigned. Paint needed retouching on basement door. Front screen door required spring work and realignment. Doors in guest room and sewing alcove needed realignment. Unspecified issue with first floor bathroom door jamb.
1986: Intention to identify door hardware manufacturer because parts were missing from kitchen door, front door, and front screen door. Dressing room and master bath closet door repairs needed.
1985: Repair of metal doors carried out, including removal of corrosion and sealants, lubrication and repair of operating mechanisms, and replacement of caulking, screens, and badly damaged metal members.
1980: Doorbell repaired. Screw to vertical rods on glass door replaced.
1975: Removed mortise lock on rear door; cleaned and lubricated before reinstallation
1969: Unspecified door switch repaired
1968: Front door lock repaired
1967: Front door lock and handles of other doors needed repairs
1966: Replacements for defective hardware including front door lock, rubber doorstops, and shelf requested
1958: Parts for glass shelving in bathroom requested. Original manufacturer no longer made them, so alternatives were purchased.
1947: Lock and doorbell repairs carried out. Kitchen drawer and cabinet door repairs requested again.
1942: Kitchen drawer and cabinet door repairs requested

BIBLIOGRAPHY

American Appliance Service, Co. Invoice. Boston: Historic New England Otis House Files, 1969.

Anonymous and untitled note. Waltham, MA: Historic New England Property Care Files, 1987.

Blau, Rosemary. *Gropius House: Work Report, 1995*. Report. MA: Society for the Preservation of New England Antiquities, 1995.

Brown, Ron. ñQuarterly Report of Conditions.ò Waltham, MA: Historic New England Property Care Files, 1988.

Brown Anthony, Beulah. "The Massachusetts Home: Dr. and Mrs. Walter Gropius." *The American Home*, July 1939, 21-25.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

"Completion of the Gropius House Restoration." Peter Gittleman to Millie, Frank, Lisa. July 06, 1990. Massachusetts.

ñDoor Hardware Conditions Assessment.ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

ñFirst Floor Interior Odd Jobs.ò Waltham, MA: Historic New England Property Care Files, 1987.

French to Walter Gropius. July 30, 1958. The Charles Parker Company, Meriden, Connecticut.

Gittleman, Peter. ñGropius Needs List.ò Waltham, MA: Historic New England Property Care Files, 1993.

"Glass Shelves." J. O. Stanaland to Walter Gropius. July 23, 1958. Speakman Company, Wilmington, Delaware.

"Gropius." Peter Gittleman to Linda Willett. January 10, 1995. Massachusetts.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter. ñThe House of New Lives,ò 1933, Busch-Reisinger Museum, Harvard Art Museums.

Gropius, Walter. "The Small House of To-day." *The Architectural Forum*, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

"Gropius House List." Marla Sullivan to Peter Gittleman, Brock Jobe, Jim Moisson, Richard Nylander, Wizzie Redmond, Lynne Spencer. October 22, 1986. Massachusetts.

Gropius House: Summary Scope of Work. Report. MA:Society for the Preservation of New England Antiquities, 1985.

"Gropius House Observations." Elizabeth Redmond to Peggy Burke. March 10, 1987. Massachusetts.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Home Depot Receipt. Waltham, MA: Historic New England Property Care Files, 2015.

Interior Odd Jobs, 1987, Massachusetts.

Lester A. Peabody to Walter Gropius. April 6, 1960. W. C. Vaughan Co., Boston,

Massachusetts.
Mazer, Nancy. ñMeeting with John Connolly.ò Waltham, MA: Historic New England Property Care Files, 1990.
Rob A. Brooks Invoice. Boston: Historic New England Otis House Files, 1980.
ñScreen Door Hinge Repair/Replacement.ò Historic New England Property Care Electronic Database of Historical Projects, 2013.
Shermanõs Invoice. Boston: Historic New England Otis House Files, 1975.
Shermanõs Invoice. Boston: Historic New England Otis House Files, 1980.
ñThe Following are Site Visit Report Notes from May 2, 1986 Re: Gropius.ò Waltham, MA: Historic New England Property Care Files, 1986.
Walter Gropius to A. L. Eames. February 6, 1946. Massachusetts.
Walter Gropius to A. L. Eames. May 1, 1947. Massachusetts.
Walter Gropius to Eames Company. September 16, 1942. Massachusetts.
Walter Gropius to Elmer H. Pratt. June 2, 1967. Massachusetts.
Walter Gropius to Elmer H. Pratt, August 1, 1968, Massachusetts.
Walter Gropius to Speakman Company. July 17, 1958. The Architects' Collaborative, Cambridge, Massachusetts.

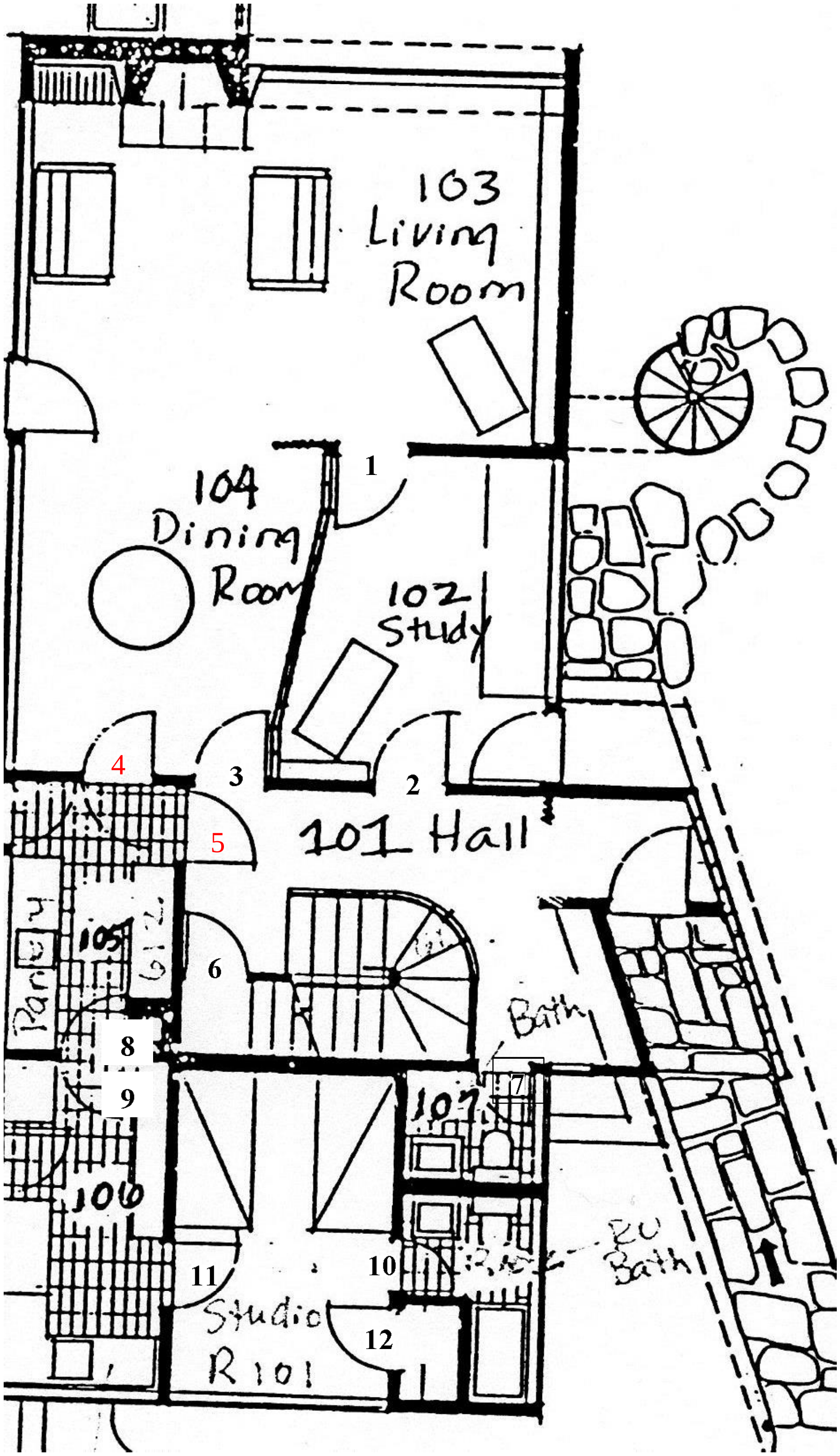
Appendix A: 2014 Interior Door hardware inventory assessment

Two different types of door hardware were noted in the survey of the doors. All bedroom and bathroom doors have a ñprivacyò lockset that includes a bit-keyed deadbolt in the mortise lock assembly. Other doors between more public spaces have a ñpassageò set that does not include a locking mechanism. Closet doors have fixed pulls.

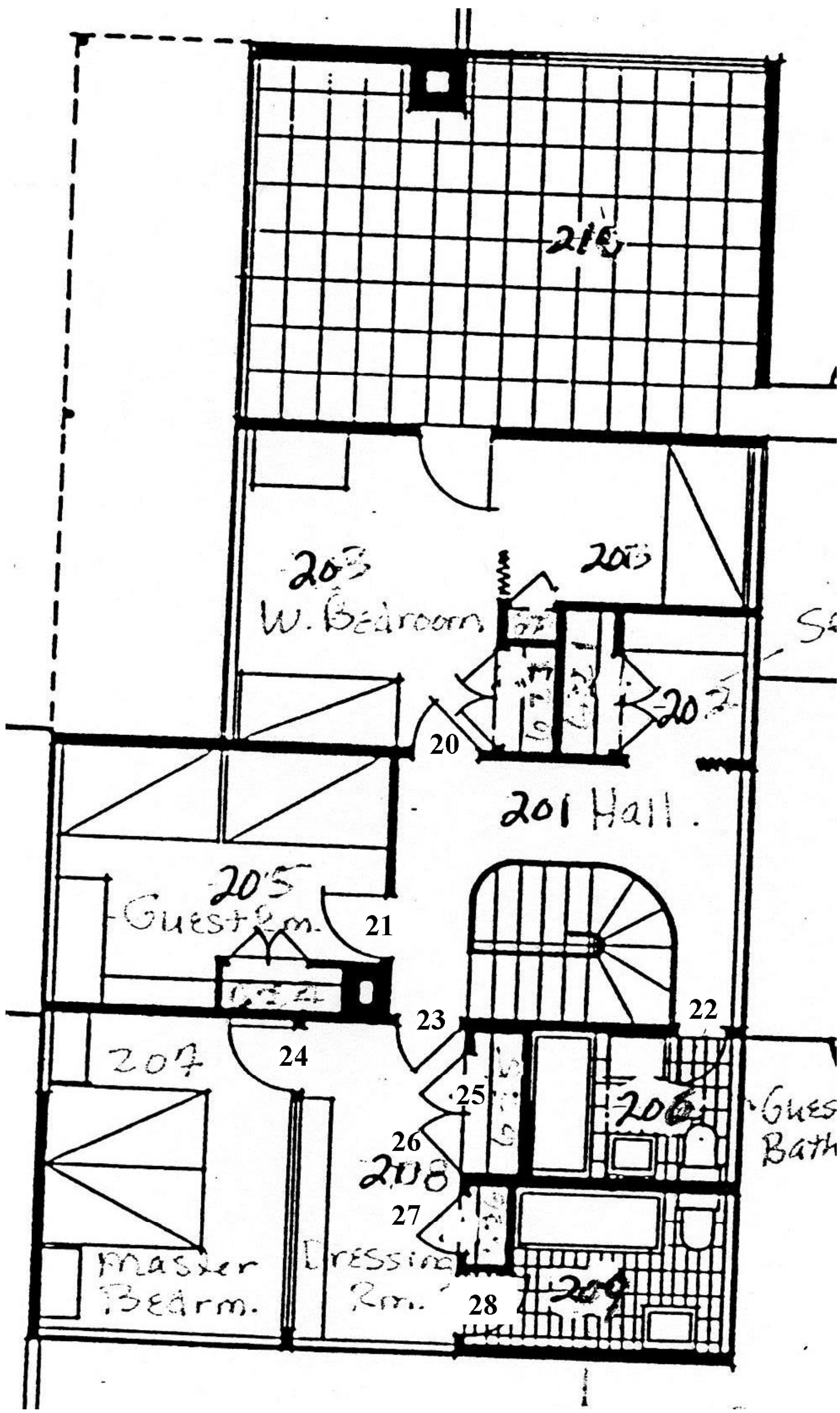
Door	Hardware Type	Condition	CFAD Work	Future work
1	Passage	Sound	Tighten set screws	none
2	Passage	Sound	Tighten set screws	none
3	Passage	Sound	Tighten set screws	none
4	Swing	Fine	None	None
5	Passage	Very loose handle. Kitchen side set screw and spindle stripped. Rosette screw holes stripped	Tightened hall side set screw	Replace spindle? Replace worn spring. Plug and re-drill rosette screw holes
6	Passage	Play in handle	Tightened set screws	Replace worn spring
7	Privacy Lock	Loose handle, lock sticks, loose rosette	None	Replace worn spring (s), disassemble and lubricate lock? Plug and fill rosette screw holes.
8	Swing	Fine	None	None
9	Same as 8?			
10	Privacy lock	Broken spring, stripped screw holes for rosette	Tightened set screws	Replace springs, fill and re-drill for rosette.
11	Passage	Missing screws on Rosette, Knobs entire spindle knob assembly loose	Tightened set screws	Fill holes(?) and replace missing screws #4or #6 x 3/4ò slotted oval head, chrome. Add washers between door knobs and rosettes to tighten.
12	NA	Door missing		
20	Privacy lock	Loose handle, functional	None	Replace worn springs
20a	Closets	One loose pull	None, unable to access	Excavate back side of doors to tighten pull screws
21	Privacy lock	Sound	None	None
21a	Closets	Loose pulls	None, unable to access	Excavate back side of doors to tighten pull screws
22	Privacy Lock	Set screws missing	Replace missing screws	Replace with proper matching set screws, chrome, slot head

Door	Hardware Type	Condition	CFAD Work	Future work
23	Privacy Lock	Sound	None	None
24	Passage	Sound, loose handle	None	Replace worn springs
25	Closet pull	Pull loose	Tightened	Excavate back side of door to tighten pull screws
26	Closet pull	Pull loose	Tightened	Excavate back side of door to tighten pull screws
27	Closet pull	Pull loose	None, unable to access	Excavate back side of door to tighten pull screws
28	Privacy lock	Sound, weak springs, loose rosette	Tightened set screws	Replace worn springs

First Floor - Key to Door Hardware Inventory



Second Floor - Key to Door Hardware Inventory



GROPIUS HOUSE MECHANICAL, ELECTRICAL AND PLUMBING

Property Name: Gropius
Structure: Gropius House
Feature: Mechanical, Electrical, and Plumbing
Original Material: Various
Original Color: Various
1965-1969 Material: Various
1965-1969 Color: Various

RS ID #56571, 2009

Vision Statement and Treatment:
The Gropius House interior will represent, with few exceptions, the house as it appeared between 1965 and 1969 during the last years of Walter Gropius's life. Furnishing will be arranged according to documentation, and will illustrate a "modern house in operation." A balance will be struck, where original material still exists, between retaining the original finishes of the interiors and collections and presenting them as a crisp modern house.[1]

Mechanical, electrical, and plumbing services ï commonly referred to by the acronym ñMEPò - refer to the back of the house services of a building. These are typically the components that are often taken for granted in the 21st century, but which have an important evolutionary history and impact on building use and configuration. For the purposes of this document the utility services include electrical (including lighting), plumbing (including water supply and sanitary drains), heating, ventilation, and air conditioning (including fuel source), and communications (telecom, internet, security, etc.). Any MEP that is visible to the public should be retained for interpretive purposes.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Last updated 2016

- The primary option for historic systems no longer in use is to deactivate the system and leave all the components *in situ*.
- Any visible historic system located above the basement level, whether the space is currently designated museum or other, should be considered part of the historic fabric and great lengths should be taken to preserve the integrity and/or appearance of that system.
- Historic system components hidden behind the walls or otherwise not in general public view should also be considered part of the historic fabric of the system.
- Limited opportunities and space for upgrades may inhibit the ability to save the material.

Electrical

- Maintenance Protocols
  - Lightbulbs may be replaced by site staff or Property Care staff.
  - Lightbulbs are to be replaced ñin-kindò, matching the existing style and wattage.
  - Change in lightbulb type (e.g., change from incandescent to fluorescent or LED) is to be reviewed by Historic New Englandôs Proactive Preservation and Interpretation Planning (PPIP) task force.
- Repair Protocols
  - All necessary electrical repairs are to be performed by a licensed electrician.
  - All repairs are to be logged in property care files so that frequent repairs of an issue can trigger a review for possible upgrading of service.
  - The primary goal should be to leave all previous wiring in place as a record of use and interactions with the site.
    - Space limitations and local code requirements in wall cavities may prevent the retention of older wiring *in situ*.
    - Electrical components (terminals, connectors, switches, resistors, fuse boxes, etc) may have historical value and efforts should be made to retain all the components of those systems *in situ*.
  - Decisions to remove electrical components should be referred to the team leader property care and the PPIP task force may be asked to make a decision.
  - Most lighting fixtures are considered collections items and questions of rewiring should be referred to the collections team. If replacement of the fixture appears to be necessary then the project should be referred to the interpretive task force.

Plumbing

- Only the bathroom in the maidôs room (current staff office) is to remain on-line and available for use.
- Maintenance Protocols
    - Inspection and cleaning of main septic drain line should be performed every other year to clear any tree roots from the pipe.
    - Septic tank pumping shall be periodically scheduled so as not to exceed one pump every three years.
    - Inspect active water lines on a weekly basis to ensure there are no leaks in the system. If a leak is discovered, turn off related valve to stop leaking and contain leak with the use of absorption pads or buckets. The plumber listed on the emergency call sheet should be contacted and property care notified.
- Repair Protocols
    - All necessary plumbing repairs are to be performed by a licensed plumber.
    - Where repairs are necessary, priority will be to retain existing visible features and functionality. For example, all efforts to repair a leaking faucet by replacing internal seats and springs will be done prior to replacing the faucet with a modern fixture. However, internal flush or fill valves hidden in the toilet tank will be replaced as necessary to avoid water leaks and retain functionality.
    - Potential historic fixtures in non-museum locations should be analyzed for their historic value and replaced in conjunction with a decision by PPIP.
    - If it is necessary to replace a working fixture in the office bathroom, consideration should be given to select the most efficient style that is most suitable for the space and its needs. The removed fixtures should be retained for archival purposes.

HVAC

- Maintenance Protocol
    - Filter replacement is to be performed on a semi-annual basis by Property Care staff.
    - Temperature settings are to be set according to the season. Summer air conditioning will be set no lower than 75oF; winter heating will be set no higher than 65oF in the museum and 68oF in the office space. Programmable thermostats are to be set to allow for temperature setbacks (80oF and 58oF respectively) during non-open hours.
    - The gas fired boiler is to be inspected annually in compliance with insurance requirements. This inspection is scheduled by the insurance company.
    - The gas meter is to be inspected as necessary by the utility supplier.
    - The landscape should be kept clear around the outdoor condensing unit.
    - Prior to the use of the AC in the spring, the outdoor condensing unit should be cleaned of gravel that may have been pushed off the driveway due to plowing activities.
- Repair Protocol
    - All repairs to the HVAC infrastructure (gas fired boiler, air handler, outside condensing unit) are to be performed by a licensed HVAC technician.

    - Historic radiator units within the house should be retained in situ if possible as a record of prior equipment for the aesthetic integrity.

Communications

- Repair Protocol
    - All repairs to existing communications services will be coordinated by Information Technology (IT).
    - All repairs to existing security services will be coordinated by Property Care.
    - New, hard wired communications services in the museum spaces or landscape requires review and coordination with PPIP and Property Care.
    - New services requiring additional trenching for conduit access requires review and coordination with PPIP and Property Care.

Original Construction and Evolution:

Original construction of the house incorporated 60 amp electrical service with a fuse box located at the top of the basement stairs. The service location entered the house underground, at the bottom of the basement stairs.

The 1938 drawings show a variety of symbols associated with the installation of electrical outlets and switched ceiling and wall mounted lighting fixtures. The drawings do not appear to indicate any exterior lighting although repair records call for repairs to exterior lighting in as early as 1945. A version of written specifications for the construction of the house is silent on the subject of electricity. The typical electrical wiring of the late 1930s was a cloth insulated two-wire cable with no ground. The service to the fixtures was then controlled by screw in fuses.

The light fixtures are notable on two levels. First is the dining room light fixture that perfectly project a circle of light over the round dining table. The light illuminated the table but did not shine into the eyes of the diners. This fixture is actually a theatre style fixture with a 250 watt lightbulb. Throughout the house, incandescent light bulbs with the bulb half covered in silver were used. These so called ñcrown bulbsò softened the light and prevented direct glare.

With respect to plumbing, the written specifications provide some additional details. The sanitary drain was to have a whole house trap on the main waste line; said trap located 5ô from the building line. All fixtures were to be individually trapped and vented. A grease interceptor was to be installed in ñan accessible position under the kitchen floorò.[2] Water pipes were to be copper with shut offs and draw off valves at each group of fixtures. It appears that hot water was originally provided via a loop of the heating plant as opposed to a dedicated hot water tank. Soil and waste risers in partition walls were to be insulated.[3]

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 51.
[3] Ibid, 52.

The plumbing fixtures were consolidated at the northeast corner of the house with a master bath (toilet, tub/shower, 2 sinks) backed up to the guest bath (toilet, tub/shower, sink). These rooms were then directly above the maidös bathroom and guest bathroom in the entry. A utility sink was then installed at the basement level. The kitchen and pantry sinks are located separately on the southeast and south elevations respectively. The kitchen sink featured an early General Electric garbage disposal. Exterior sill cocks were located on the east and south elevations with an open air outdoor shower head located on the west elevation. Sanitary waste was handled by a cess pool or septic tank that appears to have been located in the driveway area. There is no distinctive language to indicate one or the other.

There is no clear information on the heating plant. It appears that the original heating plant was an oil fired boiler that provided hydronic heating at the perimeter via radiators under the windows. These radiators are largely unseen as they are hidden behind walls with only surface vents allowing heat to wash up to the windows and then to circulate by natural convection. In the bathrooms, the radiators are visible and can serve as towel warmers. For heating the core of the building, it appears as though there was always a separate air handler that would pass air over a hot water pipe and circulate warm air through the house. The specific design of the house with a southern overhang and brise soleil, planned landscape plantings and the siting of the house on a small hill to take advantage of breezes presumably helped with summer time cooling of the house. The only clues to early heating technology are the bones of two hot water boilers located in the basement.

It is unclear if telephone service was in place in 1938. Gropiusô position at Harvard is likely to have made the inclusion of a telephone at the house a necessary part of the arrangement. The original phone number for the house was Clearwater 9-8098. This has evolved to 781-259-8098, which remains the primary phone number for the house.

Character-Defining Traits in the Interpretive Period:
While these various technologies evolve and tend to have a natural lifespan, it is likely that that other than the heating plant, the components in place today were in place in 1938 and in the interpretive period of 1965-1969. Records during the Gropius ownership period indicate several repairs to the various systems, but no wholesale replacement has been noted by the interpretive period.

History of Conservation and Maintenance Practices:
Most significant changes to systems have taken place during Historic New Englandös ownership period.

In 1985 many outlets were upgraded to three wire grounded outlets and existing fuses were replaced with Type S fuses that prevent incorrect amperage fuses from being installed. A trench was dug from the house to the garage in order to provide 2ö conduit and thus provision electrical and communications services from the house to the garage to support a visitor center operation. Over the course of the next few years, various repairs to electrical services ï mostly on the outside of the house ï were at least proposed if not executed upon. By 1995, the service was upgraded to 200 amps. In 1999, the electrical service in the former maidôs room was updated to a series of modern 20 amp outlets to support an ongoing office function at the site. In 2008/2009, the stage light fixture for the dining room table was removed, rewired and reinstalled. In 2010, surge suppression was installed at the main panel.

With respect to plumbing, there are various and inevitable mentions of toilet leaks and garbage disposal failure and replacement(s). The most significant intervention was the installation of a new septic system. It is unclear when this was done although plans were developed as early as 1982. At some point all toilets, sinks, and tubs were taken off line such that only the bathroom in the maidôs room / staff office remains operational. It is not clear what ñoff lineò means in this context as there is the occasional adventurous visitor who assumes the guest toilet is still functional. There is no routine maintenance protocol for keeping the traps wet although there is no overwhelming sewer gas smell indicative of a dried out trap.

Under Historic New Englandôs ownership, the oil fired boiler was replaced with a natural gas boiler sometime in the late 1990s. This work ultimately resulted in the discovery that the underground oil tank had leaked and thus additional remediation efforts mandated by the Massachusetts Department of Environmental Protection were required. Staff in the early 2000s noted that glycol was installed in the hydronic heating system during the 1990s work. Glycol, without proper annual maintenance, can be destructive to pipes. A series of failures in the hydronic heat system were attributed to the glycol and the deterioration it caused on the 1938 piping system. A series of the hydronic heaters and their piping have been taken off line. Additional research is required to determine which radiators are off line and if the failures are in fact due to the glycol use. In 2008/2009, the air handler and outside condensing unit for the air conditioner were replaced with a Carrier Infinity system. This unit is controlled by a programmable thermostat. The perimeter radiators ï of which only a few remain functioning ï are controlled by local Tekmar controls that have limited programming capability.

Throughout the 1990s and 2000s, incremental upgrades to communications systems to support an office function and provide the necessary levels of site safety and security have been performed. Currently, the site is serviced by Verizon FIOS fiber optic service. This service runs through existing conduit from the street (Baker Bridge Road) to the basement of the house. Data communication cable runs back down through adjacent conduit to the garage in order to provide basic point of sale service to the visitor center function. In 2016, a project involving the use of internet provisioning of digital signage resulted in the installation of the large screen TV with separate data feed in the visitor center. There is at least one wireless access point installed in the house which provides wireless services for visitors and staff. The security system provides coverage for fire, intrusion, motion, and miscellaneous object protection. Primary communication is over a POTS phone line to a monitoring station with backup coverage by an AT&T cellular connection. Any alarm detection results in the immediate dispatch of the Lincoln police department.

Interventions

2016: Replaced blower motor in AC condensing unit.

2016: Outlet on south wall of living room was identified as not working, but needed to power a lamp. Investigation revealed that the outlet had been taken off line at an unknown previous date. There was evidence of arcing on the cover plate and the supply wire was not active. At this time this outlet remains offline as access via the crawlspace is questionable.

2016: Installed new cellular communicator module in alarm system.

2016: Installed new outlet in visitor center wall to accommodate mounting of large screen TV for digital signage. Work involved drilling through 2ò bracing behind the drywall in order to pull the cable from the existing box located at the base of the wall.

2015: Clogged condensate drain caused leaking on basement floor; drain unclogged.

2015: Curbstop for oil leak inspection port was replaced due to plow damage.

2013: Replaced capacitor and control board in AC condensing unit after snake invasion shorted system. Repairs done just under the wire for warranty coverage.

2013: Septic system pumped (1,000 gallons).

2013: Tree roots augered out of main waste drain.

2011: Replaced failed ignitor in gas boiler.

2011: Septic system pumped (1,000 gallons).

2010: Leak appeared in ceiling of maidõs room. This leak was traced to the hot water radiator located in the dressing room above. The supply line for this radiator was valved off and cut in the basement and the leak has not recurred.

2010: Surge suppression was installed on the main panel located in the northeast corner of the basement.

2010: Septic system pumped (1,000 gallons).

2008: New Carrier air handler and outside condensing unit installed.

2002: Underground oil tank removed and leak remediation occurred.

2000: By this date a new septic system is in place based on a Title V inspection report and the feasibility of adding a bathroom at the visitor center. It is unclear exactly when the septic system was installed. The size is noted as 1,500 gallons in the report and the tank is located in the southwest part of the driveway near the steps to the rear entry.

GROPIUS HOUSE OVERALL LANDSCAPE

Property Name: Gropius **Structure:** Landscape **Feature:** Overall Landscape **Original Material:** White oak, white pine, red oak, Dutch elm, American beech, red cedar, Austrian pine, grass, Baldwin apple trees, creeping phlox, Euonymus, tulips, roses, cotoneaster, smoke bush, Japanese Andromeda, mountain laurels, bittersweet vine, trumpet vine, wood, steel, gravel, bluestone, fieldstone. **Original Color:** Pink, white, ñalmost-black,ò yellow, gray, green, salmon, etc.	 RS ID #270362, 2016
1965-1969 Material: White oak, white pine, red oak, red cedar, Austrian pine, dogwoods, blue cedars, Canadian hemlocks, Sargent crabapple, Japanese yew, spindletree, white fringetree, grass, Baldwin apple trees, Japanese maple, cotoneaster, smoke bush, Japanese Andromeda, mountain laurels, candytuft, Artemisia, annuals, wildflowers, yucca, pachysandra, phlox, peonies, irises, daffodils, euonymus, roses, bittersweet vine, trumpet vine, steel, gravel, bluestone, fieldstone, wood. **1965-1969 Color:** Red, pink, yellow, salmon, gray, green, blue, white, etc.	

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

The landscape features at the Gropius house were used for more functional and architectural purposes than their counterparts in more traditional designs. Thus, stone walls, trellises, the screen porch, the Japanese Garden, large trees, and plants that run along the buildingþs borders such as wintercreeper all defined the ñoutdoor roomsò which extended from the house. Thus, functionalism should be considered in the maintenance of these spaces. Views from the house and terrace are another essential part of Gropiusþs landscape design, and they should be preserved by cutting back unnecessary growth and maintaining the features that frame the views. A third reason to carefully monitor the condition of features like the large trees and stone walls is that they were meant to be functional in protecting the house from the weather and providing seats in the garden. The Japanese garden and the planting composition that mirrors the Filipowski sculpture on the north lawn are also important because they represent orientalism and modern art, which were two common features of the modern landscape. Finally, the maintenance of the landscape as a whole should be such that plants closer to the house are highly cultivated, while those towards the propertyþs edges are more natural in appearance.

Maintenance and Repair Protocols:
The overall care of the property should preserve its clean lines and sense of place. Scale of plantings is an important consideration, as trees were normally meant to frame spaces rather than dominate them. Finally, the maintenance of the landscape as a whole should be such that plants closer to the house are highly cultivated, while those towards the propertyþs edges are more natural in appearance. See Japanese Garden, Landscape Circulation, Lawns, Orchard, Plantings, Stone Walls, Trees, and Trellises sections of this document for further maintenance guidelines.

Original Construction and Evolution:
For the location of his house Gropius chose a small, relatively bare hill with a pre-existing apple orchard near the base of its slope.[2] The top of the hill was leveled in 1937 in order to facilitate construction.[3] Gropius kept previously-built drystone walls near the southernmost

---

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 4.
[3] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston

and northernmost edges of the property, and he added his own stone walls made with mortar and flagstone caps in the south lawn and along the west façade *(Figure 1)*.[4] Any areas of the lawn that were excavated for construction were backfilled and planted with grass, which was cropped close near the house but allowed to grow more freely in the orchard meadow and in areas closer to the boundaries of the property.[5] Circulation among these spaces consisted of a gravel driveway that led up toward the house and ended near the top of the hill in a circular turnaround, as well as flagstone paths at the northwest corner of the house, under the marquee, and around the perennial garden in the backyard.[6] Flagstones also made up a patio behind the house.[7]

Figure 2: Plantings along driveway, circa 1940-50
Historic New England Archives, Binder of Slides

The first plantings that Gropius added to the landscape were trees, including two white pines, a Dutch elm, a red oak, red cedars, and Austrian pines.[8] A previously existing white oak was retained near the southernmost stone wall.[9] Mountain laurels, a cotoneaster, and Japanese Andromeda were planted in front of the house near the entry, and there was a

---

University, 1996), 14. Ise F. Gropius (lecture, 1939), 36.
[4] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 12 and 15.
[5] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 9. Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[6] Gropius and Breuer, ñSpecifications,ò 10. Kramer, *Restoration Plan*, 18.
[7] Kramer, *Restoration Plan,* 18.
[8] Gropius, ñGropius House,ò 18.
[9] Gittleman, ñThe Gropius House,ò 31.

smoke bush by the east façade.[10] Wintercreeper was planted along the east trellis, around the porch, and at the northwest corner of the house.[11] A bittersweet vine was located west of the porch while a trumpet vine climbed the house to the east.[12] South of the porch there was a perennial bed filled with tulips and creeping phlox, with two lally columns forming a viewfinder at its southern end.[13] There was a climbing rose on one of the lally columns, and roses also climbed up the trellises and stone walls in the garden.[14]

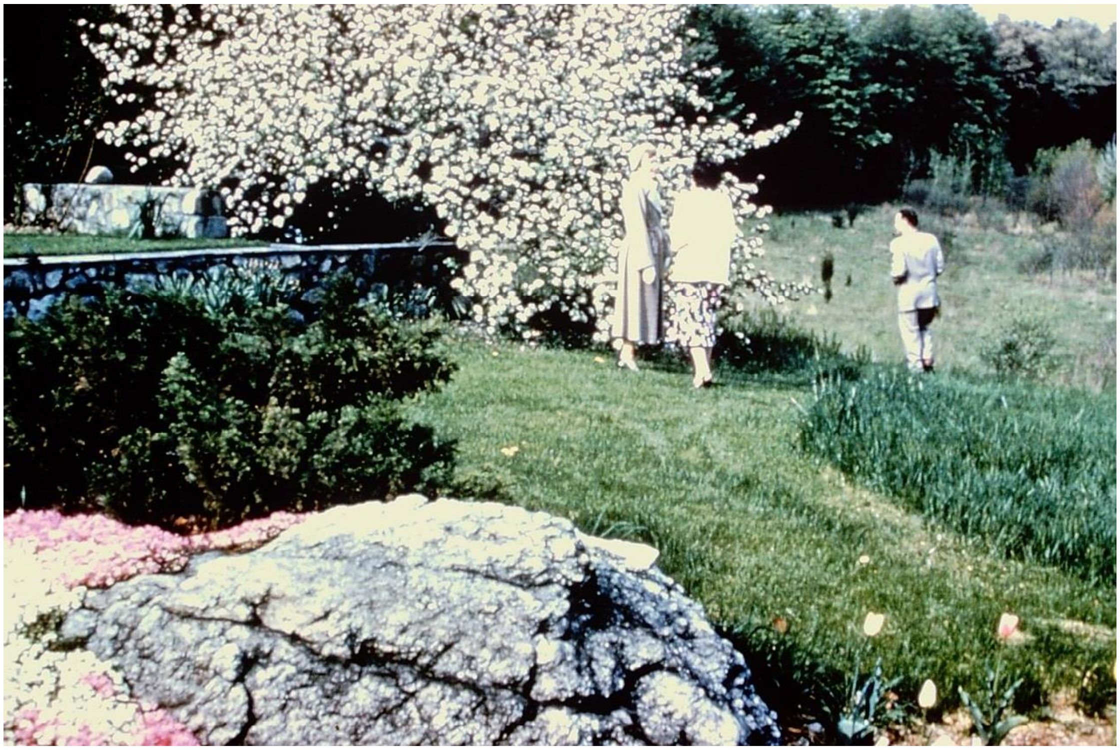


Figure 3: Backyard, circa 1940-50
Historic New England Archives, Binder of Slides

The landscape matured significantly between 1937 and the interpretive period. Canadian hemlocks and white pines were planted around the garage, and Gropius also added ornamental trees such as dogwoods, blue cedars, Sargent crabapples, Japanese yews, a spindletree, and a white fringetree to the site.[15] Wildflowers, daffodils, and annuals grew near the base of the house in several places, pachysandra flourished under a large tree in the south yard, and yucca was planted next to a modern sculpture in front of the north façade.[16] Small flower beds were also formed in the garden with irises, daffodils, phlox, and

---

10 Walter Gropius and Marcel Breuer, *Gropius Residence, Lincoln, Massachusetts*, 1938: Landscaping Plan, 1938, Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge. Kramer, *Restoration Plan*, 16.
11 Gropius and Breuer, *Gropius Residence*. Kramer, *Restoration Plan*, 16.
12 Gropius and Breuer, *Gropius Residence*.
13 Kramer, *Restoration Plan*, 16. *Cultural Landscape Treatment Report for Gropius House, Lincoln Massachusetts*, report (Portland, ME: Mohr & Seredin, Landscape Architects, Inc., 2001), 33.
14 Kramer, *Restoration Plan*, 16 and 18. Gropius and Breuer, *Gropius Residence*.
15 Gropius and Breuer, *Gropius Residence*. Gropius, ñGropius House,ò 18.
16 Kramer, *Restoration Plan*, 16, 17, and 18.

peonies.[17] In 1957 the perennial bed was entirely replaced except for the lally columns and climbing rose.[18] It was redesigned as a Japanese-style gravel garden, containing candytuft, Artemisia, cotoneasters, azaleas, and a Japanese maple.[19] The landscape feature that suffered the most during this period was the orchard, where trees began to die after the death of Gropiusôs benefactor and the owner of the property, Mrs. Helen Storrow.[20] The subsequent owner had very little interest in their productivity.[21] Finally, Gropius bought an aluminum sculpture from modern architect Richard Filipowski and placed it in his front lawn *(Figure 4)*.[22] When it was eventually damaged by playing children sometime after 1950, it was sold to new owners and replaced with another aluminum Filipowski sculpture called ñWhite Pineò that remains today *(Figure 6)*.[23]

Figure 4: First Richard Filipowski sculpture, circa 1950-57
Historic New England Archives, Binder of Slides

[17] Ibid., 17 and 18. Cochrane, *Landscape Renovation*, 19.
[18] Kramer, *Restoration Plan*, 18.
[19] Ibid.
[20] Walter Gropius to Charles Lord, September 16, 1956, Massachusetts.
[21] Ibid.
[22] Richard Filipowski, "Interview with Richard Filipowski," interview by Peter Gittleman, October 20, 2000, accessed December 01, 2016, ResourceSpace, keyword: Filipowski, 4.
[23] Ibid., 5. Gropius chose ñWhite Pineò because it was made of white metal, which Filipowski argued ñwas almost a tradition with the Bauhaus.ò

Character-Defining Traits in the Interpretive Period:
The Gropius House landscape was defined early on by the five large trees planted by the architect himself, which extended the lines of the house to create ñoutdoor roomsò with their canopies and strategic placement (see Appendix A for the locations of these trees).[24] These ñroomsò were also defined by carefully measured spaces, such as the southeast and southwest lawn areas with dimensions matching those of the porch, the backyard and garden between the parallel south façade and rough stone wall, and plantings that created borders within the landscape.[25] The trellises were the most tangible extension of the house into the garden, and they created permeable ñwallsò that screened the public driveway from the private backyard.[26] From these ñrooms,ò especially the raised flagstone patio, the visitor was meant to appreciate the views from the hill framed by major trees and maintained by the cropping of the lawn in the south meadow.[27] Plantings growing on the walls within each ñroom,ò including the trellises, the house, and the stone boundaries, provided ornamentation on the otherwise stark Bauhaus home.[28]

The trees also represented the carefully arranged ñlevelsò of cultivation within the landscape, with the more delicate ornamental ones dotting the garden and the larger oaks and pines standing close to the edges of the property.[29] The lawns and stone walls made the same progression; the grass was cropped closely in the garden and allowed to grow high in the orchard meadow and lower fields, and Gropius retained the old drystone walls at the edges of the property while building new ones with mortar and flagstone capping closer to the house.[30] In these features he blended traditional New England design with the functionalism of the Bauhaus; the benches and flagstone capping of the new stone walls facilitated sitting and mowing, and the trees were practical in their protection of the house and their fulfillment of the human need for beauty.[31]

---

[24] Kramer, *Restoration Plan*, 2.
[25] Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, 8. Kramer, *Landscape History*, 5. Cochrane, *Landscape Renovation*, i-ii. Gropius and Breuer, *Gropius Residence*.
[26] "Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset," *Boston Evening Transcript*, January 07, 1938. "RE: Landscaping and Garden of Gropius House," Ati Johansen to Peter Gittleman, October 04, 1999, Stanfordville, New York.
[27] Kramer, ñNew England Landscape,ò 11. Gropius, ñGropius House,ò 19.
[28] ñGropius Plans Modern Houses,ò *Boston Evening Transcript.* Kramer, *Restoration Plan*, 4 and 16. Cochrane, *Landscape Renovation*, 14-15.
[29] Cochrane, *Landscape Renovation*, i.
[30] Ibid. Kramer, *Restoration Plan*, 15 and 3.
[31] Kramer, ñNew England Landscape,ò 19 and 6. Kramer, *Restoration Plan*, 16 and 2.

Figure 5: Landscape in winter, 1966
Historic New England Archives, Binder of Slides

In thus merging architectural traditions, Gropius developed a new and experimental style. This experimentation was typical practice among modern architects, who often included oriental elements in their designs as well.[32] With his Japanese garden Gropius is no exception to this rule; the Japanese style likely appealed to him because it was low-maintenance, a quality valued in the Bauhaus.[33] Gropius also paid homage to modern art with a planting arrangement in the south lawn that intentionally echoed a Richard Filipowski sculpture in front of the house.[34]

History of Conservation and Maintenance Practices:

Some of the landscape maintenance carried out after Gropiusôs death related to the site as a whole rather than a particular feature. For example, the property was sprayed for poison ivy in 1973 and similar work was planned again two years later.[35] In 1980 the sale of a ñside lotò was discussed as an eventual inevitability, but the area of the landscape that this lot composed was not specified.[36] Three years later, as part of their preparations to take over the property from Gropiusôs aging wife, the Society for the Preservation of New England Antiquities (SPNEA) hired a resident overseer to care for the house.[37] His duties included

---

[32] Kramer, *Restoration Plan*, 18.
[33] Mohr & Seredin, *Landscape Treatment Report*, 32.
[34] Kramer, *Restoration Plan*, 4.
[35] Brine Tree Surgery, Inc. Invoice, (Boston, MA: Historic New England archives, 1973). Brine Tree Invoice, (Boston, MA: Historic New England archives, 1975).
[36] Daniel M. Lohnes to Ise Gropius, March 7, 1980, Massachusetts.
[37] "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from L. M. S, April 08, 1983.

general grounds care.[38] In 1985 the removal of a doghouse and an unspecified fence as well as the removal of brush piles from the south lawn were included on a SPNEA to-do list.[39] By 1989 brush and wood materials from landscape projects needed to be burned, and a year later issues with gypsy moths and milky spore disease were reported.[40] 1990 also saw the continued progression of a ñplant planò with the help of Ise Gropiusôs friend and landscape architect, Phoebe Bruck.[41] However, no further details on this document are available.

By 1991 debris required burning again.[42] In 1997 erosion along the drive was in danger of washing into a condenser, which needed to be hidden from view.[43] Junipers and a drystone wall were proposed methods for concealing the condenser, and it was suggested that increased ground cover would limit erosion.[44] By 2000, weeding was necessary all over the landscape.[45] In 2001 a Save Americaôs Treasures (SAT) grant project was being undertaken at the property, and paperwork was completed to ensure that the work had no effect on the wetlands to the south of the house.[46] In 2015 a deer block was purchased in order to protect the yews along the driveway and near the marquee.[47]

Figure 6: Filipowskiôs ñWhite Pine,ò 2001
Historic New England, Property Care Binders

---

38 Ibid.
39 Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985).
40 "Winter Projects," Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret, August 28, 1989, Massachusetts. Peter Gittleman and Kathy, untitled notes, (Waltham, MA: Historic New England Property Care Files, 1990).
41 ñTimetable for the completion of the Interior Restoration at the Gropius House,ò (Waltham, MA: Historic New England Property Care Files, 1990).
42 George Riley & Philip Bevins, ñWinter 1991 Projects: Gropius House,ò (Waltham, MA: Historic New England Property Care Files, 1987).
43 Betsy Igleheart, "Condenser Planting and Retaining Wall at Gropius House," e-mail to Jeff Wallace, August 27, 1997.
44 Ibid.
45 "Landscape Problems at Gropius," Maryanne Zephir to Dianne McGuire, July 12, 2000, Gropius House, Lincoln, Massachusetts.
46 "Gropius House: WPA Form 1 Request for Determination of Applicability," Tatyanna Seredin to Tom Gumbart, April 24, 2001, Mohr & Seredin Landscape Architects, Inc., Portland, Maine.
47 Agway Invoice, (Waltham, MA: Historic New England Property Care Files, 1987).

Interventions

2015: Deer block purchased; intended to protect the yews along the driveway and near the marquee
2001: Paperwork completed to ensure SAT grant project did not affect wetland
2000: Weeding necessary everywhere
1997: Concealing of condenser with drystone wall and junipers proposed. Increased ground cover suggested as means of preventing erosion along driveway from washing into condenser.
1991: Burning of debris necessary
1990: Problems with gypsy moths and milky spore disease. Intention to continue ñplant planò started in 1988 with Phoebe Bruck; no further details available.
1989: Brush from various landscape projects needed to be burned
1985: Maintenance list included removal of doghouse and unspecified fence and elimination of brush piles on south lawn
1983: Resident overseer hired for property. Duties included general grounds care.
1980: Intention to sell unspecified ñside lotò expressed
1975: Poison ivy spraying planned
1973: Landscape sprayed for poison ivy
1937: Top of hill leveled for construction of house. Stones and pinecones brought to site from elsewhere.

BIBLIOGRAPHY

Agway Invoice. Waltham, MA: Historic New England Property Care Files, 1987.
Brine Tree Invoice. Boston, MA: Historic New England archives, 1975.
Brine Tree Surgery, Inc. Invoice. Boston, MA: Historic New England archives, 1973.
Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.
Cultural Landscape Treatment Report for Gropius House, Lincoln Massachusetts. Report. Portland, ME: Mohr & Seredin, Landscape Architects, 2001.
Daniel M. Lohnes to Ise Gropius. March 7, 1980. Massachusetts.
Filipowski, Richard. "Interview with Richard Filipowski." Interview by Peter Gittleman. October 20, 2000. Accessed December 01, 2016. ResourceSpace. Keyword: Filipowski.
Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.
"Gropius House: WPA Form 1 Request for Determination of Applicability." Tatyanna Seredin to Tom Gumbart. April 24, 2001. Mohr & Seredin Landscape Architects, Inc., Portland, Maine.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
Gropius, Walter, and Marcel Breuer. *Gropius Residence, Lincoln, Massachusetts, 1938:*

Landscaping Plan. 1938. Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Igleheart, Betsy. "Condenser Planting and Retaining Wall at Gropius House." E-mail to Jeff Wallace. August 27, 1997.

Kathy and Gittleman, Peter, untitled notes. Waltham, MA: Historic New England Property Care Files, 1990.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997.

"Landscape Problems at Gropius." Maryanne Zephir to Dianne McGuire. July 12, 2000. Gropius House, Lincoln, Massachusetts.

Riley, George & Philip Bevins. ñWinter 1991 Projects: Gropius House.ò Waltham, MA: Historic New England Property Care Files, 1987.

"RE: Landscaping and Garden of Gropius House." Ati Johansen to Peter Gittleman. October 04, 1999. Stanfordville, New York.

"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from Lynne M. Spencer. April 8, 1983. Massachusetts.

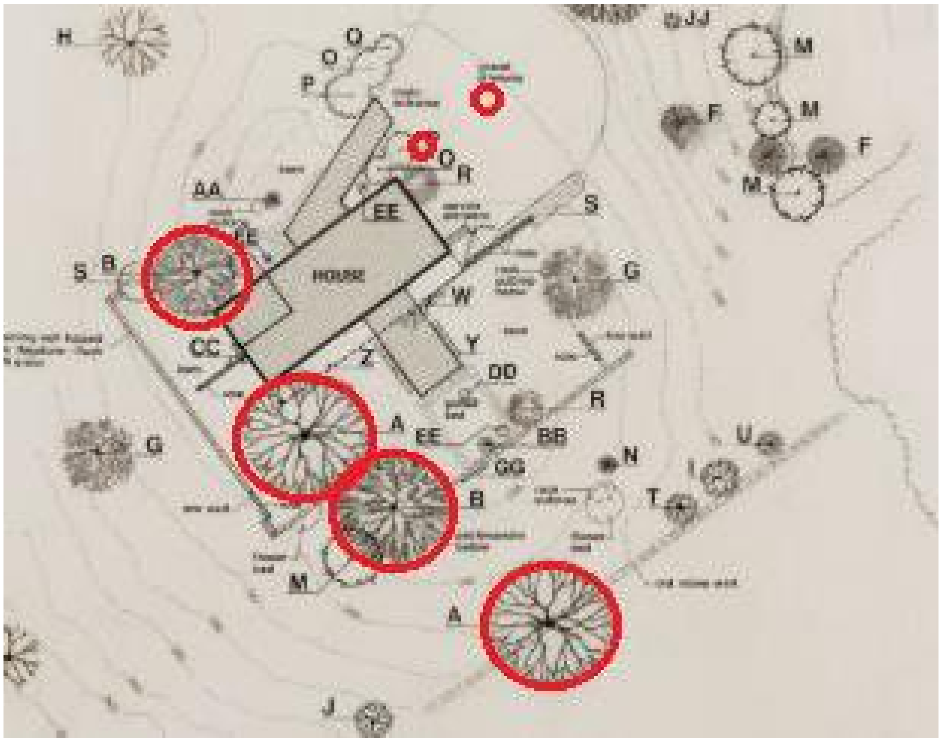
ñTimetable for the completion of the Interior Restoration at the Gropius House.ò Waltham, MA: Historic New England Property Care Files, 1990.

Walter Gropius to Charles Lord. September 16, 1956. Massachusetts.

"Winter Projects." Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret. August 28, 1989. Massachusetts.

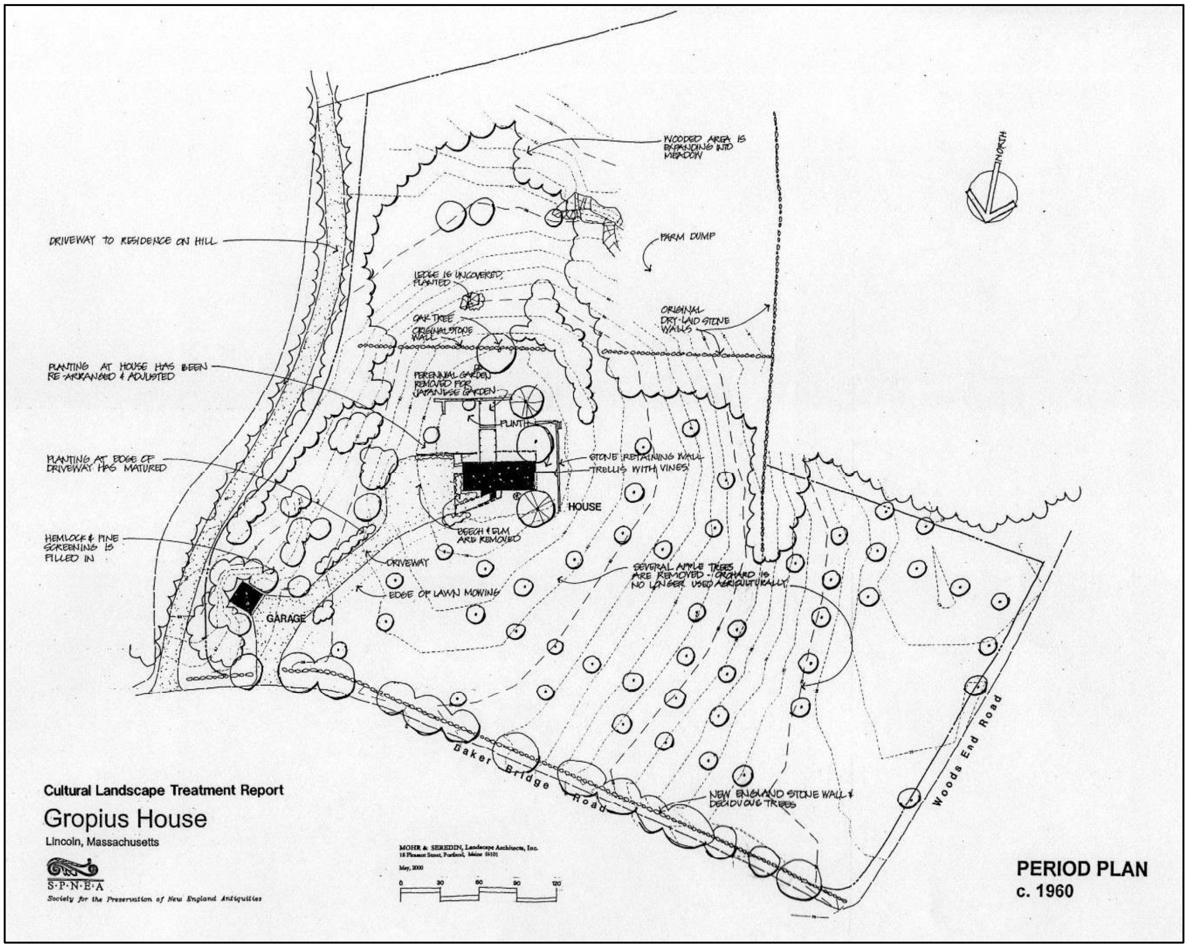
APPENDIX A: Original Landscaping Plan

Walter Gropius and Marcel Breuer, 1938, Busch-Reisinger Museum, Harvard Art Museums



Red circles indicate approximate locations of six trees Gropius originally planted before construction

APPENDIX B: Circa 1960 Landscape Plan



Mohr & Seredin Landscape Architects, *Cultural Landscape Report*, 2001

GROPIUS HOUSE LANDSCAPE CIRCULATION

Property Name: Gropius **Structure:** Landscape **Feature:** Landscape Circulation **Original Material:** Gravel, bluestone **Original Color:** Gray **1965-1969 Material:** Gravel, bluestone **1965-1969 Color:** Gray	 RS ID #281063, 2016

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

Pathways within the Gropius House landscape need to be kept as clear and straight as possible, as they are an extension of the Bauhaus architecture on the site. The driveway should be functional at all times, and should match its appearance in historic photographs from the late 1960s.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

Driveway

- Historic specifications called for a binder with a thin layer of screenings ñ½ò maximum size and down to stone dustò.[2]
- ñThe center grades [were] formed to an even hard surface 6ò below the finished grade and, or, to grades as shown with a crown of ½ò to the footò[3]
- Maintenance Protocol
    - Due to general erosion and the inevitable winter plow work, the driveway should be regraded annually (ideally in April) in order to establish appropriate coverage of the oil inspection port in the driveway, re-establish the drive at a level consistent with the metal edging, and fill in assorted ruts and potholes. This work is especially important in the area to the north of the garage/visitor center which takes the heaviest parking toll and thus tends to generate depressions which result in large puddles. The stone pushed by the plows into the adjacent grass areas should also be raked out to the driveway at the same time.
        - Loosen the gravel driveway with a scraper blade to prepare the surface. The driveway must be loosened to the depths of potholes to prevent them from reappearing.
        - Scrape the gravel from the edges of driveway to the center, creating a crown.
        - Feather gravel out lightly to the edges of the driveway
        - Pack the gravel after the final grade is created
    - The driveway should have a center crown.
    - Potholes should be filled and hand tamped as they develop.
    - The driveway has a metal edge that is not historic but provides a clean boundary between the lawn and the drive. It should be maintained, and its replacement should be discussed.
- Repair Protocol
    - Excavate out to a depth of about 8 inches
    - Lay a 4-inch base of ¾-inch gravel
    - Install 4-inch top layer of ½ò gravel down to stone dust mixture (Crusher run)
    - Compact both layers separately
    - Create a center crown

Metal Edging

- The metal edging along the driveway is not a historic feature and if replacement is necessary or desired, that replacement should be reviewed internally.

---

[2] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 11.
[3] Ibid., 10.

Turnaround at top of driveway

- Although impractical at the moment because of the way in which parking is currently used at the top of the driveway, the turnaround was a feature in the landscape for a significant amount of time and should be considered for replacement when a parking solution for the site is determined.

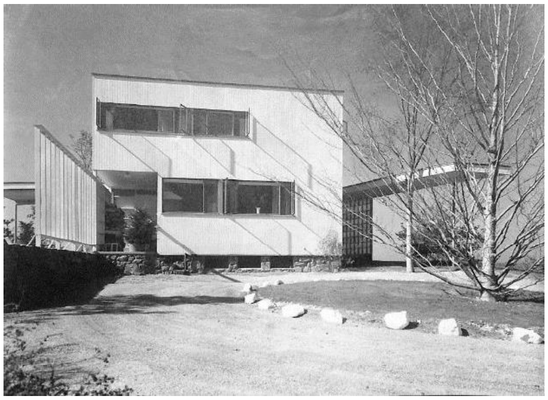
Pathways

- Bluestone flagstones were set in the ground. They are 1ò thick where laid in concrete and 1 ½ò thick where laid in earth.
- Maintenance Protocol
  - The stone path/patio on the south side of the living room is bound by flagstones set vertically to provide a stable boundary against which the horizontally bedded flagstones have been set. The vertical stones should be inspected annually to ensure that they have not subsided thus allowing the horizontal flagstones to ñcreepò towards the building.
  - The flagstone paths should be top dressed at least annually (April) to minimize trip hazards.
- Repair Protocol
  - While Gropius allowed grass to grow between the flagstones, current foot traffic has made re-establishing grass in these spaces impractical and infeasible.
  - Testing of different materials still needs to take place starting with moss to at least emulate green organic matter. Currently the area is dressed with dirt. Dirt and stone dust are not great options because the goal is to minimize loose dust and dirt at the entryway as it gets tracked into the house. If treatment continues to be problematic a polymeric stone dust could be applied to test its effectiveness.

Original Construction and Evolution:
The specifications for the Gropius House include the construction of a driveway and turnaround ñfrom the side toward the centerò of the property, ñslightly rounding in the middleò.[4] Any boulders appearing at least four inches under the drivewayôs surface were removed, and ñthe center grades [were] formed to an even hard surface 6ò below the finished grade and, or, to grades as shown with a crown of ½ò to the footò.[5] The foundation coat was made up of crushed stone partly collected during the excavation of the site, and it was applied to the driveway in a 2ò-thick coat.[6] Screenings were then watered and rolled onto the surface, with a top coat of no more than ñ½ò maximum size and down to stone dustò.[7] In the center of the round turning area at the top of the driveway there was a grassy circle surrounded by a border of stones *(Figure 2)*.[8]

---

[4] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 10.
[5] Ibid., 11 and 10.
[6] Ibid., 11.
[7] Ibid.
[8] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 18.




Figures 2 and 3: Circular turnaround at top of driveway, Paul Davis, 1939-40 and same area in 2016
Historic New England Archives, Binder of Slides and RS ID #270431

Other means of circulation throughout the landscape included bluestone flagstones set in the ground.[9] They were 1ò thick when laid in concrete and 1 ½ò thick when laid in earth.[10] These stones formed a patio on the south lawn, led to the entry under the marquee, and were used as steppingstones at the northwest corner of the house *(Figures 4 and 6)*.[11] A path also bordered the porch and southern perennial garden, which was later replanted in the Japanese style *(Figure 3)*.[12] In addition, paths of mown grass provided a means of reaching the backyard from northeast and northwest of the house *(Figure 5)*.[13]

While no exact dates are known for the creation of either the paths or the driveway, they were probably formed while the house was being built between 1937 and 1938. Only the mown paths and the flagstones around the porch and garden were not included in the specifications, and very early photographs show the path around the porch and garden and a completed driveway in front of the north façade. Most changes to the features between the houseôs construction and the interpretive period are minimal and consist of proposals or acknowledgements of damage rather than definitive work.[14] By 1941 grass was already growing between the flagstones forming a patio to the southwest of the house, but there is no evidence that Gropius considered this to be problematic.[15] The most significant project carried out on the driveway during the Gropiusô time took place in 1969, when a 4ô dry well was dug in the drive and filled with stone 2ò deep.[16] The well was then covered with either plastic or a small stone.[17] The related invoice indicates that the cost of ñprevious workò was included in the price, but the nature of this work is unspecified.[18]

[9] Gropius and Breuer, ñSpecifications,ò 17.
[10] Ibid.
[11] Ibid., Kramer, *Restoration Plan*, 18.
[12] Ibid.
[13] Kramer, *Restoration Plan*, 18. Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, 4.
[14] Walter Gropius to the Boston Ice Company, May 29, 1953, Massachusetts.
[15] Kramer, *Restoration Plan*, 16.
[16] George E. Cunningham Co. Invoice, (Boston, MA: Historic New England Archives, Family Papers, Section IV, 1969).
[17] Ibid.
[18] Ibid.

Figure 3: Steppingstones around porch and perennial garden bed, Paul Davis, 1939-40
Historic New England Archives

Character-Defining Traits in the Interpretive Period:
Due to the consistency in the landscape circulation between Gropiusôs arrival at the property and the interpretive period, the features had retained their original aspects of significance by the late 1960s. For example, the driveway and paths had been designed to reflect the architecture of the house by creating ñoutdoor rooms defined by lines on the groundò.[19] These lines were located at edges of the driveway, the patio, and the paths. The drive and paths not only created these ñroomsò but provided means of moving among them, which highlights the functionalism inherent in Bauhaus design.[20] In addition, the flagstone patio facilitated enjoyment of the views deliberately incorporated into the landscape design as a whole.[21]

[19] Ibid., 3.
[20] Walter Gropius, "The Small House of To-day," *The Architectural Forum*, March 1931, 270.
[21] Kramer, ñNew England Landscape,ò 11.

Figure 4: Flagstones southwest of the house, Jane Thompson, 1969
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
Repairs to the driveway were proposed in 1939 and 1945, and they may have been carried out after damage from fuel truck leakages in 1953.[22] Grass was already growing between the flagstones on the patio by 1941, but there is no evidence that Gropius considered this to be problematic.[23] Flagstone repair took place in 1976, but it is unclear what this work entailed and which stones were involved.[24]

Figures 5 and 6: Flagstones along the north elevation and under the marquee, circa 1950-57
Historic New England Archives, Binder of Slides

[22] Gropius to the Boston Ice Company.
[23] Kramer, *Restoration Plan*, 16.
[24] E. Tebo Invoice, (Waltham, MA: Historic New England Property Care Files, 1976).

By 1985, the driveway was in poor condition due to subsidence, erosion, and an inappropriate stone cover.[25] Tom Cochrane, a landscape consultant working with the Society for the Preservation of New England Antiquities (SPNEA), recommended that the light-colored pea stone be replaced by four inches of ñcrusher runò that matched the dark gray color of the driveway as seen in photographs from the 1960s *(Figure 6)*.[26] He wrote that the pea stoneôs mobility caused some of the drivewayôs erosion problems, and that the new mix of gravel and stone dust would drain better than its predecessor.[27] The covering replacement would require the regrading of the area.[28] Ryerson steel edging was likely added to the west side of the driveway in at some point around this time, because its presence was recorded for the first time in Cochraneôs 1988 report.[29] He wrote that it was not historically accurate and had caused vehiclesô tires to pop, so he recommended its removal.[30] He also argued that the juniper trees to the east were crowding the drive.[31] Finally, he asserted that the area between the east stone wall and the garage could be cleared to the eastern property line and used as a parking lot, and that the drive could be expanded at its western base to facilitate the maneuvering of vehicles in that space.[32] His other suggestions included widening the flagstone entry path without jeopardizing the important trees in the area, and selectively placing flagstones on the lawn where there was a high level of traffic.[33]

Figure 6: Fine, dark gravel of the driveway, 1963
Historic New England Archives, Binder of Slides

[25] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), 8.
[26] Ibid., 9.
[27] Ibid.
[28] Ibid.
[29] Ibid., 8.
[30] Ibid., 8 and 9.
[31] Ibid., 8.
[32] ñGropius Landscape Renovation (Suggestions & Recs.),ò (Waltham, MA: Historic New England Property Care Files, 1987), 1. Cochrane, *Landscape Renovation*, 9.
[33] ñGropius Landscape,ò 1 and 3.

One year later Phoebe Bruck, a landscape architect who had worked with Gropiusôs wife Ise, noted that the original circular turnaround at the top of the drive had all but disappeared.[34] She argued that the shape had never had ña place in the modernist design vocabularyò, and that the turnaround should be completely squared off.[35] By 1989 wintercreeper was overwhelming the flagstones, which needed to be reset.[36] The driveway gravel still needed to be replaced with smaller, darker stones, and parking space at the property was still scarce *(Figure 7)*.[37] Bruck argued that the driveway should be widened to better match the proportions of the house and orchard.[38] There was also a debate as to whether or not the metal edging of the drive should be retained.[39]

Figure 7: Flagstones under marquee and driveway gravel, 1989
Historic New England Property Care Binders

[34] Phoebe Mason Bruck, "Phoebe Mason Bruck's Comments on the Gropius Landscape," interview by Tom Cochrane, 1988, 1.
[35] Bruck, ñBruckôs Comments,ò 2.
[36] Pheobe Bruck, "Gropius House Landscape," interview by Peter Gittleman, April 21, 1989, 8-9. "Winter Projects," Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret, August 28, 1989, Massachusetts.
[37] Bruck, ñGropius House,ò 21.
[38] Ibid., 21 and 22.
[39] Ibid.

Projects intended for completion in 1990 included relaying the flagstones and addressing an unspecified issue with the driveway edging.[40] By 1991 the possibility of creating additional parking east of the driveway was still under consideration, and subsequent impacts of the work such as the removal of trees and the change in the garageõs appearance were discussed.[41] The flagstones were still choked with wintercreeper, giving the paths a ñramblingò feel that was not representative of Gropiusõs design intentions; the flagstones were meant to ñlead straight out from the houseò in a ñcrisp architectural statementò, so they needed to be reset.[42] Finally, more gravel was budgeted for the driveway that year.[43]

Sometime around 1990, grass had been removed from the spaces between the flagstones in the entryway and the stones were reset with marble dust.[44] However, visitors damaged the cork floors by tracking the dust into the house, so a decision was made to reset the stones again and reseed the area for grass.[45] This was carried out in 1992, along with the resetting of the flagstones around the Japanese garden.[46] It is evident that SPNEA eventually decided to keep the metal edging around the driveway, because the steel was damaged in both 1992 and 1993 by snowplows.[47] By 1994 the flagstones around the Japanese garden needed to be reset again, along with those bordering the porch *(Figure 8)*.[48] Repairs were made to the edging in 1995.[49]

---

[40] ñGropius Landscape Work for 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).
[41] Ati Johansen, "Gropius House Landscape," interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley, March 13, 1991, 53-54.
[42] Ibid., 2 and 4.
[43] Ibid., 59.
[44] ñUpdate on Gropius Grounds: Fall 1992,ò (Waltham, MA: Historic New England Property Care Files, 1992).
[45] Ibid.
[46] Ibid.
[47] "Snowplowing by Todd Brown," Millie O'Connell to Frank Thompson, January 29, 1993, Massachusetts.
[48] Peter Gittleman, ñGropius House Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1994).
[49] ñGropius Grounds: 1995,ò (Waltham, MA: Historic New England Property Care Files, 1995).

Figure 8: Flagstones along the porch and south façade, 1994
Historic New England Property Care Binders

The driveway was excavated for a trench during a utilities project in 1996, and the following year ¾ò crushed stone gravel was applied to its backfilled surface *(Figure 9)*.[50] The need for new parking area was brought up again in 1998 after the conversion of the garage into a visitor center vastly increased the number of guests to the site, but no related work was done.[51] In 2001, 1500 square feet of the driveway had to be removed again in order to allow for the replacement of the houseĉs oil tank.[52] After the area was backfilled, it

[50] D. L. Anderson Residential Services, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 1997). ñDivision I ï General Requirementsò (Waltham, MA: Historic New England Property Care Files, 1997), 3-4.
[51] "Need to Examine Parking Situation at Gropius House," Beth Shepard to Phillip Johnston, January 7, 1998, Massachusetts.
[52] *Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002),

was covered with new gravel and the steel edging was fixed.[53] Maintenance was carried out on the driveway again in 2008, including gravel work that is not detailed in the records.[54] By 2009 stone and mortar were being lost in the patio.[55] In 2010 the driveway was regraded, the edging was reset, and crusher run was purchased.[56] In 2014 the flagstones around the house were reset after frost heaving created tripping hazards.[57]

Figure 9: Trench dug in the driveway, 1997
Historic New England Property Care Binders

2.

[53] "Gropius Landscape," Marianne Zephir to Dianne McGuire, March 29, 2001, Massachusetts. Anne Marie, ñGropius Site Meeting with Joel Lord,ò (Waltham, MA: Historic New England Property Care Files, 1997), 1.

[54] ñDriveway Maintenance,ò Historic New England Property Care Electronic Database of Historical Projects, 2009.

[55] *Property Care - Gropius - 2009.Masonry Project - GRO.10142009.Mortar and Stone Loss @ Patio Near Rose.032*. October 15, 2009. Resource Space, Historic New England, Lincoln.

[56] ñRegrade Driveway and New Edging,ò Historic New England Property Care Electronic Database of Historical Projects, 2011. Boston Bark Corporation Invoice, (Waltham, MA: Historic New England Property Care Files, 2010).

[57] ñStone Walks,ò Historic New England Property Care Electronic Database of Historical Projects, 2015.

Interventions

2014: Flagstones around house reset after frost heaving caused tripping hazards
2010: Driveway regraded and reset; new gravel purchased
2008: Driveway maintenance carried out, including unspecified gravel work
2001: Driveway excavated for replacement of oil tank. Afterward, new gravel applied and steel edging repaired.
1998: More parking space requested after garage conversion increased visitor numbers
1997: Gravel reapplied to driveway after it was backfilled
1996: Driveway excavated as part of utilities work
1995: Edging repaired
1994: Flagstones around porch and Japanese garden needed to be reset
1993: Snowplow destroyed a piece of steel driveway edging again
1992: Snowplow destroyed a piece of steel driveway edging. Entryway and Japanese garden flagstones reset. Grass seeds spread between stones in entryway.
1991: Flagstone path leading away from house had been buried by wintercreeper for at least two years, and paths in general were not neat enough. More gravel needed on driveway. Debate about adding more parking spots near northeast evergreen trees.
1990: Needs included relaying flagstones and addressing issues with steel driveway edging
1989: Bruck suggested that driveway be widened and refilled with darker stone of a different texture. Debates about increased parking opportunities near northeast evergreens and authenticity of driveway edging.
1988: Bruck suggested that turnaround area at top of drive be completely squared off
1987: To-do list included widening entry walkway without jeopardizing important trees, regrading and resurfacing driveway, removing steel edging and trees that were crowding driveway, and adding flagstones to lawn in areas of high traffic
1985: To-do list included patching and/or regrading driveway
1976: Unspecified flagstones repaired with sand and cement
1969: 4ô dry well dug in driveway and filled with stone 2ò deep. Topped with plastic cover over small stone. Invoice included unspecified ñprevious work.ò
1953: Driveway damaged by leaking fuel truck multiple times
1945: Driveway repair proposed
1941: Grass already growing between flagstones on patio
1939: Driveway repair proposed
1938: Circular turnaround installed at top of driveway

BIBLIOGRAPHY

Boston Bark Corporation Invoice. Waltham, MA: Historic New England Property Care Files, 2010.

Bruck, Pheobe. "Gropius House Landscape." Interview by Peter Gittleman. April 21, 1989.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

ñDivision I ï General Requirements.ò Waltham, MA: Historic New England Property Care Files, 1997.

D. L. Anderson Residential Services, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 1997.

ñDriveway Maintenance.ò Historic New England Property Care Electronic Database of Historical Projects, 2009.

E. Tebo Invoice. Waltham, MA: Historic New England Property Care Files, 1976.

Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2002.

George E. Cunningham Co. Invoice. Boston, MA: Historic New England Archives, Family Papers, Section IV, 1969.

Gittleman, Peter. ñGropius House Landscape.ò Waltham, MA: Historic New England Property Care Files, 1994.

Gropius, Walter. "The Small House of To-day." The Architectural Forum, March 1931, 266-78.

Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.

ñGropius Grounds: 1995.ò Waltham, MA: Historic New England Property Care Files, 1995.

"Gropius Landscape." Marianne Zephir to Dianne McGuire. March 29, 2001. Massachusetts.

ñGropius Landscape Work for 1990.ò Waltham, MA: Historic New England Property Care Files, 1990.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Johansen, Ati. "Gropius House Landscape." Interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley. March 13, 1991.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997.

"Need to Examine Parking Situation at Gropius House." Beth Shepard to Phillip Johnston. January 7, 1998. Massachusetts.

Property Care - Gropius - 2009.Masonry Project - GRO.10142009.Mortar and Stone Loss @ Patio Near Rose.032. October 15, 2009. Resource Space, Historic New England, Lincoln.

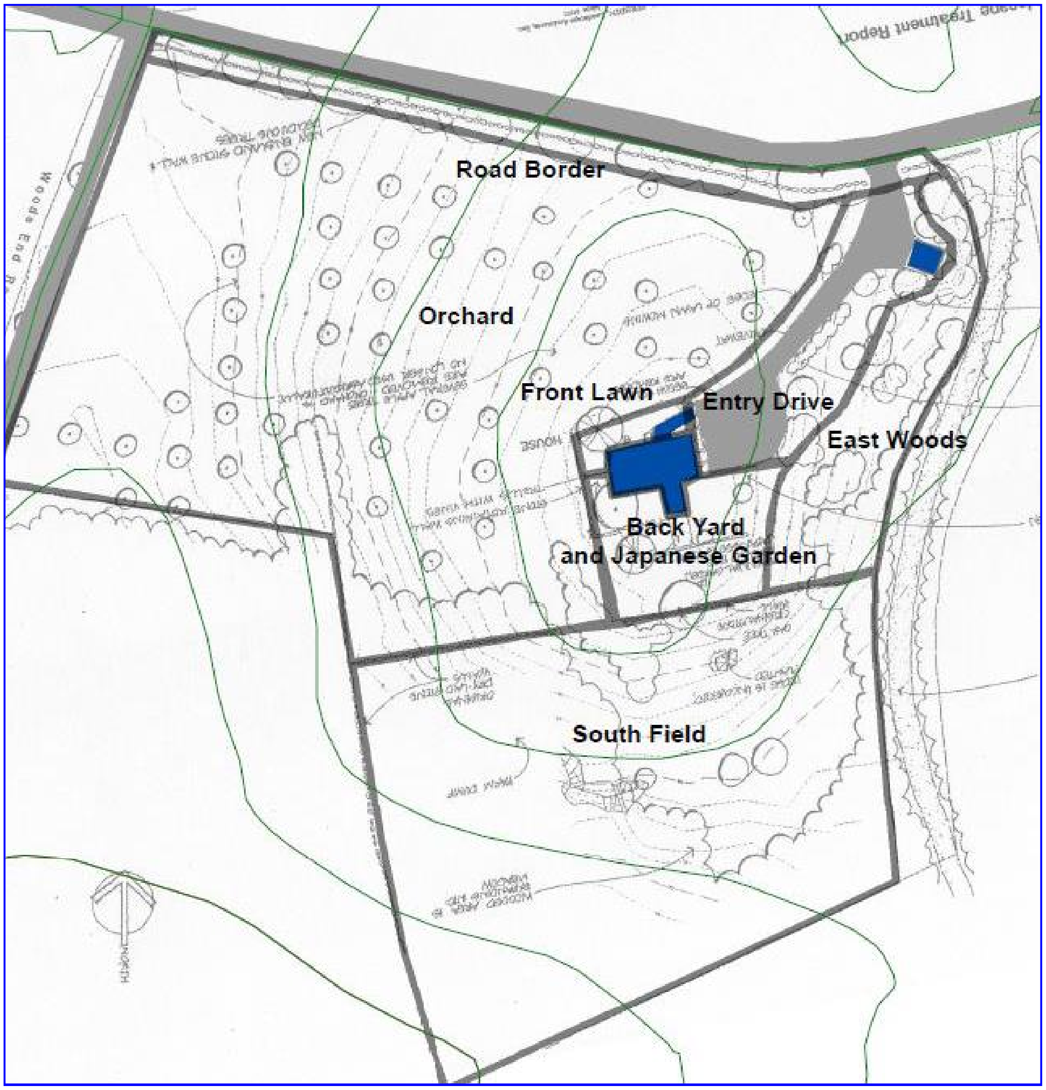
ñRegrade Driveway and New Edging.ò Historic New England Property Care Electronic Database of Historical Projects, 2011.

"Snowplowing by Todd Brown." Millie O'Connell to Frank Thompson. January 29, 1993. Massachusetts.

ñStone Walks.ò Historic New England Property Care Electronic Database of Historical Projects, 2015.
Walter Gropius to the Boston Ice Company. May 29, 1953. Massachusetts.
"Winter Projects." Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret. August 28, 1989. Massachusetts.
ñUpdate on Gropius Grounds: Fall 1992.ò Waltham, MA: Historic New England Property Care Files, 1992.

APPENDIX A: Landscape Zones

The Gropius property was split into easily identifiable management zones as part of the 2001 Cultural Landscape Report, and they were slightly altered in 2009 as pictured below. A complete listing of the zone names is on the following page.

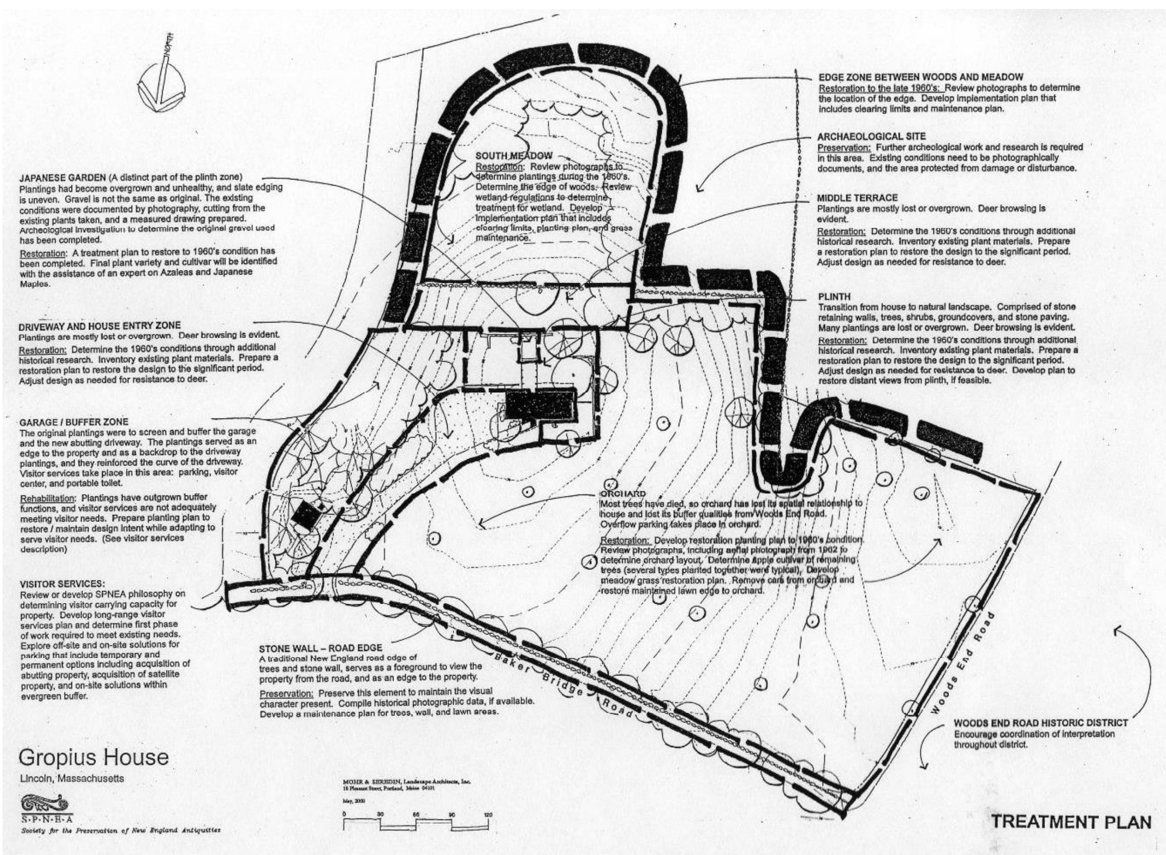


Historic New England, 2009

Management Zones

Maintenance Plan Name	CLR Name
Orchard	Zone 1 ï Orchard
Back Yard and Japanese Garden	Zone 2 ï Japanese Garden
South Field	Zone 3 ï South Meadow
Entry Drive	Zone 4 ï Driveway and House Entry
Entry Drive and East Woods	Zone 5 ï Garage / Buffer Zone
Front Yard and Back Yard and Japanese Garden	Zone 6 ï Plinth
Back Yard and Japanese Garden	Zone 7 ï Middle Terrace
No zone (beyond South Field)	Zone 8 ï Woodland / Meadow Edge
Road Border	Zone 9 ï Stone Wall ï Road Edge
No Zone	Zone 10 ï Archaeological Site
No Zone	Zone 11 ï Visitor Services
No Zone	Zone 12 ï Woods End Road Historic District

LANDSCAPE TREATMENT PLAN



Mohr & Seredin Landscape Architects, Inc., *Cultural Landscape Report,* 2001

GROPIUS HOUSE LAWNS

Property Name: Gropius
Structure: Landscape
Feature: Lawns
Original Material: Grass
Original Color: Green
1965-1969 Material: Grass
1965-1969 Color: Green


RS ID #270324, 2016

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

It is important that there continue to be contrasts in cultivation between lawns at the Gropius House (see Appendix A for differentiated lawn areas). The area around the house should be kept neat and closely mown, while the spaces around the borders of the property should have a more ñnaturalò appearance. However, the latter must be maintained well enough to allow views in all directions from the house and backyard.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

Entry Drive Area

- Mow a 10ôwide strip along the edge of the drive weekly at a height of 3ò
    - Interpretive Note: historical documents imply that a 1ôstrip of grass was mown along the drive, but multiple historic images suggest that a larger border may have been regularly maintained. For management and visitor experience purposes, 10ôis the preferred width.

Front Yard (north lawn on terrace)

- Mow to a height of 3ò
- All areas around the house foundation, poles, or the spiral stairs should be hand trimmed. These features are at or near grade and a string trimmer will damage historic material.

Backyard (south side of house from terrace to rubble stone wall)

- Mow to a height of 3ò
    - Interpretive Note: Gropiusôs wife Ise wrote that the backyard was cropped carefully in order to make several ñmagnificent bouldersò visible and ñto allow the view towards the hilly woods which border the propertyò.[2]

South Field (or south meadow past rubble stone wall)

- Let grass grow and brush mow it once per year, sometime between August and October. August 1 represents end of grassland-breeding bird season, but waiting until later in year allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies. Key is to avoid letting the woody growth take over field.
- Do not let woody growth take over the area. Make sure the woodland edge is pushed back every 2-3 years.
- Old pines should be standing in field. Clear beyond pine trees at least 10 feet past edge of canopy.
    - Interpretive Note: Views from the house should incorporate the South Field as a meadow with a woody edge beyond. It is important to avoid letting this area get overgrown with woody plants.
- Rejuvenation Protocol
    - If maintenance lapses and woody plants and weeds begin to take over meadow, the field should be mowed at least three times annually for a minimum of one year

Original Construction and Evolution:

The hill upon which the Gropius House sits was excavated for the construction of the building, and all trees and stumps were removed ñfrom [the] space occupied by [the] building and ten feet all around [the] sameò.[3] The top of the hill was leveled in order ñto

[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 19.

[3] Walter Gropius and Marcel Breuer, ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln,

create the óplatformôò for the house, and grass seed was spread ñwherever soil has been distributedò.[4] A foot-wide strip of grass was mown neatly around the house and alongside the driveway, and the backyard was carefully mown up to the southernmost stone wall *(Figure 1)*.[5] Other lawn areas were scrubbier, and sometimes contained volunteers.[6]

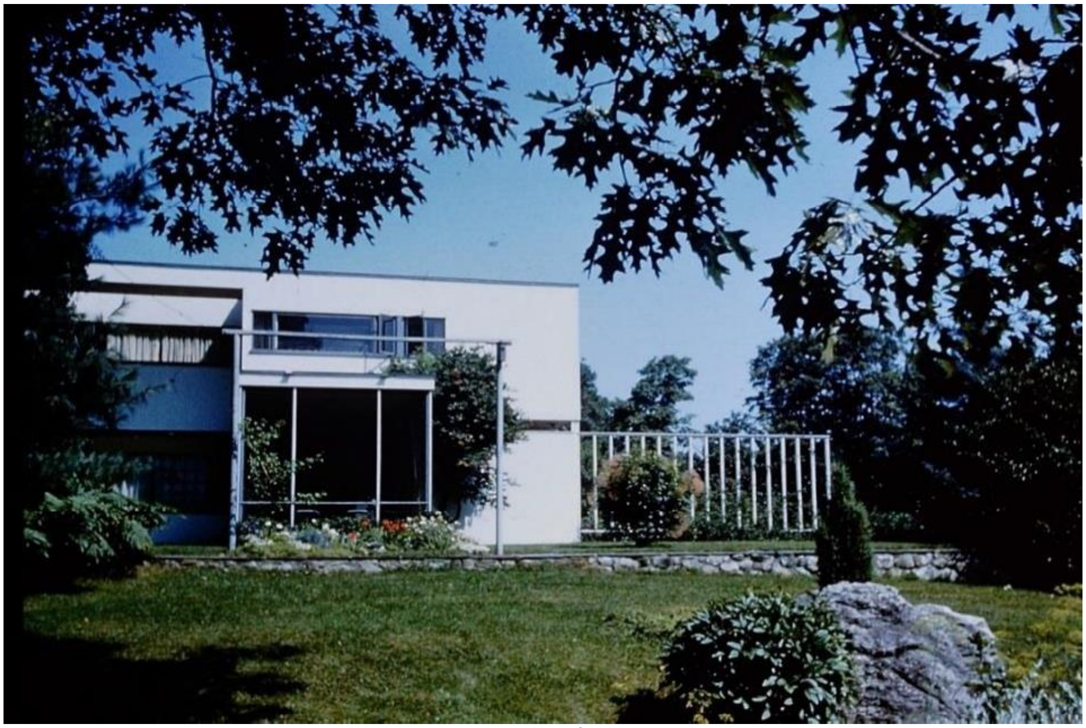


Figure 1: Cropped south field, circa 1950-57
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
No significant changes in the appearance of the lawns were recorded between the Gropiusô arrival at the property and the late 1960s, so they still reflected Gropiusôs original design intentions during the interpretive period. Gropiusôs wife Ise wrote that the south field was cropped carefully in order to make several ñmagnificent bouldersò visible and ñto allow the view towards the hilly woods which border the propertyò *(Figure 2)*.[7] This was a major aspect of the lawnôs significance, because one of Gropiusôs principle aims in landscape design was to frame views.[8] In addition, the way that the lawns shift from highly cultivated areas to more natural and wild ones is a key aspect of Gropiusôs integration of architecture and nature at the site.[9]

Massachusettsò (Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938), 8.
[4] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 36. Ibid., 9.
[5] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 14. Gropius, ñGropius House,ò 19.
[6] Kramer, *Gropius House Landscape*, 15.
[7] Gropius, ñGropius House,ò 19.
[8] Kramer, *Gropius House Landscape*, 2.
[9] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.

Figure 2: Contrast in lawn lengths at west side of house, 1965
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:
A to-do list written in 1985 by staff of the Society for the Preservation of New England Antiquities (SPNEA) included the weekly weeding, trimming, and mowing of the lawns, the cutting back of hard brush and volunteer growth, and the rejuvenation of the lawns in the fall and spring.[10] In 1987 the removal of weeds and volunteers along Baker Bridge road, the mowing of the south field twice a season, and the top dressing, liming, fertilizing, and filling of holes west of the driveway were included on a similar list.[11] By 1989 brush near unspecified cedars and dogwood trees, along the border of Baker Bridge Road, and on the back slope needed to be removed, and poison ivy needed to be sprayed.[12] The clearing of brush and weeds behind the house took place in 1990, and a thick layer of mulch was required for the east lawn.[13] The lawns in general needed to be sprayed for poison ivy and reseeded.[14] A year later, SPNEA staff were still killing poison ivy and working to clear the

---

[10] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985).
[11] ñGropius Landscape Renovation (Suggestions & Recs.),ò (Waltham, MA: Historic New England Property Care Files, 1987).
[12] Winter Projects," Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret, August 28, 1989, Massachusetts.
[13] Millie OôConnell, ñGropius House: Report of Activities, 1990,ò (Boston: Historic New England Archives, 1990).
[14] "The Gropius House Landscape," Peter Gittleman to Lisa and Mille OôConnell, July 6, 1990, Massachusetts.

south field in order to restore views.[15] Clearing projects continued into 1992, but similar maintenance was still required by 1994.[16] Poison ivy also needed to be removed from an unspecified dogwood area, and the seeding of the east slope was necessary.[17]

After a trench was dug ñfrom Baker Bridge Road southerly across the front yard to the basement of the Gropius Houseò, the lawn was backfilled, raked and reseeded in 1996.[18] As part of a Save Americaôs Treasures (SAT) grant project, the south field was mown and invasive plants near the wetlands were cut down.[19] The work undertaken during the project also made re-seeding necessary.[20] In 2009 stumps were ground and removed from the lawns along with the resulting debris, and volunteers at the south border of the property were cut down.[21] A year later, brush was removed from the same area in order to restore views from the house.[22]

Figure 3: Strip of mown lawn bordering driveway, 1958
Historic New England, Property Care Binders

[15] ñGropius Landscape Needs: Spring 1991,ò (Waltham, MA: Historic New England Property Care Files, 1991). Ati Johansen, "Gropius House Landscape," interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley, March 13, 1991, 1.
[16] ñUpdate on Gropius Grounds: Fall 1992,ò (Waltham, MA: Historic New England Property Care Files, 1992). Peter Gittleman, ñGropius House Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1994).
[17] Gittleman, ñGropius House.ò
[18] ñDivision I ï General Requirementsò (Waltham, MA: Historic New England Property Care Files, 1997), 4.
[19] Pam Griffin, "Gropius Site Visit," e-mail to Diane McGuire, March 27, 2001. ñImplementation of the Cultural Landscape Treatment Report: Restoration of the Gropius Mowing Schedule,ò (Waltham, MA: Historic New England Property Care Files, 2001).
[20] "Gropius Landscape," Marianne Zephir to Dianne McGuire, March 29, 2001, Massachusetts.
[21] ñBelmont Landscape,ò (Waltham, MA: Historic New England Property Care Files, 2009).
[22] ñTree Clearing along Border,ò Historic New England Property Care Electronic Database of Historical Projects, 2010.

Interventions

2010: Brush removed from south field in order to restore views from house

2009: Stumps removed and ground. Debris removed. Volunteers along southern border of property removed.

2001: Lawns needed re-seeding as a result of SAT grant project. Work included mowing and cutting of invasive plants.

2000: Lawns overgrown. Plans formed to cut back woodland at edge of southern lawn.

1996: Front yard excavated and then backfilled, raked, and seeded

1994: Poison ivy needed to be killed in unspecified dogwood area. Woods needed to be cut back on all sides of property. Eastern slope required seeding.

1992: Plans made to cut down brush in ñlower fortyò

1991: Poison ivy in lawns needed to be treated. Area behind house needed to be cleared for the restoration of views from house and backyard.

1990: Poison ivy needed to be sprayed, and thick layer of mulch needed to be added to east lawn. Brush and weeds behind house cleared.

1989: Brush needed to be removed from behind cedars, around dogwood trees, the back slope, and area along Baker Bridge Road. Poison ivy needed to be sprayed. Area behind stone wall needed to be cleared of trees.

1987: To-do list included top-dressing, liming, fertilizing, and filling holes in lawn area west of driveway, as well as removing volunteer and weed growth along Baker Bridge Road. South field needed to be mowed twice a season.

1985: Maintenance list included weeding, trimming, and mowing, as well as keeping brush down in rear field, keeping woodland and volunteer growth at bay, and rejuvenating lawns in fall and spring.

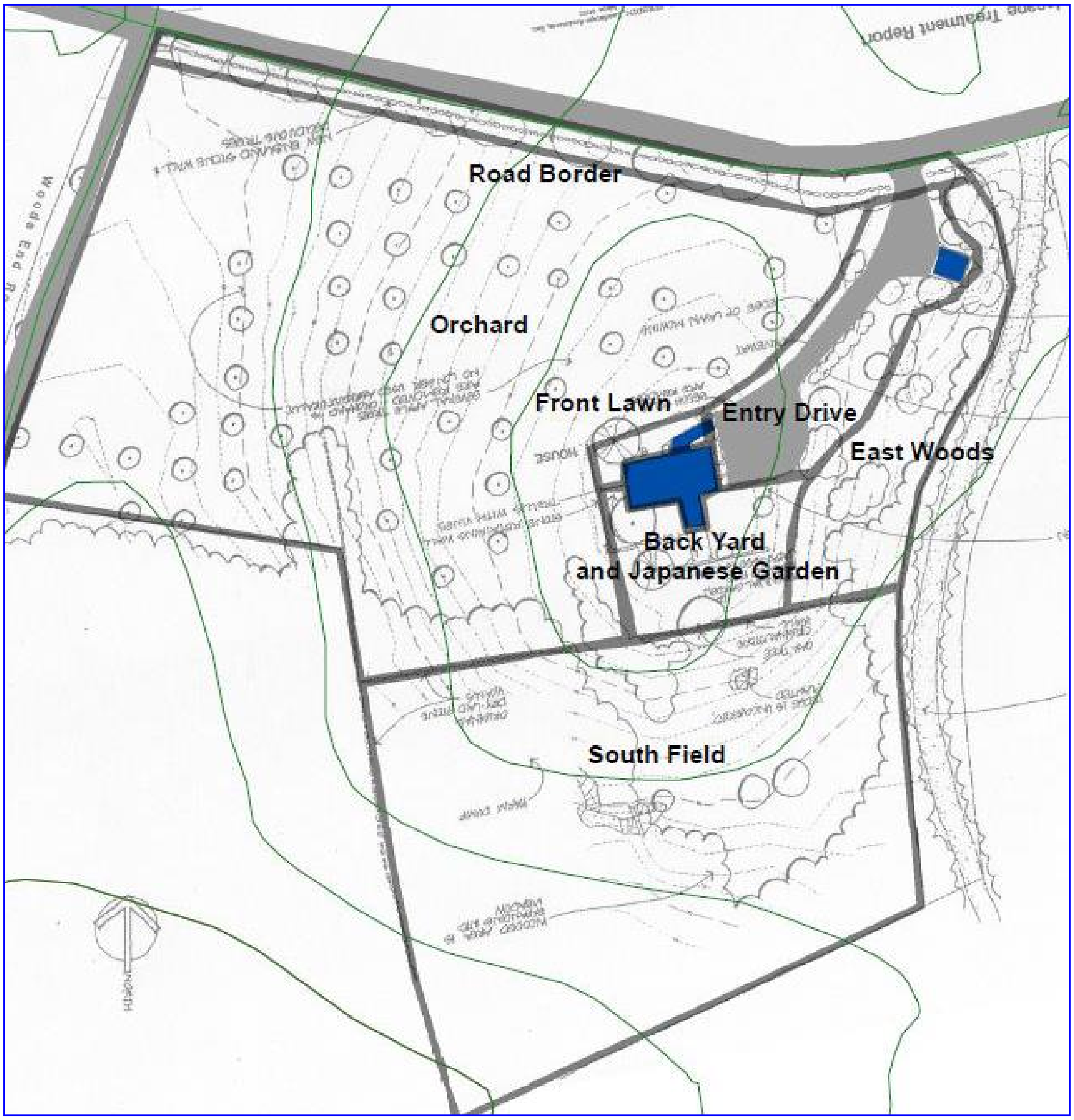
1937: Top of hill leveled prior to house construction

BIBLIOGRAPHY

ñBelmont Landscape,ò (Waltham, MA: Historic New England Property Care Files, 2009).
Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.
Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.
Griffin, Pam. "Gropius Site Visit." E-mail to Diane McGuire. March 27, 2001.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Walter and Marcel Breuer. ñAddenda to Specifications for the House of Mrs. J.J. Storrow, Lincoln, Massachusetts.ò Cambridge, MA: Walter Gropius and Marcel Breuer Associated Architects, 1938.
"Gropius Landscape." Marianne Zephir to Dianne McGuire. March 29, 2001. Massachusetts.
ñGropius Landscape Needs: Spring 1991.ò Waltham, MA: Historic New England Property Care Files, 1991.
ñGropius Landscape Renovation (Suggestions & Recs.).ò Waltham, MA: Historic New England Property Care Files, 1987.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
ñImplementation of the Cultural Landscape Treatment Report: Restoration of the Gropius Mowing Schedule,ò (Waltham, MA: Historic New England Property Care Files, 2001).
Johansen, Ati. "Gropius House Landscape." Interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley. March 13, 1991.
Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.
OôConnell, Millie. ñGropius House: Report of Activities, 1990.ò Boston: Historic New England Archives, 1990.
Peter Gittleman, ñGropius House Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1994).
"The Gropius House Landscape." Peter Gittleman to Lisa and Mille OôConnell. July 6, 1990. Massachusetts.
ñTree Clearing along Border,ò Historic New England Property Care Electronic Database of Historical Projects, 2010.
ñUpdate on Gropius Grounds: Fall 1992.ò Waltham, MA: Historic New England Property Care Files, 1992.
"Winter Projects." Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret. August 28, 1989. Massachusetts.

APPENDIX A: Landscape Maintenance Zones

The Gropius property was split into easily identifiable management zones as part of the 2001 Cultural Landscape Report, and they were slightly altered in 2009 as pictured below. A complete listing of the zone names is on the following page.

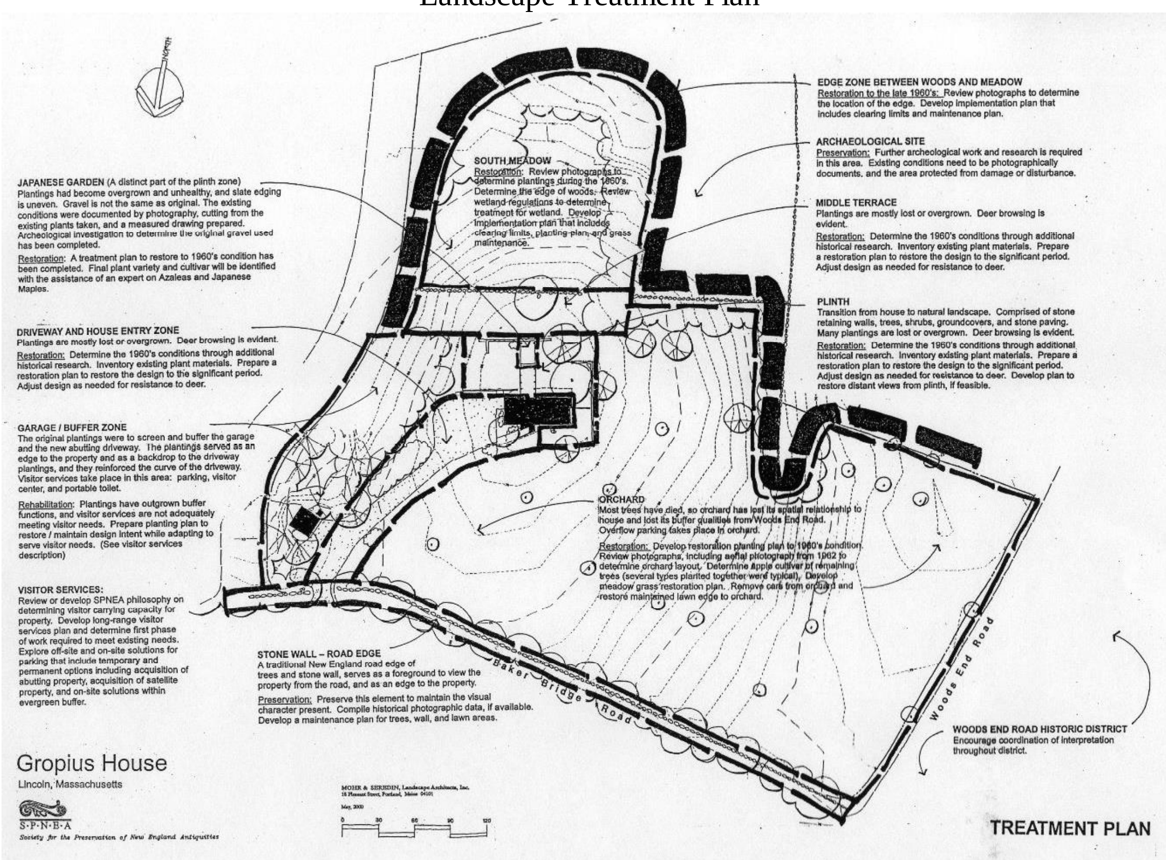


Historic New England, 2009

Management Zones

Maintenance Plan Name	CLR Name
Orchard	Zone 1 ï Orchard
Back Yard and Japanese Garden	Zone 2 ï Japanese Garden
South Field	Zone 3 ï South Meadow
Entry Drive	Zone 4 ï Driveway and House Entry
Entry Drive and East Woods	Zone 5 ï Garage / Buffer Zone
Front Yard and Back Yard and Japanese Garden	Zone 6 ï Plinth
Back Yard and Japanese Garden	Zone 7 ï Middle Terrace
No zone (beyond South Field)	Zone 8 ï Woodland / Meadow Edge
Road Border	Zone 9 ï Stone Wall ï Road Edge
No Zone	Zone 10 ï Archaeological Site
No Zone	Zone 11 ï Visitor Services
No Zone	Zone 12 ï Woods End Road Historic District

Landscape Treatment Plan



Mohr & Seredin Landscape Architects, Inc., *Cultural Landscape Report*, 2001

GROPIUS HOUSE PLANTINGS

Property Name: Gropius
Structure: Landscape
Feature: Plantings
Original Material: Japanese Andromeda, mountain laurels, cotoneaster, smoke bush, wintercreeper, bittersweet vine, trumpet vine, roses
Original Color: N/A
1965-1969 Material: Japanese Andromeda, mountain laurels, cotoneaster, smoke bush, wintercreeper, bittersweet vine, trumpet vine, roses, annuals, wildflowers, yucca, pachysandra, phlox, peonies, irises, daffodils
1965-1969 Color: N/A

RS ID #277144, 2015

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material that is out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any landscape project should consider enhancing access to the property.[1]

All plantings should be kept in good health and neatly maintained, particularly those in the more cultivated zone of the landscape closer to the house. Special care should be taken to retain the plants that act as ornaments and borders at important locations on or near architectural structures, as well as those that make up the composition near the southern rock outcropping that mirrored the Filipowski sculpture.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

Trellis Plantings

- Roses should be reestablished on both trellises. While historic material is no longer extant, the fact that roses were robust enough to block view through trellises was important aspect of Gropiusôs original design. Preference will be given to fast-growing climbing roses with a deep red or pinkish color. They can then be cut or staked back when maintenance on trellis is required.
    - An interpretive choice needs to be made between an heirloom rose that typically blooms once per year or a modern hybrid rose that blooms throughout the summer

Front Lawn

- Daylily bed in front of glass block wall should be maintained and thinned as needed. Deadhead during summer and cut back in fall.
- Agave should be maintained and thinned as needed. Cut back spike when it passes. Clean out leaves and keep neat.

Backyard Japanese Garden

- See Japanese Garden feature section for more detail
- Trumpet vine should be cut back periodically to prevent damage to house
- There are several perennial beds in lawn areas around rock outcroppings. These should be maintained and thinned as needed.

South Field

- There are several perennial beds in south field around rock outcroppings and along stone wall. These should be maintained and thinned as needed.

East Woods

- Garlic mustard must be pulled. Neighbors complain because garlic is an invasive species. Town of Lincoln has developed high community interest in attempting to halt continued spread. Volunteers throughout Lincoln consistently encourage Historic New England to actively participate by removing it in spring before it goes to seed.

Orchard

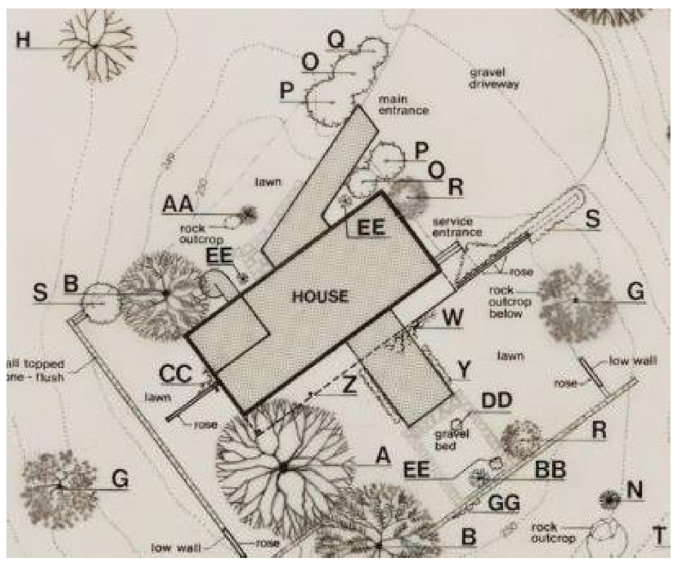
- Garlic mustard here should be pulled/mowed before it goes to seed. Garlic mustard is point of emphasis with Lincoln Conservation Commission and community, which includes some Historic New England members

Original Construction and Evolution:

A 1938 landscape plan provides a guideline of the earliest plantings at the Gropius House (see Appendix A), but the exact time that they were all added is uncertain. In fact, there is no photographic evidence to prove that anything other than trees had been planted on the property as early as 1938. However, the fact that most of the plants on the plan exist in later photographs suggests that they were added around the same time as the houseôs construction, or very soon thereafter.

These early plantings include a Japanese Andromeda (O, see Appendix A) between the marquee and the north façade, and possibly another on the opposite side of the marquee.[2] There were mountain laurels (Q) in the same locations, and another one across the driveway from the garage.[3] A photograph also suggests that an azalea bush may have been planted near the evergreen shrubs (M and F) at the top of the driveway, slightly further from the house.[4] Across the drive from the house there was a Father Hugo rose (V).[5] There was a cotoneaster (EE) slightly to the west of the southern Andromeda (O) and mountain laurel (Q) between the house and marquee *(Figure 3)*.[6]

The plan also specifies a smoke bush (R) against the upper stone wall in the backyard, just east of the porch, and another at the northeast corner of the house *(Figure 6)*.[7] Wintercreeper (S) was planted near the east trellis, and the plan also indicates that it was located at the northwest corner of the house.[8] Two vines were in the backyard, including a trumpet vine (W) to the east of the porch and a bittersweet (Z) to its west, and roses (GG) adorned low walls to the propertyôs southeast and southwest *(Figure 9)*.[9] An Adamôs Needle (AA) was planted by a rock outcropping that eventually neighbored two different Richard Filipowski sculptures.[10]



Detail of original landscaping plan. See Appendix A.

[2] Walter Gropius and Marcel Breuer, *Gropius Residence, Lincoln, Massachusetts*, 1938: Landscaping Plan, 1938, Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge.
[3] Ibid.
[4] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 15.
[5] Gropius and Breuer, *Gropius Residence*.
[6] Gropius and Breuer, *Gropius Residence*.
[7] Ibid.
[8] Gropius and Breuer, *Gropius Residence*.
[9] Ibid.
[10] Ibid.

Figure 2: Plantings along the west side of the driveway, circa 1944-48
Historic New England Archives, Binder of Slides

Photographs and documents indicate that the main changes in the garden between Gropius's arrival at the property and the late 1960s are the general addition and growth of the plants specified on the original landscape plan. However, several later plantings are not included in the drawing. Photographs from the 1940s show annuals under the south living room windows and yellow wildflowers along the southernmost stone wall.[11] By this time salmon-colored roses were thriving on both trellises, and Concord grapes (CC) climbed up the west trellis to the beams of the second-story porch ceiling above.[12] The number of plant groups along on the drive seems to have thinned by this period from four to two or three *(Figure 2)*.[13] By 1957 a Richard Filipowski sculpture had been placed in the front yard, and in photographs from the last ten years of Gropius's life there were daylilies in front of the glass block wall and pachysandra under the white pine to the southwest *(Figure 7)*.[14] Later plantings also included flower beds near the upper stone wall in the backyard, which contained phlox and peonies to the west and irises at the center.[15] A survey of the landscape undertaken in 1987 found that peonies mingled with these irises and that there was a bed of daffodils at the east end of the wall.[16] Thus, it is possible that they were all planted around

[11] Kramer, *Gropius House*, 16.
[12] Ibid.
[13] Ibid., 15.
[14] Ibid., 17 and 18.
[15] Ibid.
[16] Tom Cochrane, *Landscape Renovation Recommendations,* report (MA, 1988), 19.

the same time.[17] While the photographic evidence of their existence comes from pictures taken between 1958 and 1968, Gropiusõs wife Ise bought phlox as early as 1949.[18]

Figure 3: Plantings at north entrance, 1957
Historic New England Archives, Binder of Slides

Character-Defining Traits in the Interpretive Period:
From some of the earliest years that Gropius owned the property, the plantings in the landscape had always reflected several principles of modern architecture. One of these was ornamentation, which was ñlacking in the new architectureò and expressed through the garden instead.[19] This was originally reflected in the bittersweet (Z) and trumpet vines (W), which adorned the house and other structural elements on the property *(Figure 5)*.[20] The roses (GG) had a similar effect on the low stone walls at the east and west of the south meadow, along with the salmon roses and the grape vine (CC) on the trellises.[21] The Gropiuses added more ornamentation by the interpretive period in the form of flowers, such as irises, phlox, annuals, and more *(Figure 4)*.[22]

---

[17] Ibid.
[18] The Wayside Gardens, Co. Invoice (Boston: Historic New England Archives, 1949).
[19] "Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset," *Boston Evening Transcript*, January 07, 1938.
[20] Kramer, *Gropius House*, 16.
[21] Cochrane, *Landscape Renovation*, 14-15.
[22] Kramer, *Gropius House*, 18 and 16.

Figure 4: Perennials at bottom of south façade, 1969
Historic New England Archives, Binder of Slides

Other plantings reflected the architecture of the house itself, blurring the line between indoors and outdoors and elevating plants to the status of ñarchitectural materialò.[23] For example, the shrubs (O, P, and Q) around the marquee defined ña formal sort of entrance to the terrace area of the north side of the houseò by ñboth extending and enclosingò the approach.[24] In addition, the wintercreeper (S) ñserve[d] as [a] borderò somewhat similar to the walls of a room by running around the porch, along the edge of the house under the kitchen windows, and along flagstones at the northwest of the house.[25] Finally, a hallmark of modern landscapes is the way they paid homage to modern art.[26] At the Gropius House, the irises surrounding a boulder near the center of the southernmost stone wall were part of a composition that intentionally echoed a sculpture on the north lawn created by modern artist Richard Filipowski.[27]

History of Conservation and Maintenance Practices:
In addition to the plantings added to the landscape during Gropiusôs time, maintenance work and other more minor alterations were carried out in the landscape. In 1949 Ise ordered ten Lobelia Crystal Palace flowers, ten Nierembergia purple roses, ten phlox in

[23] Cochrane, *Landscape Renovation*, i-ii.
[24] Ibid., 13.
[25] Ibid., 11-12. Gropius and Breuer, *Gropius Residence*.
[26] Kramer, *Gropius House*, 4.
[27] Phoebe Mason Bruck, "Phoebe Mason Bruck's Comments on the Gropius Landscape," interview by Tom Cochrane, 1988, 3.

different colors, and thirty-five gold zinnias from the Wayside Gardens Co., Inc.[28] Soon afterward the company wrote an apology to Ise, admitting that they had accidentally given her the wrong seeds for the Verbena Mayflowers she had ordered.[29] The companyṫs representative also noted that while she had ordered a Delphinium Belladonna Cliveden Beauty, the Bellamosa or Pacific Hybrid King Arthur Series would better match the dark blue color she seemed to be looking for.[30] It is unknown if Ise took their advice, or where she planted the flowers she did receive.

Figure 5: Bittersweet vine, 1951
Historic New England Archives, Binder of Slides

In 1953, Gropius complained to the Boston Ice Company that their employee spilled oil on some plants close to the house.[31] One of these was the smoke bush (R) at the northeast corner of the building.[32] Other plants in the same area that may also have been damaged include a mountain laurel (Q) and a cotoneaster (EE).[33] In the letter Gropius describes the smoke bush as ñmany years old,ò which suggests that the other foundation plantings were replacements added after 1948.[34] The last recorded plant maintenance during Gropiusṫs

[28] The Wayside Gardens, Co. Invoice.
[29] Lloyd A. Weaver to Ise Gropius, June 28, 1949, The Wayside Gardens Co., Inc., Glen Head, Long Island, New York.
[30] Ibid.
[31] Walter Gropius to The Boston Ice Company, May 29, 1953, Massachusetts.
[32] Ibid.
[33] Gropius and Breuer, *Gropius Residence*.
[34] Gropius to Boston Ice Company.

ownership of the property took place in 1961, when a twenty-four inch root barrier was placed around a stone under the trumpet vine (W).[35]

Figure 6: Bush on south lawn, 1958
Historic New England Archives, Binder of Slides

Two to-do lists made by the Society for the Preservation of New England Antiquities (SPNEA) in 1985 included the elimination of scale on wintercreeper (S), the seasonal rejuvenation of flower beds, the feeding of the shrubs and vines, and the replacement of the smoke bush (R) on the east façade.[36] It was apparent that the roses on the east trellis needed to be denser by this time, and after the trellis was repaired in 1986 pink roses were planted at the bases of both trellises.[37] Roses on the west trellis are not mentioned in any later written records, so it is possible that those planted there in 1987 never grew or died quickly. A 1987 to-do list included the treatment of wintercreeper (S) for scale, in addition to the pruning of roses (GG) on the southern east and west walls, the scaling back of the plantings around the north and east facades, the training and feeding of the bittersweet vine (Z) trained to wind around a lally column under the bris soleil, and the pruning and maintenance of a smoke bush (R) and the trumpet vine (W).[38] During the same year, a

[35] Brine Tree Surgery, Inc. Invoice (Boston: Historic New England Archives, 1961).
[36] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985). Tom Cochrane, ñGropius M+Uò (Waltham, MA: Historic New England Property Care Files, 1985). Tom Cochrane, ñGropius,ò (Waltham, MA: Historic New England Property Care Files, 1985).
[37] Cochrane, ñGropius M+U.ò Cochrane, *Landscape Renovation*, 15.
[38] ñGropius Landscape Renovation (Suggestions & Recs.),ò (Waltham, MA: Historic New England Property Care Files, 1987), 1-3.

landscape analysis included the need for cutting back a Japanese barberry and fertilizing the south flower beds.[39]

By 1989 the foundation plantings were overgrown, and both smoke bushes (R) were in poor condition from previous damage.[40] The small stone garden containing phlox was rediscovered, and plans were made to reclaim it.[41] The roses (GG) on the south walls were in good condition, but the wintercreeper (S) was overgrown and covering flagstones.[42] There were also debates about whether a Spirea plant should be moved to the Lyman Estate Greenhouses, and if there should be a hedgerow along Baker Bridge Road.[43] Finally, the pachysandra under the south white pine needed to be trimmed back.[44] One year later bushes (O, P, and Q) near the house were trimmed.[45] The overgrown pachysandra and removal of the Spirea were still active issues, and a ñprickly bushò next to the Spirea needed trimming.[46] The roses on the east trellis were in poor condition.[47] By 1990 those that had not already died were infested with bugs, and when new ones were planted they were quickly wiped out in a freeze that winter.[48] Roses were purchased and planted on the east trellis yet again in 1991, but they did not thrive because the trees in the backyard cast too large a shadow.[49] Milky spore disease was another issue in 1990, along with an invasion of Japanese beetles which lasted into the following year.[50] At the same time the Spirea was still in place, the wintercreeper (S) still had to be cut away from the flagstones, and the bittersweet (Z) vine had become top-heavy.[51] During that year SPNEA also considered restoring the composition mirroring the Filipowski sculpture.[52] The purchase of daffodils, irises, and peonies was included on a to-do list, along with the reclaiming of a perennial bed.[53] The bed in question is likely the one discovered in 1989.

[39] Cochrane, ñGrounds Maintenance,ò 18 and 19.
[40] Pheobe Bruck, "Gropius House Landscape," interview by Peter Gittleman, April 21, 1989, 3 and 4-5.
[41] Ibid., 5.
[42] Ibid., 7 and 9.
[43] "Workplan for Boston Regional Landscapes," Lisa Byers to Rob Kret, Michelle Litant, Peter Gittleman, Sharron Kenney, September 29, 1989, Massachusetts. Bruck, ñGropius House Landscape,ò 20.
[44] Bruck, ñGropius House Landscape,ò 23.
[45] Millie OôConnell, ñGropius House: Report of Activities, 1990,ò (Boston: Historic New England Archives, 1990).
[46] Ibid. "The Gropius House Landscape," Peter Gittleman to Lisa and Mille OôConnell, July 6, 1990, Massachusetts.
[47] Bruck, "Gropius House Landscape,ò 6-7.
[48] Gittleman, "Gropius House Landscape.ò Ati Johansen, "Gropius House Landscape," interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley, March 13, 1991, 50.
[49] Johansen, interview, 50. ñUpdate on Gropius Groundsò (Waltham, MA: Historic New England Property Care Files, 1992).
[50] Kathy and Peter, untitled list, (Waltham, MA: Historic New England Property Care Files, 1990). ñGropius Landscape Needs: Spring 1991,ò (Waltham, MA: Historic New England Property Care Files, 1991).
[51] George Riley & Philip Bevins, ñWinter 1991 Projects: Gropius House,ò (Waltham, MA: Historic New England Property Care Files, 1987). Ati Johansen, "Excerpts from Transcription of Interview with Ati Gropius Johansen," interview by Peter Gittleman, March 26, 1991, 2-3 and 37.
[52] Johansen, ñExcerpts from Transcription,ò 24.
[53] ñGropius Landscape Needs.ò

Figure 7: Yucca and modern art sculpture, 1989
Historic New England Property Care Binders

In 1992 the wintercreeper (S) was trimmed in the porch area and relieved of scale at the north façade.[54] After this work was completed there was still some question as to whether it was low enough near the porch or if it should be replaced.[55] The results of this discussion are unclear. In the following year SPNEA staff expressed the intention of placing bars of soap on shrubs in order to protect them from deer.[56] By 1994 many old problems still plagued the landscape including the poor condition of the lower rock garden, the need to clear wintercreeper (S) from the steps by the north façade, and the overgrown south smoke bush (R).[57] 1995 saw the pruning of a hedge as well as the cleaning of flower and rose beds.[58]

The pruning of a smoke bush (R) was planned again in the early phases of SPNEAǒs Save Americaǒs Treasures grant project in 1998, but the exact bush is unclear.[59] The following year the Gropiusô daughter Ati Johansen requested that the east trellis be covered with any climbing vine that would reestablish it as a privacy screen between the public driveway and private garden, which suggests that its bareness had not been remedied.[60] In 2000 the

[54] ñUpdate on Gropius.ò
[55] Ibid.
[56] ñGropius House Grounds Progress Reports: February 1993,ò (Waltham, MA: Historic New England Property Care Files, 1993).
[57] Peter Gittleman, ñGropius House Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1994).
[58] ñGropius Grounds: 1995,ò (Waltham, MA: Historic New England Property Care Files, 1995).
[59] "Gropius House," Linda Willett to Betsy Igleheart, August 7, 1998, Massachusetts.
[60] "RE: Landscaping and Garden of Gropius House," Ati Johansen to Peter Gittleman, October 04, 1999,

smoke bush (R) on the east façade was reported to be overgrown, and the grape vine (SS) on the west trellis needed to be retrained or reattached to the porch roof beams after being cut down for paint work the year before.[61] The replacement of one of the smoke bushes (R) was planned in 2001.[62] In the same year a rotted area at the base of the bittersweet (Z) vineǿs post was removed and replaced, and the post was repainted around the plant.[63] A new smoke bush was finally purchased in 2002, and Johansen repeated her request concerning the bare east trellis the same year.[64] Invoices suggest that a cotoneaster, a succulent, a stonecrop plant, and a bracteantha were added to the landscape in 2005.[65] In 2009 the roses on the east trellis were replaced in-kind, and around the same time the Concord grape vine (CC) was flourishing on the west trellis.[66]

Interventions

2009: Roses on east trellis replaced. Concord grape vine on west trellis flourishing.
2005: Landscaping purchases included a cotoneaster, a succulent, a stonecrop plant, and a bracteantha
2002: Smoke bush purchased. Ati Johansen repeated earlier request that east trellis be covered with any vine that would provide a ñprivacy screenò between the driveway and backyard.
2001: Rotted area at base of bittersweet vineǿs post removed and replaced as part of SAT grant project, and post was repainted around plant. Other plans included spraying of wintercreeper, acquiring replacement for smoke bush, and pruning cotoneaster near front door.
2000: Smoke bush at east façade overgrown. After it was cut for 1999 paint work, grape vine on west trellis needed to be retrained or reattached to roof rafters in order to recreate canopy effect.
1999: Johansen requested that east trellis be covered with any vine that would provide a ñprivacy screenò between the driveway and backyard
1998: Smoke bush pruning planned
1995: Hedge pruned. Flower and rose beds cleaned.
1994: Lower rock garden needed to be cleaned and replanted. Wintercreeper needed to be kept off steps at north façade. Smoke bush needed to be thinned.
1993: Bars of soap placed on shrubs in order to prevent deer damage.

Stanfordville, New York.
[61] "Landscape Problems at Gropius," Maryanne Zephir to Dianne McGuire, July 12, 2000, Gropius House, Lincoln, Massachusetts.
[62] Ibid.
[63] ñWork Schedule Team Notes: April 10, 2001,ò (Waltham, MA: Historic New England Property Care Files, 2001). Pam Griffin, ñMeeting Minutes: Gropius House,ò (Waltham, MA: Historic New England Property Care Files, 2001).
[64] Gold Star Wholesale Nursery, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 2003). Peter Gittleman, "Thoughts from Ati," e-mail to Michael Lynch, November 06, 2002.
[65] Gold Star Wholesale Nursery, Inc. Invoice, (Waltham, MA: Historic New England Property Care Files, 2006).
[66] *Anthony DeAngelis, "Gropius Question," e-mail message to author, December 02, 2016. Property Care - Gropius - 2009.PMF Assessment Photos - Exterior -GRO.09162009.Trellis - Western Elevation.054*, September 16, 2009, Resource Space, Historic New England, Lincoln.

1992: Wintercreeper around porch trimmed; there were subsequent questions as to whether height was acceptable or if plants needed to be replaced. Wintercreeper in front of house treated for scale. Roses at east trellis in poor condition, probably due to shade from large trees nearby.

1991: Bittersweet had become top-heavy. To-do list included reclaiming of lower rock garden, treating Japanese beetles, and purchase of daffodils, irises, and peonies. Spirea still needed to be relocated to Lyman greenhouses. Rose purchase necessary after death of previously planted flowers at east trellis.

1990: Pachysandra under south white pine needed to be cut back. Spirea needed to be relocated to Lyman greenhouses, and ñprickly bushò next to it required trimming. Bushes near house pruned. Milky spore and Japanese beetle problems. Need for new roses at east trellis recorded; many had died and remaining were infested with bugs. New roses planted, but all died in a December freeze.

1989: Foundation plantings overgrown. Smoke bushes in poor condition from previous damage. Small stone garden containing phlox rediscovered, and plans made to reclaim it. Roses on south walls in good condition. Wintercreeper overgrown and covering flagstones. Debates about creating hedgerow by Baker Bridge Road and bringing Spirea to Lyman greenhouses. Roses at east trellis in poor condition; in need of pesticide or fertilizer.

1987: To-do list included planting daylilies along road, pruning and maintaining wall roses, maintaining and rescaling plantings around east façade, trimming wintercreeper and treating for scale, training and feeding bittersweet vine, maintaining Father Hugo rose, and pruning and maintaining smoke bush and trumpet vine. Landscape analysis found that Japanese barberry needed to be cut back and that south flower beds needed to be fertilized. Pink roses planted at both trellises.

1985: Maintenance list included thickening or replacing roses at east trellis, eliminating scale on wintercreeper and feeding shrubs and vines.

1968: By this year at the latest, pachysandra was growing under southern white pine and phlox and peonies existed between south stone walls

1965: Photographs show wintercreeper near steps at northwest corner of house

1963: Photographs show irises growing around southernmost stone wall

1961: Two-foot deep root barrier placed around blue stone under trumpet vine

1957: Photographs show daylilies in front of glass block wall. Yucca planted next to modern art sculpture in front lawn.

1953: Smoke bush and other plants near northeast corner of house damaged by oil spill from a Boston Ice Company fuel truck

1949: Lobelias, zinnias, roses, and phlox purchased. Verbenas purchased but not delivered. Purchase of dark blue delphiniums under consideration.

1948: By this year at the latest, annuals were growing under south living room windows, yellow wildflowers grew along southernmost stone wall, and number of planting groups along drive had shrunk from four to two or three.

1938: This year or soon after Japanese Andromeda and mountain laurel shrubs were planted on either side of marqueeôs east end, shrubs ï possibly including azalea bush ï lined drive, wintercreeper was planted near east trellis and possibly northwest corner of house, trumpet and bittersweet vines were planted to east and west of porch, respectively, and smoke bush was planted against upper stone wall in backyard just east of porch.

BIBLIOGRAPHY

Brine Tree Surgery, Inc. Invoice. Boston: Historic New England Archives, 1961.
Bruck, Pheobe. "Gropius House Landscape." Interview by Peter Gittleman. April 21, 1989.
Bruck, Phoebe Mason. "Phoebe Mason Bruck's Comments on the Gropius Landscape." Interview by Tom Cochrane. 1988.
Cochrane, Tom. ñGropius.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. ñGropius M+U.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.
DeAngelis, Anthony. "Gropius Question." E-mail message to author. December 02, 2016.
E. W. Higgins to Walter Gropius. August 24, 1938. H. L. Frost & Higgins Company, Arlington, Massachusetts.
Gittleman, Peter. ñGropius House Landscape.ò Waltham, MA: Historic New England Property Care Files, 1994.
Gold Star Wholesale Nursery, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 2003.
Gold Star Wholesale Nursery, Inc. Invoice. Waltham, MA: Historic New England Property Care Files, 2006.
Griffin, Pam. ñMeeting Minutes: Gropius House.ò Waltham, MA: Historic New England Property Care Files, 2001.
Gropius, Walter, and Marcel Breuer. *Gropius Residence, Lincoln, Massachusetts, 1938: Landscaping Plan.* 1938. Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge.
ñGropius Grounds: 1995.ò Waltham, MA: Historic New England Property Care Files, 1995.
"Gropius House." Linda Willett to Betsy Igleheart. August 7, 1998. Massachusetts.
ñGropius House Grounds Progress Reports: February 1993.ò Waltham, MA: Historic New England Property Care Files, 1993.
ñGropius Landscape Needs: Spring 1991.ò Waltham, MA: Historic New England Property Care Files, 1991.
ñGropius Landscape Renovation (Suggestions & Recs.).ò Waltham, MA: Historic New England Property Care Files, 1987.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
Johansen, Ati. "Excerpts from Transcription of Interview with Ati Gropius Johansen."
Johansen, Ati. "Gropius House Landscape." Interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley. March 13, 1991.
Interview by Peter Gittleman. March 26, 1991.
Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

"Landscape Problems at Gropius." Maryanne Zephir to Dianne McGuire. July 12, 2000. Gropius House, Lincoln, Massachusetts.

Lloyd A. Weaver to Ise Gropius. June 28, 1949. The Wayside Gardens Co., Inc., Glen Head, Long Island, New York.

OôConnell, Millie. ñGropius House: Report of Activities, 1990.ò Boston: Historic New England Archives, 1990.

Property Care - Gropius - 2009.PMF Assessment Photos - Exterior - GRO.09162009.Trellis - Western Elevation.054. September 16, 2009. Resource Space, Historic New England, Lincoln.

Riley, George & Philip Bevins. ñWinter 1991 Projects: Gropius House.ò Waltham, MA: Historic New England Property Care Files, 1987.

"The Gropius House Landscape." Peter Gittleman to Lisa and Mille OôConnell. July 6, 1990. Massachusetts.

The Wayside Gardens, Co. Invoice. Boston: Historic New England Archives, 1949.

ñUpdate on Gropius Grounds: Fall 1992.ò Waltham, MA: Historic New England Property Care Files, 1992.

"Walter Gropius Plans Modern Houses Here: German's First U.S. Designs Will Be in Lincoln and Cohasset." *Boston Evening Transcript*, January 07, 1938.

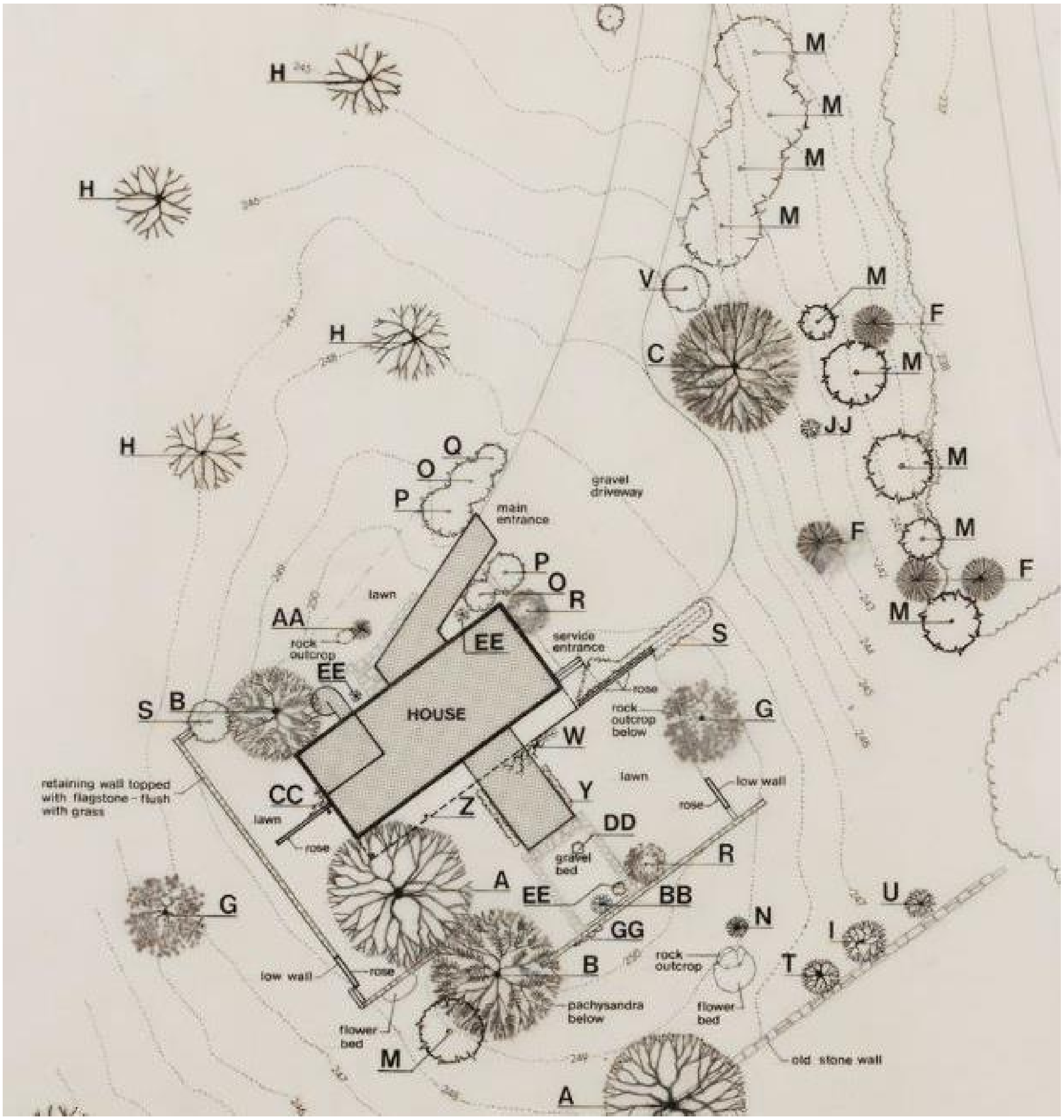
Walter Gropius to the Boston Ice Company. May 29, 1953. Massachusetts.

ñWork Schedule Team Notes: April 10, 2001.ò Waltham, MA: Historic New England Property Care Files, 2001.

"Workplan for Boston Regional Landscapes." Lisa Byers to Rob Kret, Michelle Litant, Peter Gittleman, Sharron Kenney. September 29, 1989. Massachusetts.

Zephir, Maryanne. "Gropius Landscape." E-mail to Diane McGuire. June 15, 2001.

APPENDIX A: Landscaping Plan



Detail of original landscaping plan, Walter Gropius and Marcel Breuer, 1938
Busch-Reisinger Museum, Harvard Art Museums

GROPIUS HOUSE JAPANESE GARDEN

Property Name: Gropius **Structure:** Landscape **Feature:** Japanese Garden **Original Material:** Creeping phlox, euonymus, tulips, rose, steel **Original Color:** Pink, white, ñalmost-black,ò yellow, gray, etc. **1965-1969 Material:** Rose, candytuft, Artemisia, cotoneasters, azaleas, Japanese maple, gravel **1965-1969 Color:** Red, pink, gray, etc.	 RS ID #238553, 2015

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

The Japanese Garden should be maintained as designated by the Cultural Landscape Plan that saw implementation during the Save Americaôs Treasures Grant project in 2001 *(Figure 1)*, when landscape architects replaced unhealthy plants by consulting historic photographs from the interpretive period. The shape and size of the bed should be protected, since it was intentionally designed with dimensions identical to those of the screen porch. The elements of Japanese design that Gropius originally incorporated into the garden should also be preserved. These details reflect the influence of orientalism on modern design, Gropiusôs willingness to experiment with new styles, and his preference for low-maintenance landscaping.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:

- Overall appearance of garden should emphasize a low horizontal profile
- Japanese maple is a focal point of garden and should be pruned to maintain a low profile as well as a degree of transparency
- Shrubs will require pruning to keep horizontal profile and to maintain harmonious effect among shrubs and herbaceous plants maintained[2]
- Stone pavers and edging are original features and should be protected from damage. Any work involving either should seek proper approvals.
- Stone mulch was replaced in 2001. ñCrushed stoneò was supposed to be replaced in kind using samples provided. It is not known if samples still survive. Current material should be evaluated under the assumption that it is still from 2001, and replaced in kind if necessary.

<u>Herbaceous Material</u>

- Maintenance Protocols[3]
  - Hino-Crimson Azalea: Prune to maintain low profile but allow to spread horizontally
  - Rhododendron óPink Discoveryô: Prune to maintain low profile but allow to spread horizontally
  - *Acer palmatum* óBloodgoodô: Requires careful pruning every year to keep low horizontal profile and openness through tree
  - Rosa óNew Dawnô: Keep tied to lally column for support; prune and fertilize in spring
  - Cotoneaster *apiculatus*: Prune to keep plant at 3ôï 4ô spread
  - Cotoneaster *horizontalis*: Prune to 3ô height
  - *Juniperous chinensis* óhetziô: Prune every year as necessary to maintain a height of 3ô
  - *Iberis sumpervirens* óCandytuftô: Shear back hard after flowering to encourage bushy growth
  - *Artemesia schmidtiana*: Cut back hard for late summer refoliation
  - Replacement Protocols
    - All plants in Japanese Garden are replacements from 2001 or later, so material can be replaced if plants suffer from poor health or if pruning is not achieving expected visual character
    - Any replacement should generally be in kind based on the above list of plant materials. If an inappropriate plant not matching this list is identified, it should be replaced at the first opportunity.
    - Note: As of late 2016, it was unknown why the Rosa ñNew Dawnò rose was the preferred choice to climb the lally column in the 2001 Cultural Landscape Report. Historic images from the interpretive period indicate that the rose was white, but the New Dawn is a blush pink. It is possible

[2] *Japanese Garden Record of Treatment, Summer 2001*, report (Portland, ME: Mohr & Seredin, Landscape Architects, Inc., 2001), 4.
[3] All maintenance recommendations for the plant material come from Mohr & Seredinôs *Record of Treatment,* 5.

that the rose in the photograph is indeed blush pink and only appears white, since the two colors are similar. However, further research may be required at the time of the next plant replacement.

Lally Columns

- Maintenance Protocols
    - Exterior paint should be kept in good condition, in keeping with maintenance protocol of exterior siding
    - Integrity of finish should be maintained because it is protecting steel from exposure. If there is a failure it must be treated as quickly as possible to avoid rusting.
    - Wire brush area to remove any oxidization or corrosion, spot apply rust converter, and apply finish paint
- Repair Protocols
    - Upon inspection in 2016, 2002 repairs appear to have held up well. The following repair procedure should be reviewed and updated:
        - Grit-blast for removal of paint and rust
        - Paint with zinc primer
        - Paint with an epoxy mid-coat
        - Finish with a urethane gloss matching existing color.
            - Evidence of past paint colors was lost during grit blasting repairs in 2002. A Munsell color was specified for this project, and the existing color should be reviewed. An interpretive decision may be necessary.

Original Construction and Evolution:
The Japanese garden was likely planted in 1957, after the Gropiuses returned from an inspiring vacation to Japan.[4] Before that time a perennial bed, which was defined but not yet planted in 1938, was in its place *(Figure 2)*.[5] The plantings in this garden matured significantly during the 1940s, and photographs from 1948 show that it was full of pink and white creeping flox, ñyellow, pink, and almost-black tulipsò, and euonymous that bordered the porch.[6] Two lally columns connected with a wooden board formed a ñframing deviceò designed to connect a person in the screened porch with the view to the South Meadow and beyond.[7] Historic images from the interpretive period show what appears to be a white rose on the column.

[4] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 17.
[5] Ibid., 14.
[6] Ibid., 16.
[7] Mohr & Seredin, *Cultural Landscape Report*, 32.

Figure 2: Perennial bed, 1951
Historic New England Archives, Binder of Slides

In 1957 all of these plantings were replaced with a bed of gravel containing candytuft, Artemisia, cotoneaster, and widely-spaced, red and pink azaleas *(Figure 3)*.[8] At the corner of the lally columns, which remained at the south end of the garden, a Japanese maple was planted.[9] The bed was edged in vertically-oriented slate, and a bluestone pathway ran between the porch and the garden.[10] Only the euonymous bordering the porch and the white rose climbing the lally column were retained from the perennial garden.[11]

Figure 3: Japanese garden, 1958
Historic New England Archives, Binder of Slides

[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] Ibid.

Character-Defining Traits in the Interpretive Period:

The Japanese garden had not changed significantly by the interpretive period. The only alterations that had taken place within it since 1957 were the replacement of the Artemisia with a similar-looking plant, and the general maturing and pruning of the feature as a whole *(Figure 4)*.[12] The fact that the bedôs measurements are identical to those of the screened porch makes the garden an example of the moduleôs prevalence in modern design.[13] Orientalism was another modernist ideal, and it was clearly reflected in the Japanese influences on the 1957 design, including the evenly-spaced yet asymmetrical spacing of the plants.[14] Japanese landscaping suited Gropius because it reflected several of his Bauhaus principles, including low-maintenance design.[15] The garden also proves his willingness to experiment with techniques outside of those frequently used in traditional New England or even Bauhaus designs.[16]

Figure 4: Japanese garden, 1966
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:

After the redesign of the perennial bed, very few changes to the garden were recorded until the propertyôs acquisition by the Society for the Preservation of New England Antiquities (SPNEA). Junipers were replaced with candytuft within this timeframe, but the exact date

[12] Ibid.
[13] Ibid., 5.
[14] Ibid., 4 and Mohr & Seredin, *Cultural Landscape Report*, 32. The report refers to a design in which plantings are placed at equal distances from one another, but not necessarily in straight lines.
[15] Mohr & Seredin, *Cultural Landscape Report*, 32.
[16] Ibid.

is unknown.[17] In 1985 a SPNEA to-do list included the rejuvenation of the garden, which involved obtaining peat moss and new or screened stone, as well as the pruning of the Japanese maple and the moving of azaleas.[18] The tasks were included on a to-do list again in 1987, along with the ñrenovationò and addition of plantings.[19] A report written in the same year suggested the replacement of missing plants and the supplementing of soil, along with another call for pruning of the Japanese maple.[20] Phoebe Bruck, a friend of Gropiusôs wife Ise and a source of information on modern landscapes, even went as far as to say that the Japanese garden had always been a failure and that it should be returned to its earlier perennial design.[21] In 1989, Bruck also asserted that the lally columns should be painted white instead of gray.[22]

By 1991, the Japanese maple was still too big and needed to be either pruned, lowered, or moved.[23] In a traditional Japanese garden it would not have been planted in the middle of the viewfinder, and there was a debate among SPNEA staff and consultants whether its placement should reflect the authentic Japanese design or that of the Gropiuses.[24] The other plants were too few and grouped incorrectly; cotoneasters, phlox, and alyssum were included on a list of required purchases for the garden.[25] The bed in general lacked the ñagelessò quality found in traditional Japanese landscape design, which would require a cyclical maintenance plan that SPNEA intended to form.[26] Finally, the gravel needed to be topped up and a white rose was requested for the lally column.[27]

In 1992 the Japanese maple was finally pruned, but it was replaced with a smaller variety soon afterward.[28] In the same year the bluestones that made up the gardenôs edging were reset, but SPNEA had yet to add more gravel to the bed.[29] By 1994 the flagstones around the garden needed to be reset, the Japanese maple required further pruning, and the cotoneasters had to be replaced.[30]

---

[17] Kramer, *Gropius House Landscape*, 19.
[18] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985).
[19] ñGropius Landscape Renovation (Suggestions & Recs.),ò (Waltham, MA: Historic New England Property Care Files, 1987).
[20] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), 17.
[21] ñGropius Landscape Renovation.ò
[22] Pheobe Bruck, "Gropius House Landscape," interview by Peter Gittleman, April 21, 1989, 25.
[23] Ati Johansen, "Gropius House Landscape," interview by Peter Gittleman, Phoebe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley, March 13, 1991, 11 and 15.
[24] Ibid., 16-17.
[25] Ibid., 12. ñGropius Landscape Needs: Spring 1991,ò (Waltham, MA: Historic New England Property Care Files, 1991).
[26] Johansen, ñGropius House Landscape,ò 19. ñGropius Landscape Needs.ò
[27] ñGropius Landscape Needs.ò
[28] ñUpdate on Gropius Grounds: Fall 1992,ò (Waltham, MA: Historic New England Property Care Files, 1992).
[29] Ibid. Peter Gittleman, "RE: Gropius Questions," e-mail message to author, November 28, 2016.
[30] Peter Gittleman, ñGropius House Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1994).

Major work was undertaken on the Japanese garden during the Save Americaôs Treasures (SAT) Grant project. When preparations began in 1999, landscape architects identified the Japanese maple and two of the azaleas as the only original Gropius plants in the bed.[31] They also sampled the gravel in order to identify the existing type, revealing different generations of material.[32] Preparations for the transportation of the Japanese maple to the nursery at SPNEAôs Lyman Estate were made the same year.[33] The project finished in 2002 with a complete replacement of the garden *(Figure 5)*.[34] All of the plants were removed, and the Japanese maple and original azaleas were preserved in a greenhouse at Lyman for later replanting.[35] The edging was removed and replaced, the bluestone walk was removed and reset, the surrounding lawn was seeded and adjusted for grading, geotextile was applied and tucked in around the edges, and gravel matching the landscape architectsô sample was added to the bed after the soil was amended.[36] The restoration of the lally columns was also carried out.[37] The report also included a short maintenance guide for the newly restored garden.[38]

Figure 1: Japanese garden, 2002
RS #57085

[31] Mohr & Seredin, *Cultural Landscape Report*, 30.
[32] Ibid., 31-32.
[33] "Gropius House - Reply," e-mail to Michael Lynch, October 20, 1999.
[34] *Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts*, report, Interior (Boston, MA: Society for the Preservation of New England Antiquities, 2002), 4.
[35] Mohr & Seredin, *Cultural Landscape Report*, 31. Society for the Preservation of New England Antiquities, *Federal Save America's Treasures Grant*, 4. At least a portion of the azaleas in the garden were replaced in 2016 for unknown reasons.
[36] Pam Griffin, ñMeeting Minutes: Gropius House,ò (Waltham, MA: Historic New England Property Care Files, 2001). The Picot Company, ñLandscaping Proposal: Japanese Garden Restoration, Walter Gropius House, Lincoln, MA,ò (Waltham, MA: Historic New England Property Care Files, 2001).
[37] SPNEA, *Final Project Report*, 2.
[38] Ibid.

Interventions

2016: Azaleas replaced with products from Home Depot. No details available.

2001: SAT grant restoration completed, including replacement of plants, spreading of seed and adjusting grading of lawn, adjustment of edging, resetting of stone path, application of geotextile, amendment of soil, replacement of gravel to match existing, and establishment of maintenance schedule. Lally column also likely to have been restored.

1999: SAT grant project begins with identification of original plants still in existence and their removal to Lyman nursery. Gravel also sampled and analyzed.

1994: Resetting of flagstones around garden and pruning of Japanese maple required. Cotoneasters needed to be replaced.

1992: Japanese maple pruned and size appropriateness questioned. Slate edging reset. Intention to add more gravel to bed expressed.

1991: Japanese maple too big; needed to be pruned, lowered, or replaced. Debate took place about whether maple should be moved somewhere more appropriate for an authentic Japanese garden, or whether it should stay in the inaccurate place the Gropiuses chose. Plants were too sparse and grouped incorrectly; cotoneasters, phlox, and alyssum needed to be added. Garden should have an ñagelessò quality, which would require frequent pruning. More gravel and a cyclical maintenance plan were needed. Plans made for planting of white rose at lally column.

1989: Phoebe Bruck asserted that lally columns should be white rather than gray, and that Japanese maple should not be right between them because it took away from their ñviewfinderò purpose. Maple needed pruning. Edges of bed needed to be better defined.

1987: To-do list included screening of gravel, root-pruning Japanese maple to maintain its scale, renovating plantings and adding new ones where necessary. Consultant suggested supplementing soil. Bruck called Japanese design a failure and suggested return to perennial bed.

1985: To-do list included rejuvenation of gravel bed with peat moss and a new or screened stone, root-pruning of Japanese maple, and moving of azaleas

1968: Garden appears mature and well-pruned in photographs. Artemisia had been replaced by different plant of similar appearance.

1957: Likely year of gardenôs redesign in the Japanese style. Japanese maple, candytuft, artemisia, cotoneaster, and widely-spaced red and pink azaleas planted. Bed edged in vertically-oriented slate.

1948: Historical photographs show phlox and tulips in perennial bed, which preceded Japanese garden in same location.

1938: Perennial bed defined but not planted

BIBLIOGRAPHY

Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

Cultural Landscape Treatment Report for Gropius House, Lincoln Massachusetts. Report. Portland, ME: Mohr & Seredin, Landscape Architects, 2001.

Bruck, Phoebe. "Gropius House Landscape." Interview by Peter Gittleman. April 21, 1989.

Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Interior. Boston, MA: Society for the Preservation of New England Antiquities, 2002.

Gittleman, Peter. ñGropius House Landscape.ò Waltham, MA: Historic New England Property Care Files, 1994.

Gittleman, Peter. "RE: Gropius Questions." E-mail message to author. November 28, 2016.

Griffin, Pam. ñMeeting Minutes: Gropius House.ò Waltham, MA: Historic New England Property Care Files, 2001.

"Gropius House - Reply." E-mail to Michael Lynch. October 20, 1999.

ñGropius Landscape Renovation (Suggestions & Recs.).ò Waltham, MA: Historic New England Property Care Files, 1987.

ñGropius Landscape Needs: Spring 1991.ò Waltham, MA: Historic New England Property Care Files, 1991.

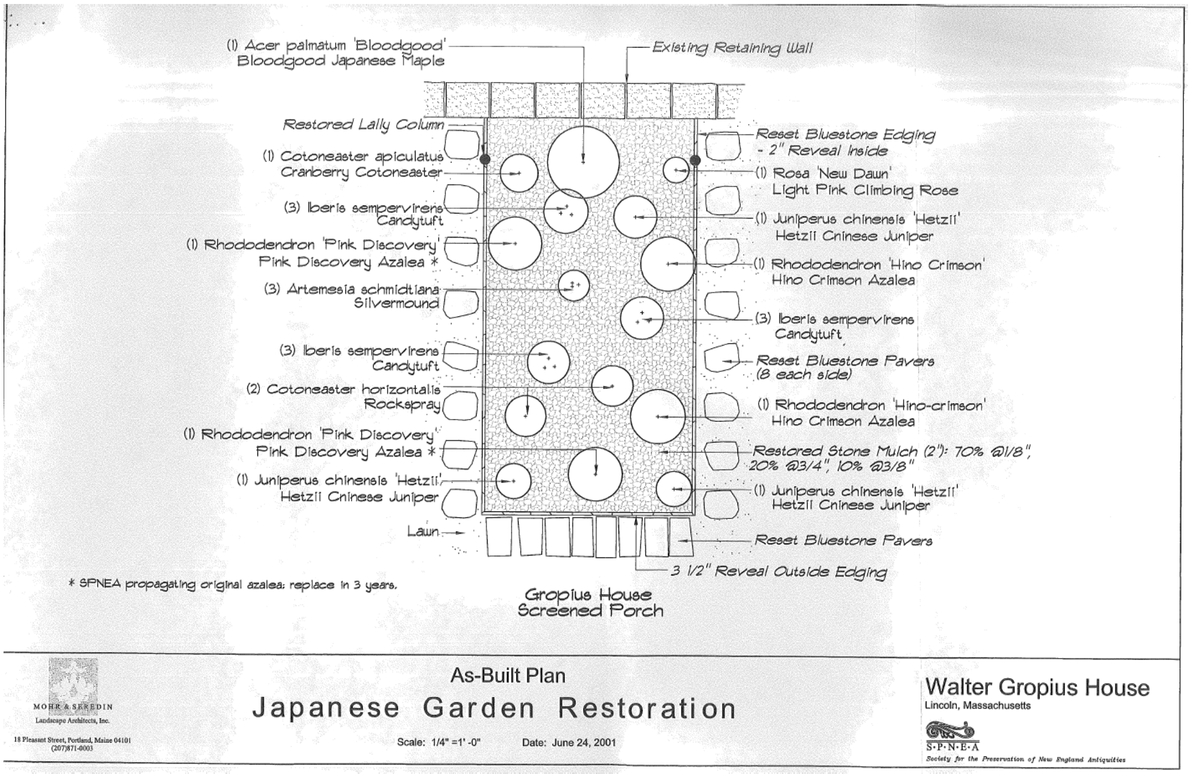
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Johansen, Ati. "Gropius House Landscape." Interview by Peter Gittleman, Phoebe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley. March 13, 1991.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.The Picot Company. ñLandscaping Proposal: Japanese Garden Restoration, Walter Gropius House, Lincoln, MA.ò Waltham, MA: Historic New England Property Care Files, 2001.

ñUpdate on Gropius Grounds: Fall 1992.ò Waltham, MA: Historic New England Property Care Files, 1992.

Appendix A: As-Built Plan of Japanese Garden, 2001



Mohr & Seredin Landscape Architects, Inc., *Cultural Landscape Report*, 2001

GROPIUS HOUSE TREES

Property Name: Gropius
Structure: Landscape
Feature: Trees
Original Material: White pine, red oak, Dutch elm, American beech, red cedar, and Austrian pine
Original Color: N/A
1965-1969 Material: White pine, red oak, red cedar, juniper, Austrian pine, dogwood, blue cedar, Canadian hemlock, sargent crabapple, Japanese yew, spindletree, and white fringetree
1965-1969 Color: N/A

RS ID #270315, 2016

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature) as part of the project, realizing that such enhancements may not be in keeping with the original design intent.[1]

It is important that the variation and placement of trees at the Gropius House represent the juxtaposition between the landscapeôs more manicured and natural areas. In order to retain the ñcolumnsò and canopies that reflect the houseôs architecture, large trees must always exist in the locations of the original white pines and red oaks (see Appendix A). The consideration for passive temperature control that Gropius incorporated into his landscape design should be maintained, including the domination of the south lawn by deciduous trees and the numerous evergreens to the east and west. Trees should not be so tall as to obscure long views from the house. They should be kept neat, healthy, and at a safe distance from the buildings on the property.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
Throughout this report, ID numbers from Historic New England's 2009 tree inventory (Appendix B) will be used where possible to indicate that a given tree is still extant.

Maintenance Protocol
- Pruning and other maintenance should be performed by certified arborist in consultation with Historic New England staff. See also Historic New England White Papers on Arborcare.
- Work should first focus on trees surrounding structures and formal areas of the property in order to address hazards to public, historic buildings, and the landscape. Work can then extend to property lines.
- Trees within rights-of-way along Baker Bridge Road have been periodically, and poorly, maintained by utility companies. Pruning of hazardous or unsightly trees in right of way should be discussed with preservation manager. Some trees have also been removed, which affects the views to and from the north.
- References to trees should use numbering system developed in the 2009 Tree Inventory

Entry Drive
- Junipers (#12) encroach into driveway. Keep pruned back but with natural shapes.
- Keep hemlocks (#17 and #18) pruned over garage and drive. Monitor for wooly adelgid.
- Monitor trees (#13 through #25) over visitor center. Pines are cabled and should be reviewed every couple years for continued stability.
- Keep Zelkova (#1) pruned away from house. Original tree was an elm and Zelkova was an inappropriate replacement. It is too stout and rubs house, while original elm towered over building. Continue the maintenance protocol however the Zelkova should *not* be replaced and can be removed if it threatens building.

Front Lawn
- Keep pine (#2) pruned away from the house.
- Bed under pine fills with poison ivy and bittersweet

Back Yard and Japanese Garden
- Oak tree (#3) adjacent to house should be pruned and inspected every other year by professional arborist. Needs to be pruned away from the house but kept close. The tree is historic and important to interpretation of the landscape and house.
- Pine (#3) is cabled and should be maintained and inspected in conjunction with the adjacent oak
- Oak tree (#5) and ornamental trees (#6, #7 and #8) along old stone wall are all historic and should be maintained
- Keep bittersweet out of trees and woody shrubs

South Field

- Old pines (#s 72 & 73) should be standing in field. Clear beyond pine trees at least 10 feet past edge of canopy.
- Keep bittersweet out of trees and woody shrubs

<u>Removal and Replacement Protocol</u>

- Trees and woody shrubs of Gropius property were intentionally retained or planted to complement elements of built environment. No tree removal should be undertaken without consultation with interpretive task force, and discussion should include possibility of replacement.
- Scale of trees is an important consideration in both removal and replacement options. Gropius planted large trees before ground was even broken for construction of house, so species and placement were related to buildingȩs orientation, fenestration, thermal regulation and overall scale. Long-term view is significant in many tree replacements at traditional house museums. However, since trees were part of Gropiusȩs original building design, immediate consideration must be made for their replacement.
- It is clear from Gropius family writings that exact tree species was less important than replacing missing elements. There was a long history of experimentation with vegetation at site. The following are brief guidelines for replacement of trees:
  - General shape/form was more important to Ati Johansen, Gropiusȩs daughter, because they reflected intentions in Bauhaus movement. This will be the philosophy going forward.
  - Tree replacements should match original species if possible, but if they are difficult to match other possibilities will be considered
  - Stumps should be left *in situ* if there is a loss of a particularly important tree without immediate replacement. The stump will mark the location and final size of the original tree.
  - The following trees or tree locations have been identified previously for replacement work:
    - Zelkova (#1) was an inappropriate replacement for original elm. There was no tree in this location during the interpretive period, and in 2016 the interpretive task force decided not to replant the tree when it is time for its removal.
    - Stump to southeast was a blue cedar (#10). Tree was cut down by Society for the Preservation of New England Antiquities (SPNEA) after it shaded adjacent roses. Cedar was part of 1938 planting plan and should be considered for replacement.
    - Tree #67 is not extant. It was a blue cedar and one of two that flanked house on west and east sides. Cedar was part of 1938 planting plan and should be considered for replacement.

Original Construction and Evolution:

The only tree on the site before Gropiusȩs arrival was a red oak (#5) near the old stone wall to the south of the property.[2] Other trees were carefully selected and purchased, or

[2] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 31.

transplanted from different locations on the Storrow estate.[3] These included two large white pines placed to the northwest and southwest of the house (#2 and #3), a red oak (#4) planted to the south, a Dutch elm near the marquee (#1 ï replanted as Zelkova), and an American beech (not extant) in a turn-around at the top of the driveway *(Figure 2)*.[4] All of these plantings occurred before the house was constructed.[5]

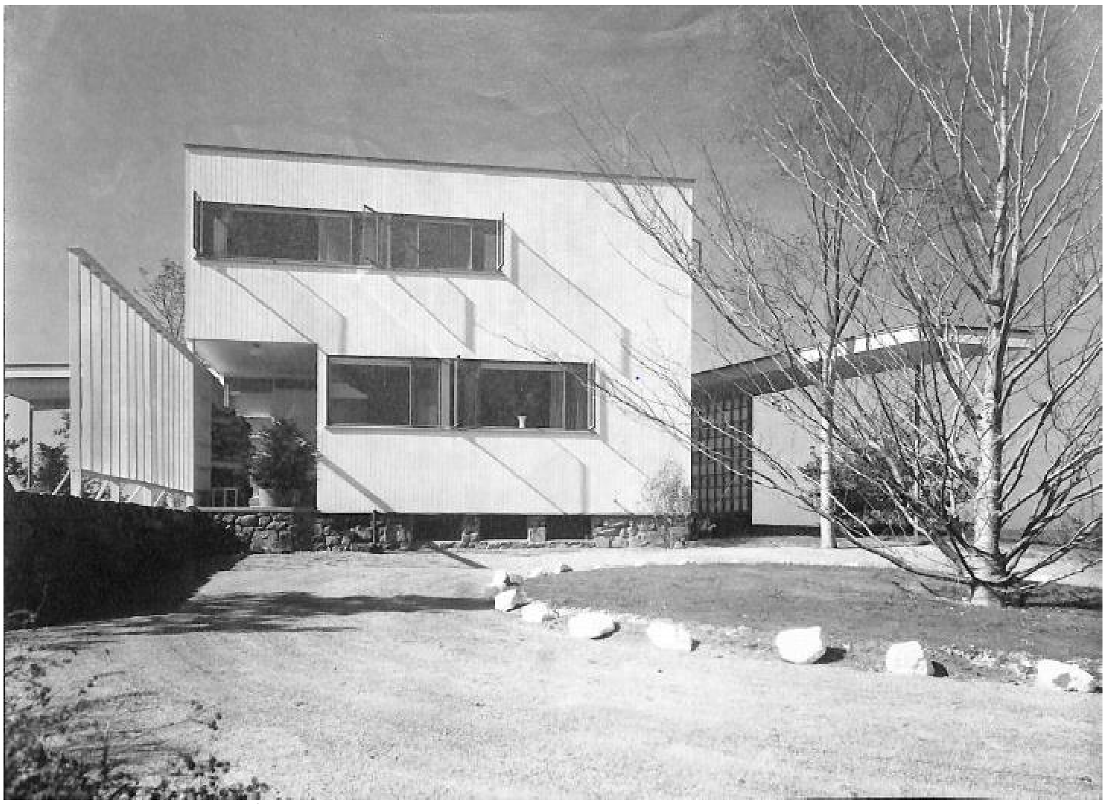


Figure 2: East façade, with the American beech to the right, Paul Davis, circa 1939-40
Historic New England Archives

Between Gropiusôs arrival at the site and the late 1960s, the number and size of trees on the property grew significantly. While it is unclear when most of them were planted, an analysis of photographs completed in 1997 suggests that there were a few ornamental trees to the east of the porch by the end of 1938.[6] Red cedars, Pfitzer junipers and Austrian pines grew on the east slope in front of the house, and Chinese and American dogwoods (#70 and #71) were planted near the red oak (#5) by the south stone wall.[7] Blue cedars were also added to the east (#10) and west sides (#67) of the house.[8] Historical documents suggest

[3] Ati Johansen, "Excerpts from Transcription of Interview with Ati Gropius Johansen," interview by Peter Gittleman, March 26, 1991, 7.
[4] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 18.
[5] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 12.
[6] Kramer, *Gropius House*, 14.
[7] Gropius, ñGropius House,ò 18 and 19. Ralph B. Meaney, *Residence of Dr. & Mrs. Gropius, South Lincoln, Mass.*, 1949, Lincoln, Massachusetts.
[8] Gropius, ñGropius House,ò 18.

that Canadian hemlocks (#17 and #18) and white pines (#19 and #21, with #14, #15, #16 and #20 possibly indicating volunteers) were planted around the garage.[9] Finally, photographs that likely date to the 1940s show a juniper covering a rock outcropping in the western section of the backyard and volunteer growth in the far south meadow.[10]

Other trees that may have existed on the site at some time are included in the original landscape plan, but some of them are not mentioned in other sources. For example, the plan shows a red cedar (#69), a spindletree (#8), and a sargent crabapple (#6) near the dogwood (#7) that stood by the south wall.[11] There is also a white pine (#65) and a red cedar to the far west of the property.[12] A white fringetree appears to have been located among the junipers, pines, and cedars on the east slope. The plan and the 2009 tree inventory both show sugar and sycamore maples lining Baker Bridge Road (Figure 3).[13] Japanese yew trees were specified for each side of the marquee, and a sargent crabapple (#22) is located across from the garage.[14]

Figure 3: Trees lining Baker Bridge Road, 1939
Historic New England Archives, Binder of Slides

[9] Letter to Walter Gropius, August 24, 1938, H. L. Frost & Higgins Company, Arlington, Massachusetts. Walter Gropius and Marcel Breuer, *Gropius Residence, Lincoln, Massachusetts*, 1938: Landscaping Plan, 1938, Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge.
[10] Kramer, *Gropius House*, 18 and 15.
[11] Gropius and Breuer, *Gropius Residence*.
[12] Ibid.
[13] Ibid.
[14] Ibid.

Minor maintenance was carried out on the trees before the late 1960s, and three significant changes were made during the 1950s. In 1952 the beech tree in the turn-around at the top of the driveway was relocated to the Harvard campus because it had outgrown its allotted space.[15] In addition, the elm tree at the northeast corner of the house died of Dutch elm disease sometime between 1952 and 1955.[16] Later in 1955, during the repair of the marquee roof, construction workers accidentally spilled hot tar on an Austrian pine and two cedars that were located close to the entrance of the house.[17] Earlier records do not indicate that there were trees of these species close enough to the building to be in danger from roof work; the nearest cedars and Austrian pines were on the northeastern slope. This suggests that some trees may have been moved from this area closer to the house sometime after the relocation of Austrian pines was first proposed in 1949.[18] If this work did occur, it is possible that the trees were replacements for the dead northeastern elm. In any case, Gropius told the roofing contractor in a letter that washing the trees had been ineffective and that they would probably die.[19]

Character-Defining Traits in the Interpretive Period:
By the late 1960s, the trees at the Gropius House had again increased in both size and variation. While some were allowed to grow seemingly unchecked, pruning and work such as the 1952 removal of the beech suggest that retaining the original scale of landscape features was significant to Gropius. This is logical given that many of the tree types and locations that Gropius chose reflected modern architecture. For example, the major trees created ñoutside roomsò by extending the lines of the house.[20] The northwestern white pine (#2) and the southern red oak (#5) acted as the buildingôs western columns, and the other red oak (#4) also defined an edge to the ñroomò of the backyard; its leaves were just ñas much a canopy as the extended roof lineò (Figure 4).[21] The trees were also expressive of the functionalism central to Bauhaus design.[22] They shaded and protected vulnerable areas of the façade, and southern deciduous shade trees cooled the house in the summer while the thick evergreens to the west blocked cold winter winds.[23] Another crucial aspect of the treesô significance was the way they framed views.[24]

[15] Gropius, ñGropius House,ò 18.
[16] Kramer, *Gropius House*, 17. Walter Gropius to Edward Higgins, February 28, 1955, Massachusetts.
[17] Walter Gropius to A. Belanger, May 13, 1955, Massachusetts.
[18] Ralph Meaney to Walter Gropius, September 14, 1949, The F.A. Bartlett Tree Expert Company, Framingham, Massachusetts.
[19] Walter Gropius to A. Belanger, May 19, 1955, Massachusetts.
[20] Kramer, *Gropius House*, 2.
[21] Ibid.
[22] Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, 6.
[23] Kramer, *Gropius House*, 2.
[24] Ibid.

Figure 4: Red oak near the south wall, circa 1967-68
Historic New England Archives, Binder of Slides

Functionalism is about not only utility but also ñthe physical and psychological needs of human beingsò.[25] Thus, beauty is encompassed in the term, and partially accounts for the many ornamental trees throughout the property. These trees also represent the most cultivated of the ñhierarchy of landscape zonesò that Gropius created, as most of them are located closer to the house.[26] The zones create the ñintegration of architecture and landscape, of indoors and out, of ï in a larger sense ï man and natureò that is central to Gropiusôs landscape design.[27]

History of Conservation and Maintenance Practices:
In 1946 a tree exam was conducted, and the specialists suggested that Gropius spray, prune, and feed his trees and clean and fill their cavities.[28] They also encouraged him to watch for split crotches, girdling roots, and interfering branches.[29] In 1949 maintenance took place, including corrective pruning of the oak behind the house and of the two western white pines.[30] The pine and elm at the west and east corners of the north façade were also fed.[31] At the same time Gropius also expressed intentions to relocate the Austrian pines on the

[25] Kramer, ñWalter Gropius,ò 6.
[26] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[27] Ibid.
[28] B. L. Brittain to Walter Gropius, February 27, 1946, Davey Tree Expert Co., Kent, Ohio.
[29] Ibid.
[30] Meaney, *Residence of Dr. & Mrs. Gropius*.
[31] Ibid.

northeastern slope and to control for insects on unspecified pines, but he eventually decided to delay this work and there is no definitive evidence that it was ever carried out.[32]

Figure 5: West façade and nearby trees, circa 1940s
Historic New England Archives, Binder of Slides

The northeastern elm had died by 1955, and that year Gropius wrote in a letter that ñthe house looks terribly nakedò.[33] He made inquiries about replacing the elm with a ñnot-too-smallò paper birch or ï as a second choice ï a honey locust.[34] However, there is no evidence that either of these replacement trees were purchased.[35] It was also in 1955 that the roofing contractors spilled tar on the Austrian pine and two cedars near the marquee.[36]

Figures 6 and 7: White pines, southwest and northwest from left to right
Historic New England Archives, Binder of Slides

[32] Walter Gropius to Ralph B. Meaney, September 16, 1949, Massachusetts.
[33] Gropius to Higgins.
[34] Ibid.
[35] Ibid.
[36] Gropius to Belanger, May 13.

After Gropiusôs death, his wife Ise continued to care for the trees. In 1973 the southern red oak (#5) had a case of anthracnose, and its treatment and feeding were planned for late that year.[37] Several oaks (#3 and #5) in the backyard were pruned and trimmed in order to maintain the views from the house and to clear the chimney and roof of branches.[38] The cabling and bracing of the northwestern white pine (#2) also needed to be checked.[39] In 1977, landscapers attended to a large limb from a pine tree and guyed a juniper with stakes and string.[40] They also pruned two unspecified pine trees and an Austrian pine.[41] Photographs show that a weeping Japanese cherry had been added between a stone outcropping and the rough stone wall in the eastern section of the backyard by this year, but the exact time of its planting is unknown.[42]

Unspecified tree work was planned by the Society for the Preservation of New England Antiquities (SPNEA) as soon as Iseôs departure from the house became imminent in 1983, but it is unclear if any of this work actually happened.[43] In 1984 SPNEA hired a consultant to look at a white pine.[44] While no detail was recorded about this visit, information from another consultation carried out in the following year suggests that it concerned the pine at the houseôs northwest corner (#2).[45] Notes from the second consultation indicate that the pineôs stability issues were threatening damage to the house.[46] The problem was solved by the removal of three to five large branches from the top of the tree, and the replacement of the cabling system that supported an old cavity.[47] Further tree work was proposed in 1985, including the pruning of dogwoods, crab trees, a spindletree, a fringetree, yews, and a red oak, as well as the replanting of an elm in the northeast corner of the property and an Austrian pine to the west of the upper parking area.[48] The planting of these trees was almost certainly suggested in order to replace the elm and pine trees that had died in the 1950s.

In 1987 a comprehensive study of the landscape was undertaken in order to propose methods for its restoration. It brought attention to such necessary tasks as pruning the trees along Baker Bridge Road and maintaining them for safety reasons, replanting the Austrian pine and the elm at the northeast corner, maintaining the cedars and planting more evergreens on the northeast slope, pruning and maintaining all major trees, and replacing the damaged spindletree.[49] The Pfitzer juniper that covered a rock outcropping under the southern white pine tree needed to be cut back and the juniper plantings east of the

[37] J. W. Brine, Jr. to Walter Gropius, August 14, 1973, Brine Tree Surgery, Inc., Bedford, Massachusetts.
[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] Ibid.
[42] Kramer, ñWalter Gropius,ò 19.
[43] "Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83," letter from Lynne M. Spencer, April 8, 1983, Massachusetts.
[44] Northeast Shade Tree Invoice, (Waltham, MA: Historic New England Property Care Files, 1984).
[45] Ibid.
[46] Jeff W. Ott to Lynne Spencer, January 3, 1985, Northeast Shade Tree, Portsmouth, New Hampshire.
[47] Ibid.
[48] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985), 2.
[49] Cochrane, *Recommendations*, 18 and 11.

driveway had to be better maintained.[50] In addition, a replacement was required for a Greek (or Irish) juniper on the south lawn, which had been part of a composition that deliberately mimicked the Filipowski sculpture in front of the north façade.[51] In 1988 Phoebe Bruck, a friend of Ise who was knowledgeable about modern landscape design, suggested that the beech removed from the turn-around in 1952 not be replaced.[52] In her opinion the turn-around itself had never been authentically modern, and by the late 1980s its shape had become almost nonexistent.[53] Bruck also asserted that the Greek (or Irish) juniper was ñwrongò and should be removed.[54] However, SPNEA staff wanted to keep it because it had been there for several decades and echoed the arrangement near the Filipowski sculpture.[55] A tree also fell at the east end of the property in 1988, and the sale of a western land parcel prompted SPNEA staff to propose the planting of cedar trees to the west in order to block the area from view.[56]

More maintenance needs came to the fore in 1989. The fallen tree to the east of the property still had not been removed, and a decision about replacing the northeast elm had not yet been made.[57] The fringetree at the northeast corner and some yews near the house needed to be pruned to a smaller size.[58] There was also a discussion about relocating the broad-leaf evergreens near the front of the property and replacing them with laurels or Andromeda.[59] Fig trees needed to be moved to the Lyman greenhouse, and an unspecified white pine needed to be pruned.[60] Finally, all fruit trees required pruning and trees generally needed to be relieved of low-hanging and dead branches.[61]

In 1990 similar issues abounded. A thinning pine needed attention, and a cedar to the south was dying and needed to be replaced.[62] The fig trees that had been moved to the Lyman greenhouses were required back on site, and a myrtle tree was to be planted behind the house.[63] The dogwoods urgently needed fertilizing, and SPNEA staff noticed that they had

---

[50] Cochrane, *Recommendations*, 18. Tom Cochrane, ñGropius Landscape Renovation (Suggestions & Recs.),ò (Waltham, MA: Historic New England Property Care Files, 1987), 2.
[51] Cochrane, ñSuggestions & Recs.,ò 3.
[52] Phoebe Mason Bruck, "Phoebe Mason Bruck's Comments on the Gropius Landscape," interview by Tom Cochrane, 1988, 2.
[53] Ibid., 1.
[54] Ibid., 3.
[55] Ibid.
[56] Ron Brown, ñQuarterly Report of Conditions,ò (Waltham, MA: Historic New England Property Care Files, 1988), 13. ñGropius Landscape,ò (Waltham, MA: Historic New England Property Care Files, 1988).
[57] Ron Brown, ñGropius House Quarterly Report,ò (Waltham, MA: Historic New England Property Care Files, 1989), 9. Pheobe Bruck, "Gropius House Landscape," interview by Peter Gittleman, April 21, 1989, 3-5.
[58] Bruck, ñGropius House,ò 10-14.
[59] Ibid., 14-16.
[60] "Workplan for Boston Regional Landscapes," Lisa Byers to Rob Kret, Michelle Litant, Peter Gittleman, Sharron Kenney, September 29, 1989, Massachusetts.
[61] "Winter Projects," Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret, August 28, 1989, Massachusetts.
[62] "The Gropius House Landscape," Peter Gittleman to Lisa and Mille OõConnell, July 6, 1990, Massachusetts.
[63] Ibid. Peter Gittleman and Kathy, untitled notes, (Waltham, MA: Historic New England Property Care Files, 1990).

symptoms of an unspecified a disease.[64] Trees near the house were pruned, and small trees along Baker Bridge Road required removal.[65] A Zelkova (#1) was planted in place of the elm tree that had died in the 1950s, and soon afterwards it experienced an infestation of some kind that was not specified in any records.[66] Finally, the white pine (#2) at the northwest corner of the house was replaced with a smaller tree near the top of the hillôs north slope.[67]

Figure 8: Garage surrounded by Canadian hemlocks and white pines, 1991
Historic New England, Property Care Binders

The skinny, dying cedar in the south lawn still needed to be replaced by 1991.[68] The same year a large fallen pine tree behind the garage required removal, and the cabling of the

[64] Ibid.
[65] Ibid. Millie OôConnell, ñGropius House Report of Activities, 1990,ò (Boston, MA: Historic New England Files, 1990).
[66] OôConnell, ñGropius House.ò Untitled notes, (Waltham, MA: Historic New England Property Care Files, 1990).
[67] OôConnell, ñGropius House.ò
[68] ñGropius Landscaping Needs, Spring 1991,ò (Waltham, MA: Historic New England Property Care Files, 1991).

other pines in the area was recommended as protection for the garage.[69] While there is no definitive evidence that the cabling was carried out, the dead tree was removed the following year.[70] 1992 also saw the removal of oak branches that were growing dangerously close to the house, as well as the fertilization and pruning of diseased dogwoods.[71] In 1993 a survey of proposed tree work was planned.[72] In addition, an unspecified tree in the south area of the property was causing damage to the house, so its removal was urgently requested.[73] It is possible that the tree in question was the red cedar south of the east trellis, which was removed in 1995.[74] During the same year the evergreens on the property were fertilized.[75] Four years later Johansen requested that the line of young trees down the west hill be controlled and topped in order to prevent obstruction of the deliberately-designed long views from the house.[76]

Figure 9: Trees to south of house, 1994
Historic New England, Property Care Files

69

70 ñUpdate on Gropius Grounds: Fall 1992,ò (Waltham, MA: Historic New England Property Care Files, 1992).

71 Ibid.

72 ñGropius House Grounds Progress Report: February 1993,ò (Waltham, MA: Historic New England Property Care Files, 1993).

73 "Tree Eating the Rear Elevation of Gropius," Frank Thompson to Peter Gittleman and Millie O'Connell, September 7, 1993, Massachusetts.

74 Historic New England Proactive Preservation Interpretation and Planning (PPIP) meeting, September 16, 2016.

75 ñGropius Grounds,ò (Waltham, MA: Historic New England Property Care Files, 1995).

76 "Landscaping and Garden of Gropius House," Ati Johansen to Peter Gittleman, October 04, 1999, Stanfordville, New York.

By the time a Save Americaôs Treasures grant project was underway at the property in 2001, the hemlocks near the garage were seriously infested with woolly adelgid and many tree branches had fallen down throughout the site.[77] Invasive species were growing in the south meadow, and the dogwoods needed to be sprayed.[78] Wooly adelgid was still an issue in the following year, and one of the hemlocks was also suffering from malnourishment by this time.[79] The large, multi-trunk white pine needed to be cabled and pruned into an ñA-shape,ò and several the oaks at the house and in the meadow needed to be pruned, thinned, and fertilized.[80] It is unclear whether all of this work was carried out, but the pine was cabled in 2002 along with two oaks, and during the following year hemlocks and white pines were treated for woolly adelgid.[81]

The next record relating to the trees at the Gropius House comes from 2008, when dead-wooding was reported.[82] About a year later three red cedars, stumps, and small trees were cleared from the area along the wood border.[83] In addition, staff were considering the possibility of removing the Zelkova that had been planted in 1990 and leaving a stump in its place as the Gropiuses had done when the elm died.[84] Johansen strongly advocated for the necessity of a tree in its location, so the tree was retained and pruned.[85] In the same year the Zelkova was crown-cleaned along with an unspecified oak and pine, and two trees fell in the local right-of-way.[86] In 2010 two large white pines were removed from the west side of the house.[87] By 2016, trees adjacent to the garage and house had grown enough to endanger the buildings ï and possibly visitors ï by dropping limbs or degrading paint and wood with rubbing branches.[88] The Zelkova was cited as one of these problematic trees.[89]

---

[77] ñGropius,ò (Waltham, MA: Historic New England Property Care Files, 2001). "Gropius Landscape," Marianne Zephir to Diane McGuire and Peter Gittleman, March 29, 2001, Massachusetts.
[78] ñGropius House Meeting Minutes: April 3, 2001,ò (Waltham, MA: Historic New England Property Care Files, 2001). Pam Griffin to Todd Brown, June 5, 2001, Mohr & Seredin Landscape Architects, Inc., Portland, Maine.
[79] Joe Camilliere, ñReview of Gropius Tree Work,ò (Waltham, MA: Historic New England Property Care Files, 2002).
[80] Ibid.
[81] Hartney Greymont Invoice, (Waltham, MA: Historic New England Property Care Files, 2002). Hartney Greymont Invoice, (Waltham, MA: Historic New England Property Care Files, 2003).
[82] ñMaintenance & Deadwooding,ò Historic New England Property Care Electronic Database of Historical Projects, 2009.
[83] Belmont Landscape Invoice, (Waltham, MA: Historic New England Property Care Files, 2009).
[84] Peter Gittleman, "Just as I Thought," e-mail to Anthony DeAngelis and Ben Haavik, March 10, 2009.
[85] ñCrown Clean for Oak Pine and Zelcova,ò Historic New England Property Care Electronic Database of Historical Projects, 2010.
[86] ñZelcova Structural and Clearance Pruning,ò Historic New England Property Care Electronic Database of Historical Projects, 2010. *Property Care - Gropius - 2009.PMF Assessment Photos - Landscape - GRO.09162009.Landscape - Downed Trees in Right of Way.235*, September 16, 2009, Resource Space, Historic New England, Lincoln.
[87] Belmont Landscape Invoice, (Waltham, MA: Historic New England Property Care Files, 2010).
[88] ñZelcova + General Maintenance,ò Historic New England Property Care Electronic Database of Historical Projects, 2017.
[89] Ibid.

Interventions

2016: Trees adjacent to garage and house had grown enough to endanger buildings and visitors. Limbs could drop and paint or wood could be degraded by rubbing branches. Trees along Baker Bridge Road were removed by power company as approved by the Lincoln tree warden.

2010: Two large white pines removed from west side of house

2009: Consideration of removing Zelkova and either leaving its stump or replacing it with new tree. Johansen insisted on necessity of tree in its location. Structural and clearance pruning of Zelkova carried out, along with crown cleanings for oak, Zelkova and pine. Three red cedars, stumps, and small trees removed from area bordering woods.

2008: Dead-wooding observed

2003: Hemlocks and white pines treated for woolly adelgid

2002: Needs included woolly adelgid treatment for one hemlock and nourishment for another, cabling and pruning of multi-trunk white pine, and pruning, thinning, and fertilizing of oaks. Two oaks and one pine tree cabled.

2001: Branches coming down throughout property. Needs included spraying dogwoods, treating hemlocks for woolly adelgid, and cutting down volunteer trees in south meadow.

1999: Johansen requested that line of young trees on hill west of house be controlled and topped to prevent obstruction of long views

1995: Cedar tree behind east trellis removed. Evergreens fertilized.

1993: Tree behind house getting too large; removal and replacement farther away recommended. Survey of proposed tree work planned.

1992: Arborists removed pine tree behind garage and trimmed oak behind house. Diseased dogwoods pruned and fertilized.

1991: Large fallen pine behind garage needed to be removed, and three remaining pines needed cabling. Skinny cedar still required replacement.

1990: Needs included attention to thinning pine, replacement of dying cedar on south lawn, retrieving fig trees from Lyman greenhouses, fertilizing dogwoods, planting myrtle behind house, removal of small trees along Baker Bridge Road, and addressing elm infestation and diseased dogwoods. Zelkova planted at northeast corner of house, and trees near building pruned. White pine removed from northwest corner and replaced with smaller tree slightly farther from house.

1989: Needs included removal of fallen tree, pruning of fringetree, decrease in size of yews near house, relocation of fig trees to Lyman greenhouse, removal of low-hanging and dead branches, and pruning of all trees. Replacement of dead elm discussed, as well as the possibility of substituting laurels or Andromeda for broad-leafed evergreens near front of property.

1988: Bruck recommended that beech taken from turn-around at top of drive in 1952 not be replaced, and that Irish juniper on south lawn be removed. SPNEA staff preferred to keep juniper. Tree fell at east end of property. Sale of land to west prompted SPNEA to consider planting of cedars in that direction.

1987: To-do lists included pruning street trees and maintaining them for safety, replanting Austrian pine at top of drive, maintaining juniper plantings east of drive, replacing Greek/Irish juniper in lower lawn, cutting back juniper under south white pine, maintaining cedars and planting evergreens east of drive, replanting elm or substitute at northeast corner of house, pruning and maintaining all major trees, and replacing damaged spindletree.

1985: Maintenance list included planting Austrian pine west of upper parking area and elm near northeast of house, as well as pruning dogwoods, crab trees, spindletree, fringetree, yews, and red oaks. White pine inspected; three to five large branches at top of tree thinned, and cable system supporting old cavity near base replaced.

1984: White pine consult carried out

1983: Unspecified tree work planned for Iseôs departure from house

1977: Problem with large limb of pine tree addressed. Two unspecified pine trees and one Austrian pine pruned. By this year, weeping Japanese cherry had been planted between stone outcropping and rough stone wall to east.

1973: Oak immediately behind porch had bad case of anthracnose; spraying and feeding planned for later in the year. Same tree pruned and thinned, along with oak on terrace, in order to maintain skyline from house. Planning for pruning of oak at bottom of hill behind house. Cabling and bracing of northwest pine planned. General need for pruning expressed.

1955: Elm tree in front of house died of Dutch elm disease between 1952 and 1955. Gropius requested paper birch or honey locust as replacement. Evergreens accidentally drenched in tar by roofers, and likely died as a result.

1952: Beech tree in turn-around at top of drive removed after outgrowing its space

1949: Relocation and insect control for Austrian pines proposed but delayed. Northeast elm fed. Northwest pine fed and pruned. Southwest pine pruned correctively. Oak pruned for character.

1946: Tree exam conducted. Specialists suggested spraying, pruning, feeding, and cleaning/filling of cavities. Advised Gropius to watch for splitting crotches, girdling roots, and interfering branches.

1938: Trees brought from offsite planted by Gropius. Evidence of small ornamental tree where screened porch would eventually be. Hemlock planted on either side of drivewayôs base, and another at corner of garage. Two small ornamental trees across flagstones on eastern side of porch by end of 1938.

BIBLIOGRAPHY

Belmont Landscape Invoice. Waltham, MA: Historic New England Property Care Files, 2009.

Belmont Landscape Invoice. Waltham, MA: Historic New England Property Care Files, 2010.

B. L. Brittain to Walter Gropius. February 27, 1946. Davey Tree Expert Co., Kent, Ohio.

Brown, Ron. ñGropius House Quarterly Report.ò Waltham, MA: Historic New England Property Care Files, 1989.

Brown, Ron. ñQuarterly Report of Conditions.ò Waltham, MA: Historic New England Property Care Files, 1988.

Bruck, Pheobe. "Gropius House Landscape." Interview by Peter Gittleman. April 21, 1989.

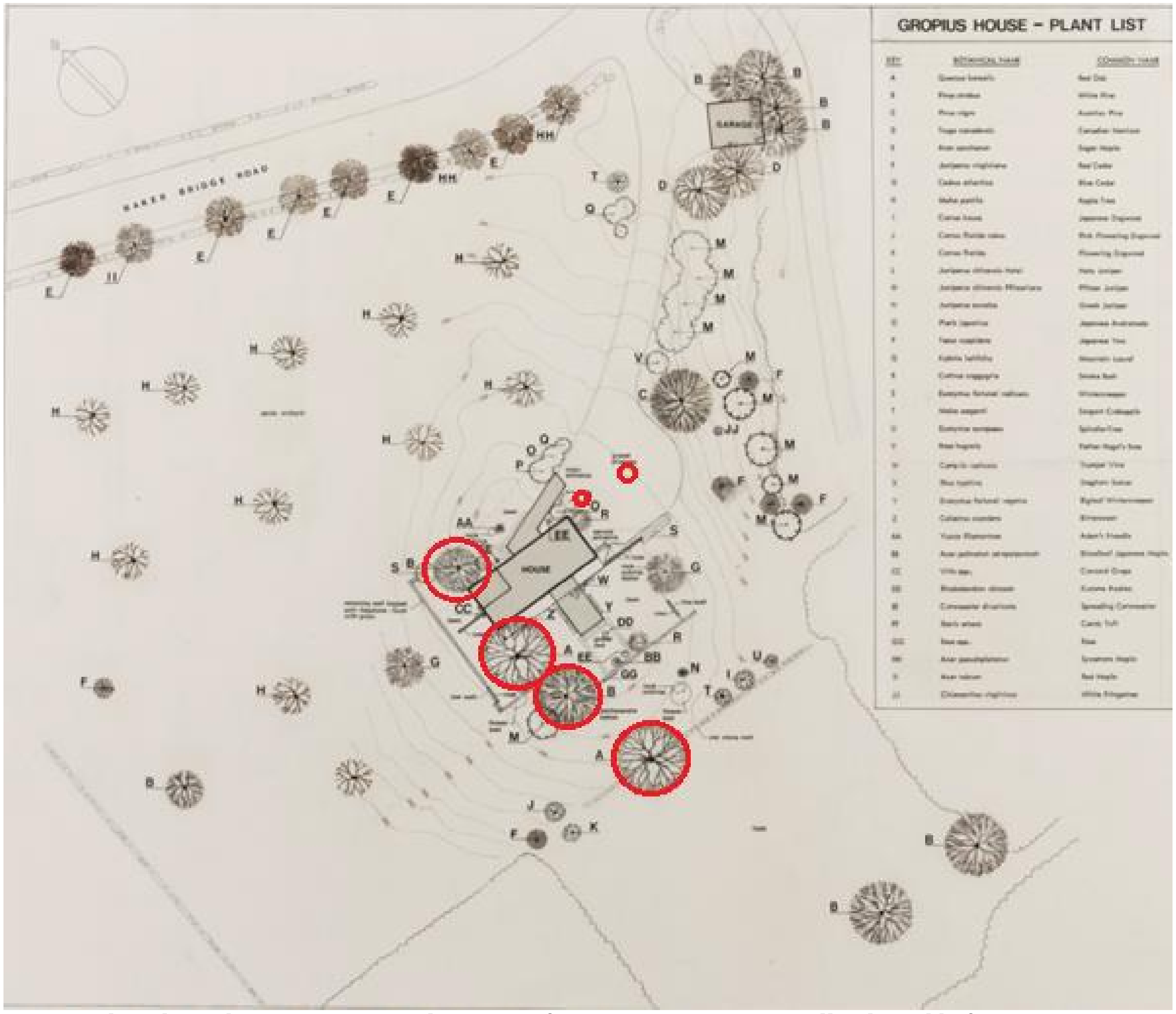
Bruck, Phoebe Mason. "Phoebe Mason Bruck's Comments on the Gropius Landscape." Interview by Tom Cochrane. 1988.

Camilliere, Joe. ñReview of Gropius Tree Work.ò Waltham, MA: Historic New England Property Care Files, 2002.
Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.
Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.
Cochrane, Tom. ñGropius Landscape Renovation (Suggestions & Recs.).ò Waltham, MA: Historic New England Property Care Files, 1987.
ñCrown Clean for Oak Pine and Zelcova.ò Historic New England Property Care Electronic Database of Historical Projects, 2010.
Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.
Hartney Greymont Invoice. Waltham, MA: Historic New England Property Care Files, 2002.
Hartney Greymont Invoice. Waltham, MA: Historic New England Property Care Files, 2003.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) meeting, September 16, 2016.
Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.
J. W. Brine, Jr. to Walter Gropius. August 14, 1973. Brine Tree Surgery, Inc., Bedford, Massachusetts.
Jeff W. Ott to Lynne Spencer. January 3, 1985. Northeast Shade Tree, Portsmouth, New Hampshire.
Johansen, Ati. "Excerpts from Transcription of Interview with Ati Gropius Johansen."
Interview by Peter Gittleman. March 26, 1991.
Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997.
Gittleman, Peter. "Just as I Thought." E-mail to Anthony DeAngelis and Ben Haavik. March 10, 2009.
Gittleman, Peter and Kathy. Untitled notes. Waltham, MA: Historic New England Property Care Files, 1990.
Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.
Gropius, Walter, and Marcel Breuer. *Gropius Residence, Lincoln, Massachusetts, 1938: Landscaping Plan.* 1938. Modern and Contemporary Art, Harvard Art Museums/Busch-Reisinger Museum, Cambridge.
ñGropius Grounds.ò Waltham, MA: Historic New England Property Care Files, 1995.
"Gropius Landscape." Marianne Zephir to Diane McGuire and Peter Gittleman. March 29, 2001. Massachusetts.
ñGropius Landscape.ò Waltham, MA: Historic New England Property Care Files, 1988.
Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.
"Landscaping and Garden of Gropius House." Ati Johansen to Peter Gittleman. October 04, 1999. Stanfordville, New York.
Letter to Walter Gropius. August 24, 1938. H. L. Frost & Higgins Company, Arlington, Massachusetts.
ñMaintenance & Deadwooding.ò Historic New England Property Care Electronic Database

of Historical Projects, 2009.
Meaney, Ralph B. *Residence of Dr. & Mrs. Gropius, South Lincoln, Mass*. 1949. Lincoln, Massachusetts.
Northeast Shade Tree Invoice. Waltham, MA: Historic New England Property Care Files, 1984.
OĜConnell, Millie. ñGropius House Report of Activities, 1990.ò Waltham, MA: Historic New England Property Care Files, 1990.
Pam Griffin to Todd Brown. June 5, 2001. Mohr & Seredin Landscape Architects, Inc., Portland, Maine.
Property Care - Gropius - 2009.PMF Assessment Photos - Landscape – GRO.09162009.Landscape - Downed Trees in Right of Way.235. September 16, 2009. Resource Space, Historic New England, Lincoln.
Ralph Meaney to Walter Gropius. September 14, 1949. The F.A. Bartlett Tree Expert Company, Framingham, Massachusetts.
"Telephone Conversation with Mrs. Tlumacki, 3/21/83 and 3/28/83." Letter from Lynne M. Spencer. April 8, 1983. Massachusetts.
"The Gropius House Landscape." Peter Gittleman to Lisa and Mille OĜConnell. July 6, 1990. Massachusetts.
"Tree Eating the Rear Elevation of Gropius." Frank Thompson to Peter Gittleman and Millie O'Connell. September 7, 1993. Massachusetts.
"Trees at Gropius." Millie O'Connell to Frank Thompson and Tess. March 13, 1991. Massachusetts.
Untitled notes. Waltham, MA: Historic New England Property Care Files, 1990.
Walter Gropius to A. Belanger. May 13, 1955. Massachusetts.
Walter Gropius to A. Belanger. May 19, 1955. Massachusetts.
Walter Gropius to Edward Higgins. February 28, 1955. Massachusetts.
Walter Gropius to Ralph B. Meaney. September 16, 1949. Massachusetts.
"Winter Projects." Lisa Byers to Michelle Litant, Peter Gittleman, Sharron Kenney, George Riley, Rob Kret. August 28, 1989. Massachusetts.
"Workplan for Boston Regional Landscapes." Lisa Byers to Rob Kret, Michelle Litant, Peter Gittleman, Sharron Kenney. September 29, 1989. Massachusetts.
ñZelcova + General Maintenance.ò Historic New England Property Care Electronic Database of Historical Projects, 2017.
ñZelcova Structural and Clearance Pruning.ò Historic New England Property Care Electronic Database of Historical Projects, 2010.

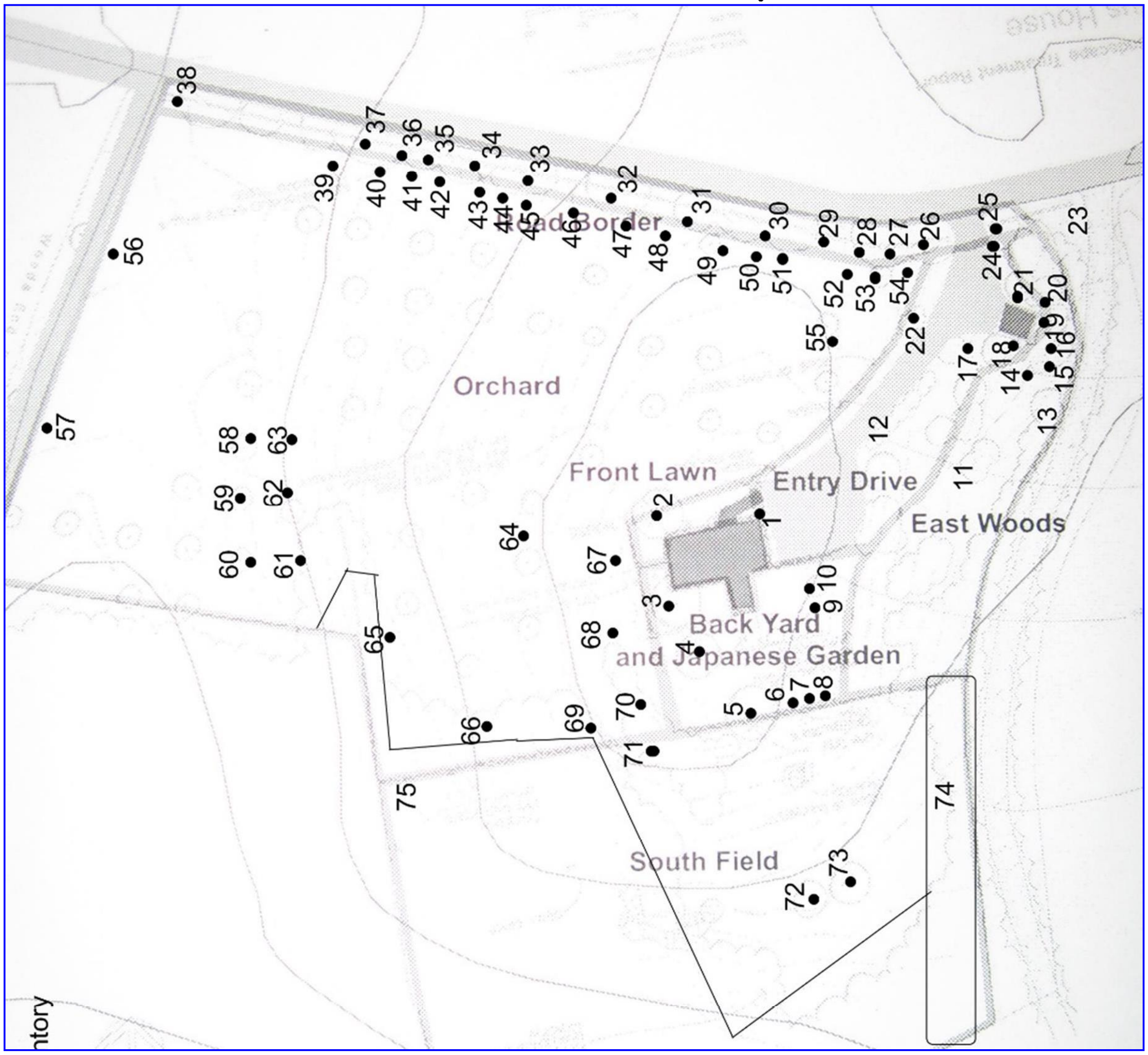
APPENDIX A: Plans and Inventory

Walter Gropius and Marcel Breuer, 1938, Busch-Reisinger Museum, Harvard Art Museums



Red circles indicate approximate locations of six trees Gropius originally planted before construc

APPENDIX B: Tree Inventory



Tree Inventory, Historic New England, 2009
Busch-Reisinger Museum, Harvard Art Museums

Gropius House Tree Inventory and Survey

Gropius House Tree Inventory and Survey

Site Name			Gropius	Objective Abbreviation		Pruning Type			Priority- 1,2,3	
Date			3/13/2009	M- Maintenance		CC- Crown Clean			Condition- Good,Fair,Poor	
				R- Removal		CR - Crown Reduce			Safety Issue-Yes,No	
				SR- Storm Repair		SB- Structural Bracing			Notes-Historically Significant- Hist	
						CRA- Crown Raise		Part of a Landscape Design Feature- Feature		
						CT- Crown Thin				
ID #	Zone #	DBH	Common Name	Objective	Pruning Type	Safety Issue	Priority	Condition	Notes	2016 Historical Notes
1	ED	19"	Zelkova	M	CC,CRA	NO	1	Good	Clearance off house	Replacement of historic elm tree. DO NOT REPLACE. The original was one of five trees Gropius planted before construction.
2	FL	21"	White Pine	M	CC,CR,CT	NO	2	Good		Replacement of a historic tree. The original was one of five trees Gropius planted before construction
3	BY	32"	Red Oak	M	CC,CR,CT	NO	2	Good	Lightning protect?	Historic Tree planted by Gropius before construction.
4	BY	47"	White Pine	M	CC,CR,CT	NO	CR1. 2	Good	CR limbs off juniper. Inspect SB	Historic Tree planted by Gropius before construction.
5	BY	39"	Red Oak	M	CC,CR	NO	3	Good		Historic Tree planted by Gropius before construction.
6	BY	5"	Crab Apple	M	CC	NO	3	Good		Historic Tree planted by Gropius.
7	BY	12"	Dogwood	M	CC	NO	3	Good		Historic Tree planted by Gropius.
8	BY	15"	Euonymus	M	CC	NO	3	Good	Research origin	Historic Tree planted by Gropius.
9	BY	5"	Juniper SP.	R ?					Dead, Replant?	Provenance not known at this time.
10	BY	N/A	Cedar Stump						Stump, Replant?	Historic Tree should be replace.
11	EW	10"-15"	Red Cedar						13 trees research? Clean out invs.	
12	ED	N/A	Juniper	M	CC,CR				Shrub border	Historic Gropius plantings.
13	EW	N/A	Mixed woods						SugM,Ash,Wpne remove all but sm	

Historic New England, 2009

Tree inventory continued…

Gropius House Tree Inventory and Survey

14	EW	31"	White Ash	M	CR	NO	2	Fair		Provenance not known at this time.
15	EW	31"	White Pine	M	CC,SB	NO	2	Fair	Co dominant stem	Provenance not known at this time.
16	EW	24"	White Pine	M	CC,SB	NO	2	Fair		Provenance not known at this time.
17	ED	26"26"	Hemlock	M	CC,CR,SB	NO	2	Good	2 stems, old monitor for adelgid	Historic Gropius plantings.
18	EW	26"	Hemlock	M	CC	NO	2	Good	CC low dead, monitor for adelgid	Historic Gropius plantings.
19	EW	34"	White Pine	M	CC,CR,SB?	NO	2	Good	SB inspection, rmve saplings around	Historic Gropius plantings.
20	EW	26"	White Pine	M	CC,SB	NO	2	Good		Provenance not known at this time.
21	EW	36"	White Pine	M	CC,CR,SB	Yes	1		3 way cable-split, over garage	Historic Gropius plantings.
22	ED	6"	Crab Apple						Shaded out	Historic Gropius plantings.
23	EW	N/A	Sugar Maple saplings						Clean out	
24	ED	14"14"	Sycamore Maple					Fair	Volunteers?	Provenance not known at this time.
25	RB	46"	White Ash					Fair		
26	RB	36"	Sycamore Maple					Poor	Town Tree	
27	RB	29"	Sugar Maple					Fair	Town Tree	
28	RB	24"	Sycamore Maple					Poor	Town Tree	
29	RB	27"	Sugar Maple					Fair	Town Tree	
30	RB	31"	Sugar Maple					Poor	Town Tree	
31	RB	21"	Sugar Maple	R				Poor	Town Tree	

Historic New England, 2009

Tree inventory continued...

Gropius House Tree Inventory and Survey

32	RB	25"	Sugar Maple	R				Poor	Town Tree	
33	RB	20"	Red Maple					Fair	Town Tree	
34	RB	8"	Red Maple					Fair	Town Tree	
35	RB	16"	Red Maple					Fair	Town Tree	
36	RB	4"	White Ash					Fair	Town Tree	
37	RB	20"	Red Maple					Poor	Town Tree	
38	RB	41"	Red Oak					Poor	Town Tree	
39	O	4"	Cherry	R					Scale	
40	O	6"	Black Oak							
41	O	35"	Black Oak	M	CC	No	3	Fair	Causing wall damage	
42	O	5"	Red Maple							
43	O	10"	Red Maple							
44	O	10"	Red Maple							
45	O	10"	Sugar Maple							
46	O	22"	Pin Oak	M	CRA			Good	Low Branches	
47	O	22"	Red Oak	M	CRA					
48	O	19"	Red Oak	M	CRA					
49	O	7"	Red Oak							

Historic New England, 2009

Tree inventory continued…

Gropius House Tree Inventory and Survey

50	O	8"	Red Oak							
51	O	8"	Red Oak							
52	O		White Ash							
53	O		White Ash							
54	O		White Ash							
55	O	17"	Apple	M	SB			F/P	Old	
56	O	24"	Apple	M	CC,SB				Old	
57	O	21"	Apple	M	CC				Old	
58	O	24"	Apple	M	CC				Old	
59	O	18"	Apple	M	CC				Old	
60	O	12"	Apple	M	CC				Old	
61	O	19"	Apple	M	CC				Old	
62	O	17"	Apple	M	CC				Old	
63	O	19"	Apple	M	CC				Old	
64	O	16"	Apple	M	CC				Old	
65	O	30"	White Pine	M	CC,CT,CR	NO	2	Good	SB,Remove brush around	
66	O	25"	White Pine	M	CC	NO	2	Good		
67	O	16"	Red Cedar	M	CR				Remove?	

Gropius House Tree Inventory and Survey

68	O	14"	Red Cedar	M	CR				Removed.	
69	O	12"	Red Cedar	M	CR				Remove?	Historic Gropius plantings.
70	O	12"	Flowering Dogwood						Monitor for anthracnose	Historic Gropius plantings.
71	SF	12"	Flowering Dogwood						Stump, Replant?	Historic Gropius plantings.
72	SF	56"	White Pine	M	CC,SB		SB1		CC rough, 3way cable, ant frass	Historic Gropius plantings.
73	SF	50"	White Pine	M	CC,SB		3		CC rough	Historic Gropius plantings.
74	SF	N/A	Mixed woods						Clear invasive and saplings, mow	
75	O	N/A	Mixed woods						Selective removal down to wall	
76	O	N/A	Apples, new						(Root collar excavation fill with sand,	
									Mulch around with composted wood	
									chip. Remove cages as needed.	
									Monitor for orchard diseases)	

Historic New England, 2009

GROPIUS HOUSE ORCHARD

Property Name: Gropius
Structure: Landscape
Feature: Orchard
Original Material: Baldwin apple trees
Original Color: N/A
1965-1969 Material: Baldwin apple trees
1965-1969 Color: N/A

RS ID #277132, 2015

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

The orchard was one of the few pre-existing features on the site Gropius chose for his new home. The site was otherwise ñalmost completely bare of trees or any other growthò, and consisted of a hill with a swampy area down the slope to the east.[2] Gropius chose this particular site for various reasons, including the tremendous views and light it offered as well as the hillôs ability to ñperform the miracle of keeping us cool in the hot seasonò.[3] Based on historical evidence, the orchard was probably not one of the main factors that made Gropius select the site. However, he certainly considered it a significant part of its character; the orchard was valued for the way it reflected the natural charm of New England farmland and landscape.[4] In contrast with the clean lines of his architectural designs, the orchard ñwould be left to grow naturallyò with minimal maintenance.[5]

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.
[2] Ise Gropius, ñGropius House: A Historyò (Boston: Society for the Preservation of New England Antiquities, 1977), 4.
[3] Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary" (Master's thesis, Boston University, 1996), 14. Ise F. Gropius (lecture, 1939), 16.
[4] Gittleman, "The Gropius House,ò 31.
[5] Ibid.

The species of all plantings should match those of the interpretive period with as much accuracy as possible. The meadow should be mowed once a year to keep pests and woody plants at bay, while also allowing for natural growth that would give it the appearance of a typical New England field. The layout of the orchard should be restored to its late-1960s condition using the documentation compiled in the Cultural Landscape Report despite the fact that the historic grid pattern will no longer be recognizable to visitors due to the number of trees that had died by that time. The grid was important because it represented the more geometric orchard arrangement that developed with the grafting technique in New England.[6] The neat pattern became even more significant between the late-nineteenth and early-twentieth centuries, when spaces between trees widened in order to allow farm vehicles to manoeuver between the columns and rows.[7] The seemingly irregular placement of the trees will be a good representation of the fact that Bauhaus designs often reflected the modest finances of the average modern family; Gropiusœ wife Ise wrote that her husband could not afford to keep up the orchard in the way that its original owner had done.[8]

The genetics of the apple trees is a more complicated matter. It may be argued that dead trees do not need to be replaced with genetically-identical counterparts in the future since the orchardœ significance was mainly aesthetic rather than practical.[9] However, the Baldwin was ñdiscoveredò in Lowell, Massachusetts and subsequently propagated throughout New England.[10] It was extremely popular, of high quality, and easily shipped.[11] Several severely cold winters beginning in 1918 devastated Baldwin orchards, making the species both historically significant and rare.[12] Further research is necessary in order to confirm whether this means that replacement trees at the Gropius House should be grafted from the originals in order to preserve the genetic stock.

---

[6] Susan A. Dolan, *Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Register of Historic Places* (Washington, DC: National Park Service: U.S. Department of the Interiors, 2009), 6-7.
[7] Ibid., 8.
[8] Gropius, ñGropius House,ò 19.
[9] Ibid.
[10] Creighton Lee Calhoun, Jr., *Old Southern Apples: A Comprehensive History and Description of Varieties for Collectors, Growers, and Fruit Enth*, Revised and Expanded ed. (White River Junction, VT: Chelsea Green Publishing, 2010), 41.
[11] Ibid.
[12] Ibid.

Maintenance and Repair Protocols:
Last updated 2016
<u>Orchard Trees</u>

- Maintenance Protocol
  - Trees should be pruned and maintained, but apple production is not the goal. More research needs to be conducted on proper pruning methods for early twentieth-century orchards so they can be put into practice on site.
  - Monitor trees for tent caterpillar and cedar apple rust
  - Wrap bases of young trees before winter to guard against vole damage
- Rejuvenation Protocol
  - Orchard should be restored to 1960s grid appearance. Gaps in grid do not necessarily need to be filled.
  - Further research is necessary in order to confirm whether or not replacement trees should be grafted from originals in order to preserve genetic stock. In 1999, the National Park Service argued that new trees should be propagated from the genetic material of Gropius trees because they represented an heirloom breed called the Baldwin. However, the species is currently available through heirloom apple growers. The question remains whether or not it is Historic New Englandôs role to preserve this species of apple from pure genetic Gropius/Storrow stock.

<u>Meadow</u>

- Maintenance Protocol
  - Let orchard grass grow and brush mow it once per year, sometime between August and October. August 1 represents end of grassland-breeding bird season, but waiting until later in the year allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies. Key is to avoid letting the woody growth take over field.
    - Interpretive Note: the Gropius family maintained orchard grass as a meadow. Historical records indicate that field might have been cut once each summer. Field will be cut in fall to support bird habitat.
  - String trim with caution around apple trees after mowing
  - Mow a strip 10ô wide along the edge of the drive weekly to a height of 3ò
  - Mow a 10ô path 3ò high from garage down to Woods End Road at same time as maintenance of path around meadow, adjacent to the stone wall along Baker Bridge Road.
  - Mow a 10ô path along Woods End Road for extent of property line, creating clean edge
  - String trim along stone wall on a weekly basis
  - Remove volunteer woody shrubs and trees from stone wall on an annual basis
  - Garlic mustard must be pulled. Neighbors complain because garlic is an invasive species. Town of Lincoln has developed high community interest in attempting to halt continued spread. Volunteers throughout Lincoln consistently encourage Historic New England to actively participate by removing it in spring before it goes to seed.

- Rejuvenation Protocol
    - If maintenance lapses and woody plants and weeds begin to take over meadow, it should be mowed at least three times annually for a minimum of one year

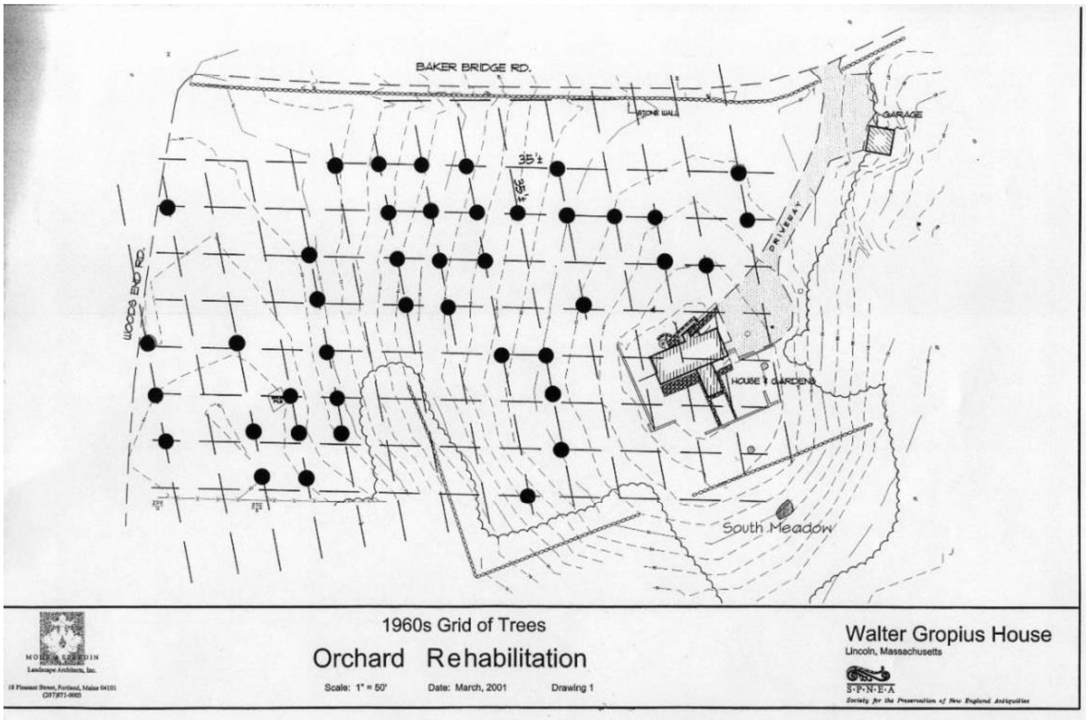


Figure 2: Plan from the 2001 Cultural Landscape Report for the Gropius House
By Mohr & Seredin documenting the 1960s grid of trees.

Original Construction and Evolution:

The orchard is a unique feature of the Gropius property in that Gropius himself did not design it. He also had less to do with its maintenance and use than he did with other elements of the landscape and house. When Gropius arrived in Lincoln the orchard made up part of the farmland owned by Mrs. Helen Storrow, who paid for the houseôs construction.[13] When Gropius chose the hill with its commanding views as the site for his home, the orchard became part of a ñsecond levelò of landscape beyond the more carefully manicured areas adjacent to the house.[14] Along with the nearby swamp, he let nature take its course in this ñlevelò with very little maintenance.[15] Mrs. Storrow had been the one to care for the orchard while she lived, and only ñthat one-fourth of the treesé standing nearest to the houseò were available to Gropius for harvesting.[16] Even the more planned aspects of the landscape were meant to ñ[enhance] the natural features of the hilly siteò

[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Gropius, ñGropius House,ò 19. Walter Gropius to James Storrow, October 26, 1945, Massachusetts.

rather than to impose a completely alien design upon it.[17] In these ways the orchard was part of Gropiusøs larger intention to let the siteøs natural New England character thrive.

Figure 3: Aerial photograph of Gropius property, 1946
Historic New England Archives

The orchard began to suffer from neglect soon after Mrs. Storrowøs death in 1944. In 1956 Gropius sent a letter to its new owner, Charles Lord, requesting that he trim the trees.[18] He also warned that the trees were breaking under the load of their unharvested apples, but he received no reply.[19] The following year he wrote to Lord again, telling him ñI am afraid if [the trees] are not cut this spring they will quickly deteriorateò and that ñone has collapsed already completelyò.[20] It was not until 1958 that Gropius finally heard from Lord, who said that he wanted to give up the orchard because it did not make him enough money.[21] Gropius replied that he had not maintained the orchard himself because he did not own it, and that he had been told he ñwould not be burdenedò with the work.[22] For these reasons he requested that Lord carry out maintenance on the orchard before he gave it up.[23] Whether Lord finally acquiesced is unknown.

---

[17] Gittleman, ñThe Gropius House,ò 32.
[18] Walter Gropius to Charles Lord, September 16, 1956, Massachusetts.
[19] Ibid. Walter Gropius to Charles Lord, February 07, 1957, Massachusetts.
[20] Walter Gropius to Charles Lord, February 07, 1957, Massachusetts. Walter Gropius to Charles Lord, September 04, 1957, Massachusetts.
[21] Walter Gropius to Charles Lord, January 14, 1958, Massachusetts.
[22] Ibid.
[23] Ibid.

Character-Defining Traits in the Interpretive Period:
By the late 1960s the orchardôs condition had declined, and the Gropiusô attitude towards the feature seems to have become somewhat complex. The Gropiusô daughter, Ati Johansen, said that ñthe orchard was a headache to [her parents]ò.[24] They had intended the feature to be part of the more ñwildò part of the site, and yet ñyou cannot turn your back on [apple trees]ò.[25] Ati herself said that she would ñcut them down, or replace them if you mustò, and that her parents ñwould have cut these trees down long beforeò they were decrepit with disease and damage.[26]

Atiôs assertion that the orchard was a nuisance to her parents after the death of Mrs. Storrow and the neglect of Mr. Lord seems to be correct, judging from Iseôs written history of the site. She did not write about the orchard until the very end of her landscaping section, and she began the subject by saying that it was less a matter ñof adding to the surroundings but of clearing away the too abundant growth to keep the vistas open and to provide a sense of spaciousnessò.[27] She wrote that her family could not afford to maintain the trees as Mrs. Storrow had done.[28] Their solution was to cut down fifty of the ninety trees and maintain the remaining ones as ñornamentalò features.[29]

However, the fact that the Gropiuses were interested in ñhaving [the trees] sprayed and fertilized twice in spring, having the grass mowed once in summer and having them pruned every three yearsò shows that they still held value for the family.[30] In fact, historical photographs suggest that the Gropiuses had even planted a new apple tree near the driveway by 1965.[31] Iseôs use of the word ñornamentalò suggests that the orchard was an important visual aspect of the siteôs design, even if Gropius didnôt plant it himself. If their only concern was that the trees were ugly in their decline, they might have cut them down. Instead, in the late 1960s the orchard continued to contribute to the traditional New England farmland character that helps define the site.[32]

Figures 4, 5, and 6: Meadow grass at different times within the same decade: 1951, 1950-57, and 1957
Historic New England Archives, Binder of Slides

[24] Pheobe Bruck, "Gropius House Landscape," interview by Peter Gittleman, April 21, 1989, 18.
[25] Ati Johansen, "Gropius House Landscape," interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley, March 13, 1991, 43.
[26] Ibid, 40 and 46.
[27] Gropius, ñGropius House,ò 19.
[28] Ibid.
[29] Ibid.
[30] Ibid.
[31] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 18.
[32] Bruck, "Gropius House Landscape," 17-18.

History of Conservation and Maintenance Practices:
As previously described, during the earliest years of Gropiusô time in Lincoln Mrs. Storrow maintained the orchard and allowed Gropius to harvest a quarter of the trees closest to the house. After her death and the neglect of Charles Lord, the Gropiuses maintained the trees as ñornamentalò rather than fruit-producing. There is some evidence of this care in Mrs. Gropiusôs invoices, which detail work such as the pruning and spraying of the apple trees in 1973, more pruning in 1977, and mowing of the area in 1981.[33]

The earliest records of the SPNEA care of the orchard come from 1985 to-do lists, which include pruning, pest control, and the replacement of trees that had died.[34] In 1987 the mowing of the orchard was in the budget, and another to-do list included liming, mowing twice a season, the removal of vegetation along the wall and 75% of the red cedar volunteers in the field, the transplanting of young cedars along the wall, and the replacement of missing apple trees.[35]

Despite these preservation-related intentions, by 1989 there was a debate within SPNEA as to whether the orchard should be kept at all. It was in the process of returning to woodland, with cedars starting to come up in the area.[36] The trees were so sparse and damaged that they no longer had their original visual effect, and it would be difficult for SPNEA to maintain the orchard properly even if it was restored.[37] It was also adjacent to a lot that was considered a potential land bank for the house; the area could be sold for the construction of new houses, and the funds would be used for the propertyôs maintenance.[38] A greater distinction between the lawn area adjacent to the house and the less cultivated meadow would retain the distinction of the orchard if the trees were removed.[39]

However, some argued that the orchard should be retained because it existed during the interpretive period and because it was part of New Englandôs fast-disappearing traditional farmland.[40] Several methods were put forward for the restoration of the orchard. The old trees could be cut down and replaced with new ones, as a farmer would have done.[41] Another option was to keep the old trees and plant new apples, while simultaneously planting adult ornamental trees that would create a look of ñtree-nessò as the young apples grew.[42] In either of these scenarios, the orchard could be maintained through partnerships

[33] J. W. Brine, Jr. to Ise Gropius, March 26, 1973, Brine Tree Surgery, Inc., Bedford, Massachusetts. J. W. Brine, Jr. to Ise Gropius, July 7, 1977, Brine Tree Surgery, Inc., Bedford, Massachusetts. Robert L. Normandie to Ise Gropius, 1981, R. L. & E. Normandie, Lincoln, Massachusetts.
[34] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1985). Tom Cochrane, ñGropius,ò (Waltham, MA: Historic New England Property Care Files, 1985).
[35] ñBudget ï 1987, Gropiusò (Waltham, MA: Historic New England Property Care Files, 1987). ñGropius Landscape Renovation (Suggestions & Recs)ò (Waltham, MA: Historic New England Property Care Files, 1987).
[36] Bruck, "Gropius House Landscape," 17.
[37] Ibid.
[38] Ibid., 18.
[39] Ibid., 21.
[40] Ibid., 17.
[41] Ibid.
[42] Ibid., 19.

with food banks, co-ops or organizations that leased farms to young people.[43] By 1991 an apple farmer had been contacted, but he was not interested in the orchard because there were not enough trees to make his involvement worth the cost.[44] In the same year several new options were discussed, such as the possibility of replacing the trees with crabapples or cutting them down and letting the cedars flourish.[45]

Figure 7: Remaining apple trees, 1995
Google Earth

SPNEA staff carried out basic maintenance such as tree pruning as they considered these options.[46] In 1997 they sent some apples to a fruit biologist in order to determine the species of the trees.[47] He wrote that they were likely Baldwins, but he could not be sure because the apples had been so badly mutilated by pests.[48] By 2000 the meadow was overgrown and the need for a conservation plan was still urgent.[49]

The opportunity for major orchard work came after SPNEA was awarded the Save Americaós Treasures (SAT) Grant for the Gropius House in 1999. During the course of the project, many ideas concerning the philosophy for orchard restoration were formed, rejected, and adopted. For example, one of the first ideas proposed in 1999 was to reestablish the grid of trees that was in place during the late 1960s, using an aerial

[43] Ibid., 17-18.
[44] Johansen, ñGropius House Landscape,ò 40.
[45] Ibid., 45 and 40.
[46] ñGropius Landscape Work for 1990,ò (Waltham, MA: Historic New England Property Care Files, 1990).
[47] William G. Lord to Gary Wetzel, October 23, 1997, University of New Hampshire, Durham, New Hampshire.
[48] Ibid.
[49] "Landscape Problems at Gropius," Marianne Zephir to Dianne McGuire, July 12, 2000, Gropius House, Lincoln, Massachusetts.

photograph and other historic documentation for guidance *(Figure 8)*.[50] However, the National Park Service (NPS) rejected this idea because it involved the planting of mature trees genetically unrelated to the original ones, which were an heirloom species that could no longer be grown for commercial purposes.[51] In order to preserve this type of tree, the NPS insisted that the new plantings be whips grafted from the older trees already in the orchard.[52] This process was initiated in in 1999.[53]

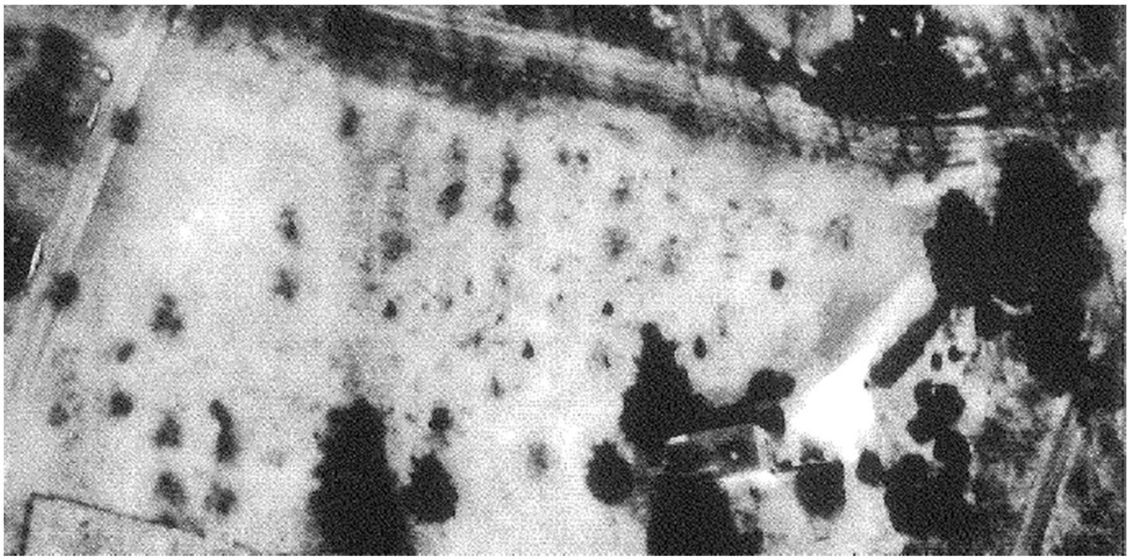


Figure 8: Aerial view of orchard in the 1960s
Historic New England, Property Care Files

By 2001 there were only eighteen remaining trees, ten of which still bore fruit.[54] The meadow was choked with poison ivy and invasive, woody plant species.[55] The eight trees that would not be able to recover from disease or damage were removed that year, and the rest were pruned and sprayed.[56] While the plan included retaining the distinct New England character of the meadow, paths were to be mown within it so that visitors could walk through the area without fear of poison ivy and ticks.[57] The new whips were planted in a grid formation in April 2002 with help from the Lincoln Food Project.[58] The replacements were not planted exactly where their predecessors had been because the orchard had lost its characteristic grid formation by the interpretive period, and the restoration of this pattern

[50] Mohr & Seredin Landscape Architects, Inc., ñScope of Services, Gropius House, Landscape Rehabilitation,ò (Waltham, MA: Historic New England Property Care Files, 1999).
[51] Pam Griffin to Michael Lynch, July 11, 2000, Mohr & Seredin Landscape Architects, Inc., Portland, Maine.
[52] Ibid.
[53] Cultural Landscape Treatment Report, Mohr & Seredin, 24.
[54] Ibid.
[55] Ibid.
[56] Pam Griffin, "Apple Tree Cutting," e-mail to Maryanne Zephir, Robert Surabian, Michael Lynch, Martha Pinello, Diane McGuire, and Peter Gittleman, June 18, 2001. Cultural Landscape Treatment Report, Mohr & Seredin, 29.
[57] Pam Griffin, ñGropius House Meeting Minutes,ò (Waltham, MA: Historic New England Property Care Files, 2001).
[58] Cultural Landscape Treatment Report, Mohr & Seredin, 27.

was an objective of the project.[59] Returning the orchard to its exact 1960s appearance was impossible in any case, because the new trees were whips rather than fully grown plants.[60]

Figures 9 and 10: Volunteers from The Food Project install deer guards on the whips, 2002
Historic New England, Property Care Binders

After the whips were planted in their new pattern, deer cages designed using Bauhaus geometric principles were installed around them for protection *(Figure 9)*.[61] The recommended treatment of the meadow was its frequent mowing for two to three years and the application of an herbicide for one year, which would kill the poison ivy and woody plants that were thriving in the field.[62] After this time, the area would be mowed only once a year in order to allow for the growth of wildflower species.[63] Pruning and an irrigation system were intended to maintain the trees and prevent them from declining again.[64]

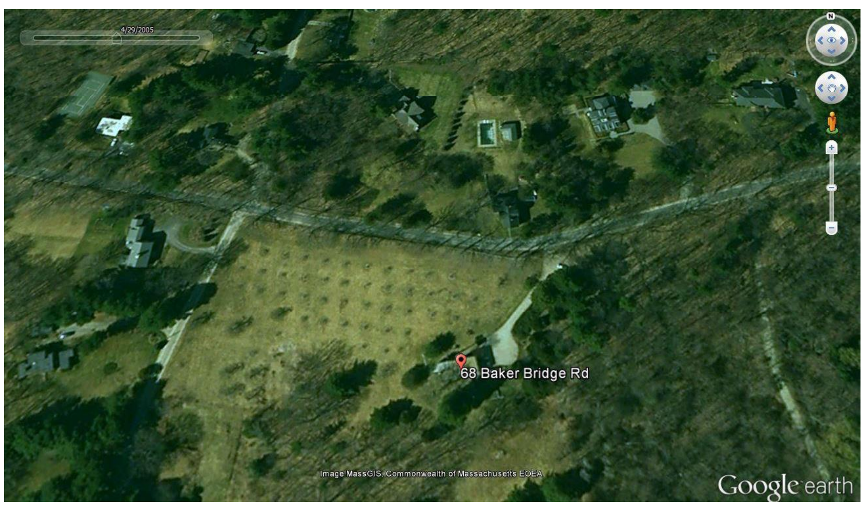


Figure 10: Orchardôs grid pattern restored, 2005
Google Earth

---

[59] Ibid., 25.
[60] Ibid.
[61] Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts, report (Boston, MA: Society for the Preservation of New England Antiquities, 2002). The deer cages began to be removed starting about five years later when the trees began to outgrow them.
[62] Cultural Landscape Treatment Report, Mohr & Seredin, 28-29.
[63] Ibid., 29.
[64] Ibid.

After the Lincoln Food Project extended support to SPNEA in helping to plant the whips, they offered to assist with the orchardôs maintenance.[65] This work included pruning, fertilizing, weeding, watering, spraying, harvesting, mulching, mowing, poison ivy control, and more.[66] Despite this careful maintenance, four of the young trees planted in 2002 had died within two years.[67] Some of the other whips grafted at the same time were sought out, but the end result of these efforts is unclear.[68] In 2004 there was a debate about the appropriate length of the meadow grass, which was previously kept high in order to exaggerate the appearance of the plinth but which also caused insect issues for visitors.[69] The resolution of this discussion is unclear. The last contract on record between SPNEA and The Food Project was signed in March 2005.[70] Since then, maintenance work on the orchard has decreased and mainly involved mowing and the removal and reinstallation of protective wraps.[71] In 2015 the removal of the deer cages and a survey of the orchard were completed. Fifteen dead or dying trees were removed, four of which were scheduled for replanting in 2016. Forty-one trees were reported missing from the grid pattern, and all the removed trees were marked by wooden stakes planted in the ground.[72]

Interventions:

2015: Fifteen dead or dying trees removed, four scheduled for replanting in 2016. A further forty-one trees found to be missing. No written documentation, but trees marked by wooden stakes in the ground. Removal of deer cages completed.

2010: Tree wraps purchased for apple trees

2008: Removal of deer cages around larger apple trees begins

2005: Maintenance carried out by The Food Project

2004: Maintenance carried out by The Food Project. Four of the trees planted in 2002 had died, prompting search for other whips grown with them and planted at different locations. Debate about height of meadow grass.

2003: Maintenance carried out by The Food Project

2002: Fifty whips planted in grid formation to replace some of the dead and dying trees. Deer guards installed on whips. The Food Project assisted with planting and maintenance of trees.

2001: Modified restoration plan for orchard completed. Called for replacement of dead and dying trees with whips grafted from originals, in order to preserve historically significant species at Gropius orchard. Ten original trees identified for pruning and

---

[65] ñContract for Orchard Management and Use at Gropius House in Lincoln, MA,ò (Waltham, MA: Historic New England Property Care Files, 2002).
[66] Ibid.
[67] Christopher D. Patzke to Lynne Huggins, November 16, 2004, Historic New England, Lyman Estate, Waltham, Massachusetts.
[68] Ibid. Miriam Mohiuddin, "The Food Project - Orchard," e-mail to James J. Lee, III, April 16, 2004.
[69] Christopher D. Patzke, "Fwd: Gropius Grounds," e-mail to Richard Nylander and Peter Gittleman, June 03, 2004.
[70] ñAgreement Between Historic New England and The Food Project,ò (Waltham, MA: Historic New England Property Care Files, 2005).
[71] ñTree Wraps for Apples,ò receipt, (Waltham, MA: Historic New England Property Care Files, 2010). ñTree Cages ï Phase I,ò Historic New England Property Care Electronic Database of Historical Projects, 2008.
[72] ñGropius House ï 2015 Orchard Surveyò (Waltham, MA: Historic New England Digital Property Care Files, 2015).

care. Orchard meadow to be sprayed and mowed frequently for several years in order to remove poison ivy and woody plants, and then mowed only once a year to allow growth of wildflowers. Paths to be mown in order to protect visitors from poison ivy and tics.

2000: Meadow becoming overgrown with woody plants.
1999: Cuttings taken from trees grafted onto standard rootstock in order to grow whips
1998: Initial restoration proposal completed. Included replacement of dead and dying apple trees with fully grown ones in a pattern consistent with an aerial photograph from the interpretive period.
1997: Fruit biologist reported that trees were likely Baldwins (low certainty due to poor fruit samples)
1991: Debate about keeping orchard continued
1990: Need for pruning of apple trees noted
1989: SPNEA debated whether or not to keep orchard. In the case of its removal, distinction between grass types in lawn around house and in meadow would be made clearer.
1987: To-do lists and budgets included replacement of dead and dying trees, liming, removal of 75% cedar volunteers and volunteer vegetation along wall, transplant of young cedars along wall, and mowing twice a season.
1985: To-do lists included replacement of missing apple trees, pruning, pest control, and other general orchard maintenance
1981: Orchard mowed
1977: Apple trees pruned
1973: Apple trees pruned and orchard sprayed
1965: New ornamental apple tree planted along driveway
1958: Gropiuses found out that Charles Lord, owner of orchard after Mrs. Storrowȯs death, wanted to give up business. Trees still suffered from lack of pruning and harvesting.
1957: Gropius wrote to Lord, complaining that trees were never cut back as he had requested the previous year. Orchard still desperately needed maintenance.
1956: Gropius asked Lord to cut back apple trees, and wrote that they were breaking under the loads of their apples after prolonged lack of harvesting.
1945: Letter suggests that Gropius could take a quarter of the apples from trees closest to house, and the rest went to Mrs. Storrowȯs estate

BIBLIOGRAPHY

ñAgreement Between Historic New England and The Food Project.ò Waltham, MA: Historic New England Property Care Files, 2005.

Bruck, Pheobe. "Gropius House Landscape." Interview by Peter Gittleman. April 21, 1989.

ñBudget ï 1987, Gropius.ò Waltham, MA: Historic New England Property Care Files, 1987.

Calhoun, Creighton Lee, Jr. *Old Southern Apples: A Comprehensive History and Description of Varieties for Collectors, Growers, and Fruit Enth*. Revised and Expanded ed. White River Junction, VT: Chelsea Green Publishing, 2010.

Christopher D. Patzke to Lynne Huggins. November 16, 2004. Historic New England, Lyman Estate, Waltham, Massachusetts.

Cochrane, Tom. ñGropius.ò Waltham, MA: Historic New England Property Care Files, 1985.

Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.

Cultural Landscape Treatment Report for Gropius House, Lincoln Massachusetts. Report. Portland, ME: Mohr & Seredin, Landscape Architects, 2001.

Dolan, Susan A. *Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Register of Historic Places.* Washington, DC: National Park Service: U.S. Department of the Interiors, 2009.

Final Project Report, Federal Save America's Treasures Grant: Walter Gropius House, Lincoln, Massachusetts. Report. Boston, MA: Society for the Preservation of New England Antiquities, 2002.

Gittleman, Peter. "The Gropius House: Conception, Construction, and Commentary." Master's thesis, Boston University, 1996.

Griffin, Pam. "Apple Tree Cutting." E-mail to Maryanne Zephir, Robert Surabian, Michael Lynch, Martha Pinello, Diane McGuire, and Peter Gittleman. June 18, 2001.

Griffin, Pam. ñGropius House Meeting Minutes.ò Waltham, MA: Historic New England Property Care Files, 2001.

Gropius, Ise. ñGropius House: A History.ò Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Ise F. Lecture, 1939.

ñGropius House ï 2015 Orchard Survey.ò Waltham, MA: Historic New England Digital Property Care Files, 2015.

ñGropius Landscape Renovation (Suggestions & Recs).ò Waltham, MA: Historic New England Property Care Files, 1987.

ñGropius Landscape Work for 1990.ò Waltham, MA: Historic New England Property Care Files, 1990.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

Johansen, Ati. "Gropius House Landscape." Interview by Peter Gittleman, Pheobe Bruck, Mille O'Connell, Cathy Nolan, Phillip Bevins, and George Riley. March 13, 1991.J.

J. W. Brine, Jr. to Ise Gropius. July 7, 1977. Brine Tree Surgery, Inc., Bedford, Massachusetts.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

"Landscape Problems at Gropius." Marianne Zephir to Dianne McGuire. July 12, 2000. Gropius House, Lincoln, Massachusetts.

Mohiuddin, Miriam. "The Food Project - Orchard." E-mail to James J. Lee, III. April 16, 2004.

Mohr & Seredin Landscape Architects, Inc. ñScope of Services, Gropius House, Landscape Rehabilitation.ò Waltham, MA: Historic New England Property Care Files, 1999.

Pam Griffin to Michael Lynch. July 11, 2000. Mohr & Seredin Landscape Architects, Inc., Portland, Maine.

Patzke, Christopher D. "Fwd: Gropius Grounds." E-mail to Richard Nylander and Peter Gittleman. June 03, 2004.

Robert L. Normandie to Ise Gropius. 1981. R. L. & E. Normandie, Lincoln, Massachusetts.

ñTree Cages ï Phase I.ò Historic New England Property Care Electronic Database of Historical Projects. 2008.

ñTree Wraps for Apples.ò Receipt. Waltham, MA: Historic New England Property Care Files, 2010.

W. Brine, Jr. to Ise Gropius. March 26, 1973. Brine Tree Surgery, Inc., Bedford, Massachusetts.

Walter Gropius to Charles Lord. September 16, 1956. Massachusetts.

Walter Gropius to Charles Lord. February 07, 1957. Massachusetts.

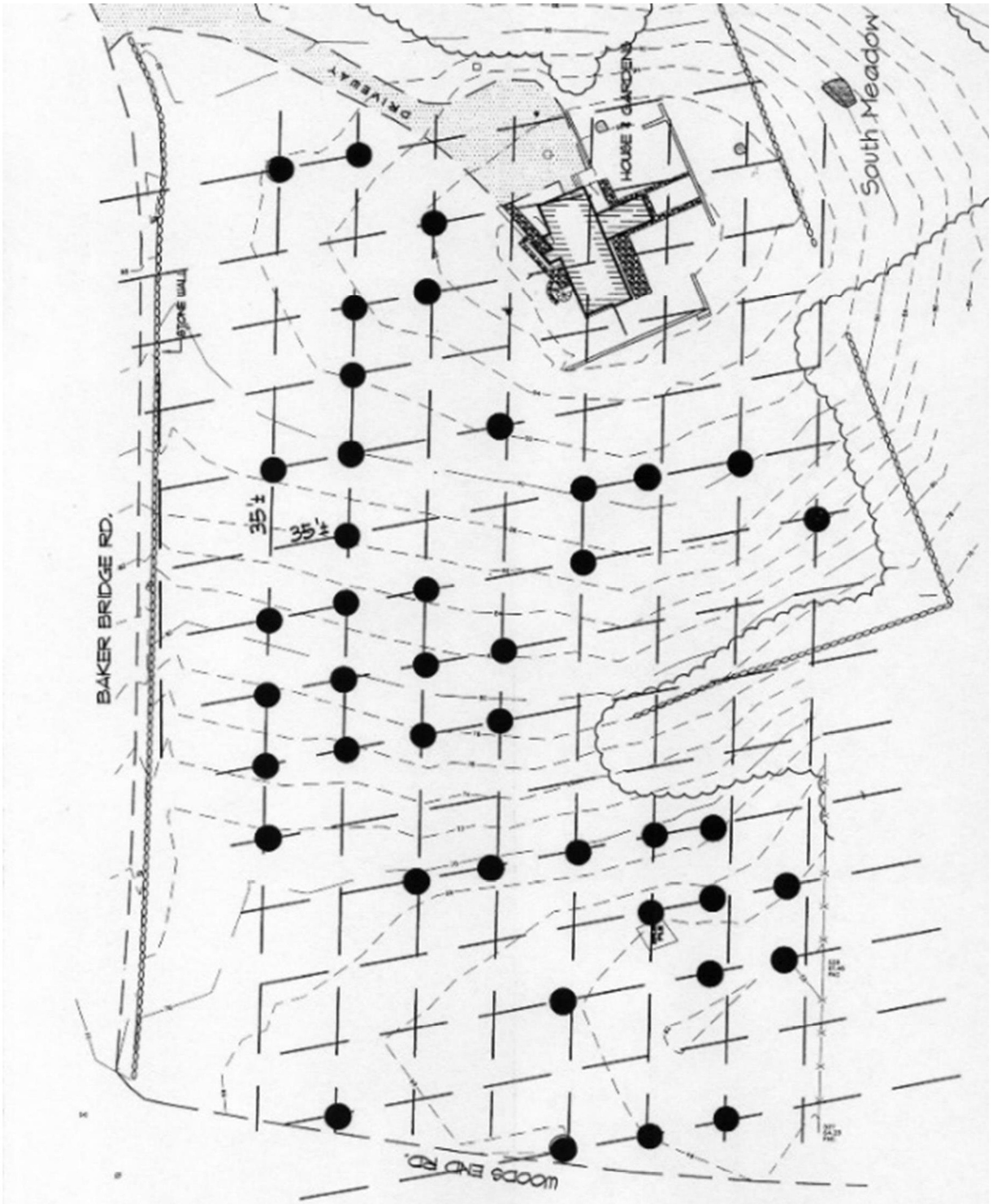
Walter Gropius to Charles Lord. September 04, 1957. Massachusetts.

Walter Gropius to Charles Lord. January 14, 1958. Massachusetts.

Walter Gropius to James Storrow. October 26, 1945. Massachusetts.

William G. Lord to Gary Wetzel. October 23, 1997. University of New Hampshire, Durham, New Hampshire.

Appendix A: Gropius orchard grid in 1960s



Mohr & Seredin Landscape Architects, Inc., 2001, created using historic aerial photo

GROPIUS HOUSE STONE WALLS

Property Name: Gropius **Structure:** Landscape **Feature:** Stone Walls **Original Material:** Stone **Original Color:** Gray **1965-1969 Material:** Stone **1965-1969 Color:** Gray	 RS ID #270404, 2016

Vision Statement and Treatment:
The Gropius landscape will reflect the period circa 1965-1969, when the landscape that the Gropius family developed was mature. By this period, the stone terracing had been established (1940) and the Japanese Garden was installed (1958). In all future preservation efforts, the views, the woodland edge, and the connection between the landscape and the building must be maintained due to the significance of their design. If replacements are considered when plant material is either dangerous or is thought to be out of scale, the original 1938 size of the plantings should be considered. The site has limited accessibility for those with mobility impairments. Any future landscape project should consider enhancing access to the property (or a feature), realizing that such enhancements may not be in keeping with the original design intent.[1]

The stone walls at the Gropius house are closely related to the house and its orientation, so their position must not be altered. The contrasting construction of the preexisting dry laid stone walls near the north and south borders of the property and those that Gropius built himself should be maintained (see Appendix A for plan with wall types). All stone walls should be kept in good condition for safety and aesthetic reasons.

[1] Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House, updated 09/16/2016.

Maintenance and Repair Protocols:
The stone walls should be kept in good repair. Minor maintenance should occur on a regular basis. When evidence of work becomes obvious, the replacement of finishes and materials should be considered.

<u>Dry-Laid, Rubble Fieldstone Walls:</u>

- Maintenance Protocol
  - In spring, walk stone walls and replace singleton stones that have been knocked off. Try to position stones on top of wall so that they fit in place.
  - If more than three stones have fallen in a specific location, notify preservation manager
- Repair Protocol
  - A fieldstone wall repair project should endeavor for the final work to match the existing wall sections in style and character.
  - In cases of traumatic damage, such as a car accident, it may not be possible or practical to rebuild wall with same stones in exact same location and orientation. Walls that are dry-laid require some level of craftsmanship license that often precludes precise replication of stone locations.
  - When more than minor maintenance is needed, project should be developed with qualified mason who has experience with traditional techniques. Coursing, orientation, width and height of repaired section should match undamaged areas, and faces originally oriented outward should face same direction again. If replacement stones are required, stone type, mineralogy, sizing and color must be considered.
  - A minor project is defined as no more than two sections of wall, or a total of 40 linear feet.
  - A major project is defined as more than two sections of wall, or wall work totaling more than 40 linear feet.

- <u>Dismantling the Wall</u>
  - Clear vegetation at least six feet back from repair area of wall, and remove any growth within wall assembly when ñstripping out.ò Plant growth shall be removed to base and cut off below grade level.
  - ñStrip outò or take down old wall back to sound material on each side of damaged area
  - Strip out old wall to footings beneath, ascertaining whether any need to be re-laid for reestablishment of level base surface
    - Re-lay footings/foundation stones as required in manner consistent with wallôs original construction. Mark stones on non-exposed face with non-permanent, non-staining implement so they may be placed back in their original orientation.
- <u>Wall Assembly</u>
  - Reconstruct damaged area of wall so that coursing and orientation of stones match undamaged sections
  - Endeavor to place stones with original outside faces again facing outwards
  - Width of wall at footings should match extant sections
  - Height of wall should be specified if possible

  - Angle of wall batter will should match extant sections
  - Reuse original cover band/cap stones for cope where applicable, matching existing width of remaining sections of wall. These stones should cover open joints below and be laid level and straight. Use string line as guide during installation.
  - Employ through stones to create strong wall assembly, using extant wall as a guide for placement and spacing
  - Stagger vertical joints in manner consistent with those of original wall. Do not ñrunò joints.
  - Do not trace or face walling by placing stones so that their sides are visible. At least 70% of stone must be oriented with long dimension running into wall, preferably more.
  - No face stones should shift or be removed using oneôs hands
- <u>Shaping of Stone</u>
  - Original primary stones shall <u>not</u> be shaped in any manner to facilitate installation
  - Shaping of hearting and pinning in order to facilitate proper bearing of stones is acceptable, but not preferable. Shaped edges shall be placed towards inside of wall and shall not be visible to passersby.
- <u>Finish Work</u>
  - Upon completion, finished work shall match original appearance as closely as possible and shall connect visually with remainder of wall
  - Clean and grade landscape on both sides of wall, ensuring that finish grade around rebuilt wall is in harmony with adjacent undisturbed areas

<u>Formal Walls with Capstones:</u>

- Maintenance Protocol
  - In spring, walk stone walls and identify any dislodged stone or capstone and identify any areas of mortar loss or deterioration.
  - Spot pointing to address areas of loss or to secure capstones
- Repair Protocol
  - When more than minor maintenance is needed, project should be developed with qualified mason who has experience with traditional techniques. Coursing, orientation, width and height of repaired section should match undamaged areas, and faces originally oriented outward should face same direction again. If replacement stones are required, stone type, mineralogy, sizing and color must be considered.
  - A minor project is defined when less than 40 square feet of wall is being pointed.
  - A major project is defined when more than 40 square feet of wall is being pointed or any section of the wall is being rebuilt.
- Scope example
  - Stones and capstones are bedded in a strong mortar. They should be retained, and their identity, location, and orientation should be documented before any project requiring their repair or rebuilding so that they can be returned to their historic location.
    - Photographs of wall should be taken to develop numbering scheme

that will help facilitate rebuilding

        - Each stone should be wrapped with wire and stamped metal tag that indicates identity and proper orientation. As these projects can take time and weather will naturally erode tags, consideration should be given to careful etching of stone on non-visible face for appropriate identification
        - All capstones should be numbered and set aside to reinstall in same linear order
    - Carefully chip old mortar off stones
    - Any damaged section of wall should be dismantled to a point where it is solid and stable. This may involve removal of stones beyond those that have been displaced in damage.
    - Mason will establish plumb and level string lines to guide rebuilding effort
    - Mortar stones in place
        - While no mortar analysis has been performed, period of construction supports use of Portland cement. 2009 repair utilized mortar mix of 2:1:4 (lime, Portland, sand). More refined repairs would incorporate mortar analysis and include careful search for aggregate that matches existing in color and size distribution. [2]
    - Strike joints to match existing detail.

[2] Kerry Vautrot, *Gropius Completion Report*, report (Lincoln, MA: Historic New England, 2009).

Original Construction and Evolution:
Several old dry-laid stone walls already existed at the site when Gropius arrived. Two of these were parallel and perpendicular to the south façade, respectively, and another bordered Baker Bridge Road *(Figure 2)*.[3] Sometime between 1939 and 1941 Gropius added one low retaining wall between the house and the old south drystone wall, and another parallel to the west façade *(Figure 2)*.[4] These were made with cement mortar and capped with flagstones, and seats were formed within them in several places.[5]

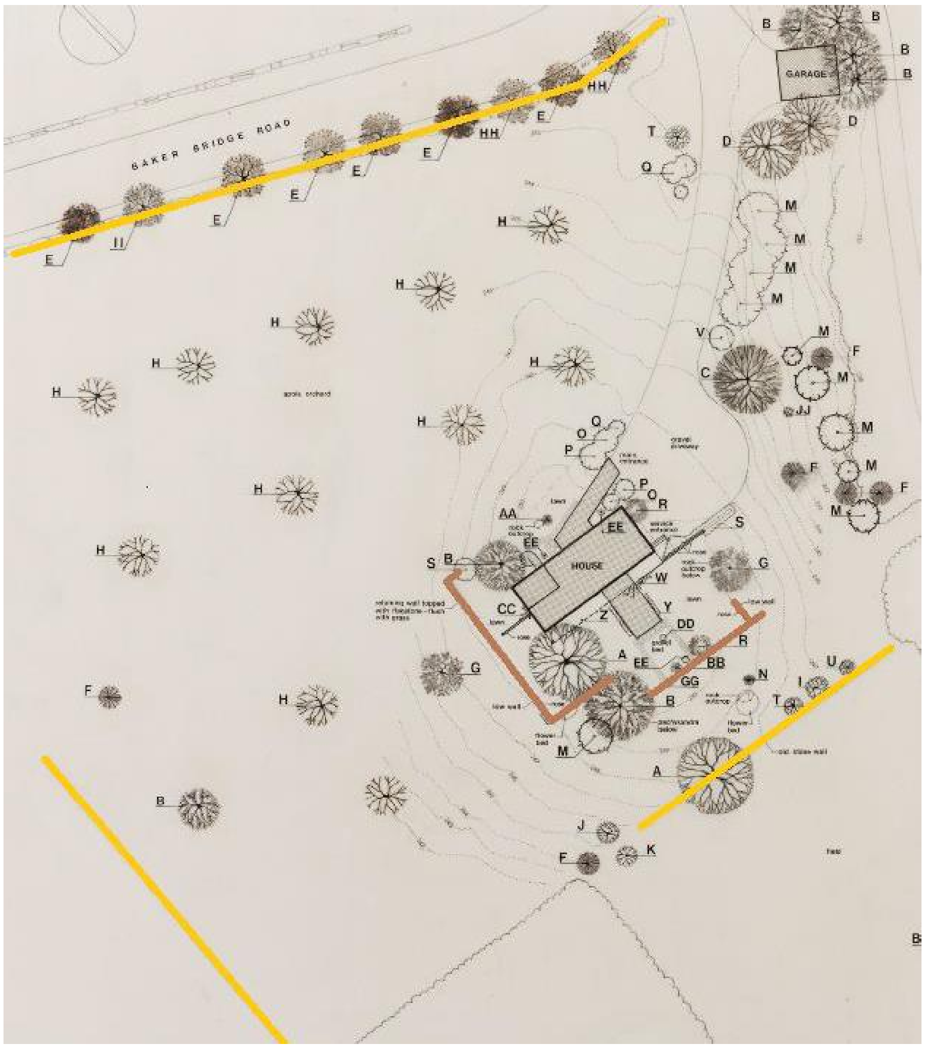


Figure 2: Gold lines indicate preexisting stone walls. Brown lines indicate stone walls added by Gropius.

[3] Eric Kramer, *Gropius House Landscape History/Restoration Plan*, report (MA, 1997), 12.
[4] Ibid., 15.
[5] Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, 8. Kramer, *Landscape History*, 16.

Character-Defining Traits in the Interpretive Period:

The stone walls were major features of the landscape at the Gropius House, and Gropiusôs original design intent defined them throughout the interpretive period. The links between the locations of the walls that preceded Gropiusôs arrival and the house itself indicate that Gropius took them into consideration when he orientated the property as a whole *(Figure 3)*.[6] This argument is logical given the fact that one of Gropiusôs principles was the importance of linking ñman and natureò through connections between buildings and landscapes.[7] The lawns were flat and carefully mowed between the house and the retaining walls that Gropius added, representing the more cultivated section of the site occupied by the family. In contrast, the preexisting fieldstone wall defined a border between the main backyard and the more unruly, natural area of the property that was dominated by woody growth.[8] The stone walls also reflected the architecture of the house itself, mimicking the façades to the south and west and lining up with the precise boundaries of the lawns on either side of the porch.[9] In this way they formed the permeable barriers of outdoor ñrooms,ò organized with Gropiusôs habitually practical eye.[10]

Figure 3: Retaining walls reflecting edges of house, 1994
Historic New England Property Care Files

Even the design of the walls themselves contained echoes of the adjacent Bauhaus home, since Gropiusôs innovative use of neat mortar and flagstone capping complimented ñthe pure lines and defined edges of the houseò *(Figure 4)*.[11] The flagstones and mortar were just

[6] Kramer, ñNew England Landscape,ò 3.
[7] Tom Cochrane, *Landscape Renovation Recommendations*, report (MA, 1988), i.
[8] Kramer, *Landscape History*, 15 and 3.
[9] Ibid., 15. Kramer, ñNew England Landscape,ò 5.
[10] Kramer, ñNew England Landscape,ò 6.
[11] Ibid., 9.

a few of the ways in which Gropius altered the traditional New England retaining wall; the ñbenchesò incorporated within them exemplify the functionalism that is so important in the modern architecture movement.[12] The flagstone capping was also functional in that it made the mowing of nearby grass easier.[13] Unlike traditional New England fieldstone walls, those that Gropius added at his house were not solid barriers but places to step or sit.[14] However, the fact that Gropius was incorporating such a typical New England landscape feature into his design is significant, because it was one of the many ways in which the property represents a marriage between the Bauhaus and the regionôs traditions.[15]

Figure 4: Gropius stone wall with mortar and flagstone clapping, circa 1967-68
Historic New England Archives, Binder of Slides

History of Conservation and Maintenance Practices:

The first evidence of maintenance on the stone walls is from 1945, when their repointing and resetting was included on a list of necessary repairs.[16] In 1958 Gropius wrote that some of the walls were crumbling, and they were subsequently repaired with stone mortar.[17] Similar maintenance was carried out in 1971.[18] In 1987, after the property had been acquired by the Society for the Preservation of New England Antiquities (SPNEA), the repointing of the retaining walls around the garden and the rebuilding of a collapsed eastern

---

[12] Ibid.
[13] Kramer, *Landscape History*, 16.
[14] Ibid., 4-5.
[15] Ati Gropius Johansen, "Excerpts from Transcription of Interview with Ati Gropius Johansen," interview by Peter Gittleman, 8.
[16] ñHouse Repairs,ò (Waltham, MA: Historic New England Property Care Files, 1945).
[17] Walter Gropius to Howard Custance, June 9, 1958, Massachusetts.
[18] E. Tebo Invoice, (Waltham, MA: Historic New England Property Care Files, 1945).

section of the wall along Baker Bridge were included on a to-do list.[19] By 1994 an unspecified wall needed repairs to the southeast and the stone walls were included in the ñmajor improvementsò and ñwishesò sections of a 1995 budget list.[20]


Figure 5: Old drystone wall and newer retaining wall parallel to south façade, 1994
Historic New England Property Care Binders

The stone walls were reset in 1996 after the siteśs grounds were disturbed for an excavation related to utilities maintenance.[21] One year later the flagstone capping on the west wall was reset, and an unidentified fieldstone wall was rebuilt at the same time.[22] In 2009 a comprehensive stone wall project was carried out. Fallen stones from the crumbling wall bordering Baker Bridge Road were replaced, and a section of the wall near the east trellis was rebuilt after it had been damaged by a snow plow.[23] Stones in a fifteen-foot section of the wall behind the porch had moved outward due to freeze/thaw action in the ground over time, so the mortared wall was rebuilt *(Figure 6)*.[24] Finally, some of the unstable flagstone caps behind the house were reset in new mortar.[25] Similar flagstone capping repairs were carried out in the next year.[26]

[19] Tom Cochrane, ñGropius House Grounds Maintenance,ò (Waltham, MA: Historic New England Property Care Files, 1987), 3 and 1.
[20] "The Gropius House Landscape," Peter Gittleman to Lisa and Mille OśConnell, July 6, 1990, Massachusetts. ñBudget Worksheet,ò (Waltham, MA: Historic New England Property Care Files, 1995).
[21] "Repair Requests for Gropius House," Linda Willett, Tess Cederholm, and Myron Stachiw to Catherine Mayes, April 2, 1996, Massachusetts.
[22] Warwick Carpentersô Co. Invoice, (Waltham, MA: Historic New England Property Care Files, 1997).
[23] *Completion Report*, report (Boston, Massachusetts: Historic New England, 2009), 2.
[24] Ibid.
[25] Ibid.
[26] ñStone Wall Restoration,ò Historic New England Property Care Electronic Database of Historical Projects,

Figure 6: Stone wall repair, 2009
RS ID #46978

Interventions

2010: Flagstone capping re-adhered to top of rear walls
2009: Stone walls repaired and rebuilt throughout property
1997: Flagstone capping reset on west stone wall, and unspecified fieldstone wall rebuilt
1996: Stone walls reset after siteôs grounds were disturbed for excavation related to utilities maintenance
1995: Stone wall repairs included in ñmajor improvementsò and ñwishesò sections of budget list
1994: Unspecified stone wall needed repairs to the south east
1987: Repointing of stone walls in garden and rebuilding of collapsed drystone wall at east end of Baker Bridge Road included on to-do list
1971: Garden wall repaired with sand and cement
1958: Unspecified walls crumbling; repaired with cement mortar
1945: Repointing and resetting of fieldstone walls included on list of repairs
1941: Gropiusôs new retaining walls had been completed by this time

---

2011.

BIBLIOGRAPHY

ñBudget Worksheet,ò (Waltham, MA: Historic New England Property Care Files, 1995).

Cochrane, Tom. ñGropius House Grounds Maintenance.ò Waltham, MA: Historic New England Property Care Files, 1985.

Cochrane, Tom. *Landscape Renovation Recommendations*. Report. MA, 1988.

Completion Report. Report. Boston, Massachusetts: Historic New England, 2009.

E. Tebo Invoice, (Waltham, MA: Historic New England Property Care Files, 1945).

Gropius Johansen, Ati. "Excerpts from Transcription of Interview with Ati Gropius Johansen." Interview by Peter Gittleman.

Historic New England Proactive Preservation Interpretation and Planning (PPIP) Vision Statement: Gropius House. Updated 09/16/2016.

ñHouse Repairs.ò Waltham, MA: Historic New England Property Care Files, 1945.

Kramer, Eric. *Gropius House Landscape History/Restoration Plan*. Report. MA, 1997.

Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997.

Ralph Meaney to Walter Gropius. September 14, 1949. The F.A. Bartlett Tree Expert Company, Framingham, Massachusetts.

"Repair Requests for Gropius House." Linda Willett, Tess Cederholm, and Myron Stachiw to Catherine Mayes. April 2, 1996. Massachusetts.

ñStone Wall Restoration,ò Historic New England Property Care Electronic Database of Historical Projects, 2011.

"The Gropius House Landscape." Peter Gittleman to Lisa and Mille OôConnell. July 6, 1990. Massachusetts.

Vautrot, Kerry. *Gropius Completion Report*. Report. Lincoln, MA: Historic New England, 2009.

Walter Gropius to Howard Custance. June 9, 1958. Massachusetts.

Additional Resources 01

Historic New England
Preservation Philosophy

Includes

- Preservation Philosophy Overview
- The Preservation Philosophy and the Management of Built Structures
- The Preservation Philosophy and Landscape Management

Introduction to the Preservation Philosophy

If buildings, landscapes, and objects are to convey their full meaning, it is essential that their authenticity be protected and cherished. The patterns of wear, methods of construction, historic materials, and irregularities of age communicate the uses to which these structures have been put and document the changes made to it over time. Because this physical evidence is valuable, and can be exceedingly fragile, Historic New England believes that the collections in its care must be treated in the most conservative manner possible, whenever possible through stabilization and traditional maintenance rather than restoration and reconstruction.

Terms like preservation, stabilization, restoration, and reconstruction are often loosely used in connection with caring for old buildings, but for professionals these terms define actions with specific and distinct meanings. For organizations that own and manage historic museum structures, for example, responsible conservation demands careful and consistent implementation of specific actions to maintain its collections. Historic New England strives to retain all materials as they were when the property came into museum use. When materials must be replaced, either to safeguard the life of the object or building, or because they are beyond repair, the first priority is to replace them with the same kind of material. If in-kind replacement is impossible, the reasons for making a change must be clearly articulated and a treatment protocol developed. All conservation measures are thoroughly documented.

What is Historic New England's preservation philosophy?

- Historic New England preserves our buildings and landscapes as artifacts for current and future generations to study and enjoy.
- We research the sites as needed to keep as much of the building as possible intact without replacing material.
- This philosophy has evolved over the 100-year history of the organization. How we approach the preservation of the sites today sometimes differs from how our founder William Sumner Appleton approached the preservation of the buildings in his time. The overall intent was the same ï to preserve the properties and to make as few changes to them as possible so that they retain their historical significance.

The full statement of Historic New Englandôs philosophy towards preservation can be found at http://www.historicnewengland.org/preservation/copy_of_preservation-philosophy and in Historic New Englandôs Policy and Procedures Manual. In brief, the preservation philosophy is to:

- *Research and document the history, evolution, features, materials, integrity and areas of significance of resources prior to undertaking any repair or conservation work. Research should be considered a continuum that serves to direct the overall management approach for resources, and records Historic New England's contribution to their care and maintenance;*
- *Monitor usage to prevent irreparable loss of historic fabric;*

- *Choose maintenance and conservation treatments that reflect a commitment to retaining and preserving historic material;*
- *Recognize and preserve the design and craftsmanship that has uniquely shaped a resource over time;*
- *Disseminate the experiences and information associated with resources to internal and external audiences; and*
- *Follow or exceed nationally-accepted professional standards and guidelines, as appropriate for each discipline, in order to ensure the longevity of resources and maintain a reputation for innovation and the highest quality of work.*

Historic New England’s Evolving Approach to Preservation

With over a century of stewardship of its historic property, Historic New Englandôs approach to preservation has shifted over the years as professional standards were established and matured. This evolution was described in *Preservation Pendulum*; published in the summer 2009 edition of *Historic New England:*

> Ever since its founding in 1910, Historic New Englandôs work has been guided by a philosophy of preservation. Our goal has always been to keep for future generations the significant features at any site. Yet, defining what is significant is subjective. One person may think that a window installed in the 1870s is significant, while someone else might value more the window that preceded it. Looking back over the years, we can see that our approach has fluctuated with the prevailing wisdom of the time, swinging like a pendulum between restoration and strict conservation. The preservation pendulumôs position begins to the right of center with our founder, William Sumner Appleton, during the early decades of the twentieth century. The common preservation methodology of his day was to restore historic housesð to take them back to their ñoriginalò appearance by removing features added after the house was first constructed. Appletonôs approach, more conservative than that of his peers in the field, tried to respect later alterations. Indeed, he was criticized for his conservative philosophy. Regarding his decision to preserve later additions to the 1664 Jackson House in Portsmouth, New Hampshire, he responded, ñeven were this new wall built of old stock, it would still remain mine, and I much prefer the interesting old alterations made by some long dead generation of Jacksons.ò On occasion, however, Appleton did remove later modifications to restore older features if he felt the evidence was sufficiently compelling. The evidence for the original seventeenth-century window at the Jackson House was so clear that he decided to replicate it in order to restore the principal façade.
>
> After Appletonôs death, the preservation pendulum in the 1940s and 1950s swung dramatically toward restoration. This was inspired in part by the popularity of Colonial Williamsburgôs reconstructed Colonial capitol as well as by a widespread preference for eighteenth-century architecture and design. Thus, in keeping with current practices, Historic New England undertook to restore the house at the c.1750 Casey Farm in

Saunderstown, Rhode Island, removing the nineteenth-century dormer windows and porch so as to return the building to its original appearance. Today, Historic New England staff look back at this restoration with some regret over the loss of details that show alterations over time as the Casey family modified the house to suit their changing needs and taste.

In the 1960s, the pendulum at Historic New England swung back, past Appleton, to a very conservative philosophy, influenced by the latest thinking at the National Park Service, which advocated leaving properties exactly as they were when acquired. The only way to prevent the loss of fabric, such as had occurred at Casey Farm, was to preserve, not restore. When Historic New England acquired the c. 1740 Codman Estate in Lincoln, Massachusetts, in 1969, conservative philosophy dictated that the architectural details be preserved exactly as they came to us. For example, the elevator that the family had installed at the back of the house in the 1950s was left in place despite the fact that it compromised the exterior and darkened the hall. Our guiding philosophy dictates that regardless of how we interpret the house to the public, we must leave all the evidence intact. At present, the tour narrative focuses on the early twentieth century, when the last two generations of the family were using the estate as a country house, but if in future staff chooses to portray life at the house in the 1960s, the evidence of that era survives.

While Historic New Englandôs preservation philosophy toward architectural fabric is conservative, it is flexible toward the interior, so long as any changes are reversible. A committee of curatorial, research, interpretative, and preservation staff analyzes preservation and presentation issues and carefully considers the best approach. We would never remove a later mantelpiece from a room, but might change the wall treatment, carpet, and furnishings to suit the interpretive concept. In the early 1970s, our flagship museum the 1796 Otis House, was refurbished to reflect the appearance of a mansion belonging to a prominent family during the Federal era. Thirty years later, as a result of changing visitor interests, we reinstalled two rooms to allow us to represent the lives of a female physician and a middle-class boarder who lived there in the 1830s and 1850s. Preservation and reversibility are the keys to Historic New Englandôs philosophy today. It is likely that our approach will always remain faithful to the available historical evidenceð conservative in protecting historic features and flexible in interpreting houses to the public. As Appleton said, ñWhat is left today can be changed tomorrow whereas what is removed today can perhaps never be put back.ò

The Preservation Philosophy and the Management of Built Structures

If buildings, landscapes, and objects are to convey their full meaning, it is essential that their authenticity be protected and cherished. The patterns of wear, methods of construction, historic materials, and irregularities of age communicate the uses to which these sites have been put and document the changes. Because this physical evidence is valuable, Historic New England believes that the collections in its care must be treated in the most conservative manner possible, whenever possible, through stabilization, conservation and traditional maintenance rather than restoration and reconstruction.

Historic New England strives to retain all original materials. When materials must be replaced, either to safeguard the life of the object, plant or building, or because they are beyond repair or saving, the first priority is to replace them with the same kind of material. If this is impossible, the reasons for not doing so must be clearly articulated and existing treatment protocols followed. All measures taken, regardless of approach, are thoroughly documented.

What is Historic New England's preservation philosophy?

- Historic New England preserves our buildings and landscapes as artifacts for current and future generations to study and enjoy.
- We research the sites as needed, to keep as much of the property intact without replacing material.
- This philosophy has evolved over the 100-year history of the organization. How we approach the preservation of the sites today sometimes differs from how our founder William Sumner Appleton approached the preservation of the buildings in his time. The overall intent is the same ï to preserve the properties and to make as few changes to them as possible so that they retain their historical significance.

<u>Secretary of the Interior's Standards for the Treatment of Historic Properties</u>

Regardless of Historic New Englandôs internal preservation philosophy, its work is often judged on a local, state and national level based on how it adheres to the current regulatory parameters set in the Secretary of Interiorôs Standards for the Treatment of Historic Properties. Since 1978, with revisions in 1983 and 1995, these federally-established standards have formed the regulatory basis for all public preservation projects and set policy in most preservation jurisdictions and in other preservation non-profits.

The four treatment approaches outlined by the standards are Preservation, Rehabilitation, Restoration, and Reconstruction, outlined below in hierarchical order:

- **Preservation:** places a high premium on the retention of all historic fabric through conservation, maintenance and repair. It reflects a building's continuum over time, through successive occupancies, and the respectful changes and alterations that are made to it.

- **Rehabilitation:** is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values
- **Restoration**: focuses on the retention of materials from the most significant time in a property's history, while permitting the removal of materials from other periods.
- **Reconstruction:** the fourth treatment, establishes limited opportunities to re-create a non-surviving site, landscape, building, structure, or object in all new materials.

Historic New England often uses the term ñpreservationò loosely to cover a broad span of activities that include what the Secretary of the Interior might qualify as ñpreservationò projects or ñrestorationò. All activities undertaken by Historic New England fit within one of the categories.

Conservation versus Preservation

The term ñpreservationò is often used as an umbrella-like encapsulation of many different activities that all occur in what is called ñHistoric Preservation.ò ñConservationò is a similar term: in Europe, conservation encompasses a similar range of topics that in the United States would be called ñpreservation.ò The following terms are also used:

- **Conservation:** The profession devoted to the preservation of cultural property for the future. Conservation activities include examination, documentation, treatment, and preventive care, supported by research and education.
- **Architectural conservation:** the science of preserving a historic structure's materials by observing and analyzing their deterioration, determining causes of and solutions to problems, and directing interventions.

<u>TARPED - The philosophy has you covered!</u>
In order to remember the core elements of Historic New Englandôs preservation philosophy in application, the Property Care team has developed the acronym ñTARPED.ò

- **T**reat existing material as historic
- **A**ll changes should be reversible and retreatable
- **R**eplace in kind
- **P**lan, review, and discuss
- **E**ach situation is different ï donôt assume!
- **D**ocument, document, document

T = Treat existing material as historic

- Historic fabric, or historic material, is not the ñoldestò material or the ñoriginalò material but rather the material you find on the building or landscape the minute you step on the property. Although simplistic in nature this concept underscores the idea that all material should be considered significant until proven otherwise through discussion.
    - Example: The 1728 Cogswellôs Grant property that was the home of folk art collectors Bertram and Nina Fletcher Little has a sunporch on the rear ell built in the 1970s. Although not ñoriginalò to the building, it is seen as historic because it is associated with construction that took place during the Littleôs ownership and it contributes to an overall understanding about the site was used.

- Any detail at a site, whether small like a hinge or a nail or large like roof material or a tree location, is significant in understanding the evolution and use of a site.

A = All Changes should be Reversible and Retreatable

- A reversible project is one in which the intervention does not harm the surrounding material and can be removed in the future with limited damage to the surrounding materials.
    - Example: At the Gropius House site, the Visitor Center occupies the Gropius garage and uses a box-within-a-box concept to allow for reversibility ï the Visitor Center could be removed from the garage with no damage to the garage materials and the garage could at that point be interpreted as a garage.
    - Example: In order to protect historic wallpaper in situ in a space where Historic New England intends, for interpretive purposes to restore the room, a cushioned false wall is installed over the extant historic wallpaper protecting it and allowing new wallpaper to be installed on the false wall.
- Retreatability is a treatment concept that is an extension of reversibility. Retreatability implies that if the repair/treatment fails or the condition degrades, the failed repair can be removed and a new repair can be created without loss or damage to the surrounding historic material.
    - Example: Most timber frame repairs are not reversible as they generally involve the removal of deteriorated material to allow for the physical repair. But if traditional joinery and bolts are used for the repair and the use of epoxies, consolidants, or glues are avoided, then a repair should be retreatable.
    - Example: A plaster repair using traditional materials is re-treatable but the plaster re-adhesion methodology Historic New England currently employs to stabilize is NOT re-treatable as it uses glues that cannot be removed. It is used, however, with the intent of retaining in situ as much historic plaster and lath as possible.

R = Replace in kind

- Historic New England strives to retain the historic fabric and detailing of its structures and landscapes features through proactive maintenance and conservative repairs and treatments. When we need to replace an element the initial approach is to replace the material utilizing the same material type or species, dimension, texture, detailing, and compatibility, shortened commonly to the phrase ñreplace in kind.ò
    - Example: when Historic New England needs to repair an oak sill we will use oak; when we need to replace a pane of glass we will strive to match the characteristics of that glass (waviness, seediness, thickness); and when we need to replace a tree we will attempt to use the same species of tree.

P = Plan, Review, Discuss

- Any decision to intervene in a structure is a serious one and it means fabric is put at risk ï both from its physical condition but also from the repair.
- Careful planning and review of a project is needed to ensure that repairs will stay true to the interpretation of the site and respect its historic fabric.
- An integral part of Historic New Englandôs project planning process includes:
  - Condition assessment, condition analysis, research, development of a scope of work and treatment plan;
  - identification of materials to be used;
  - identification of areas where the project may require philosophical decisions.
- Some philosophical decisions are the purview of the team leader and tend to include issues not readily visible to a visitor such as material choice or construction details.
- Detail changes that ultimately affect the aesthetics or interpretation of the site go through a multiple stage interdisciplinary review process known as Proactive Preservation and Interpretation Planning (PPIP) to ensure organizational awareness and discussion.

E = Each Situation is Different – Don't Assume!

- An approach used appropriately at one site may not work at another site.
  - The preservation approach at a site like the 1937 Gropius House in suburban Lincoln, Mass. may be different from one used at a site such as the ca. 1750 Casey Farm in rural Saunderstown, R.I..
  - An approach used to repair one window may not necessarily work on the adjoining window.

D = Document, document, document

- Documentation is the backbone of all the work Historic New England does. With thorough documentation, decisions made by our predecessors can be understood today and future generations can understand the decisions we make.
- Whether we are right or wrong in our decision making process, if those decisions are not documented, future generations will be left guessing about the validity and intent of our interventions and their basis in historical precedent
- Documentation efforts include:
  - Pre-project: including photography of the presenting issue but also of that issue in its surrounding context, with conditions drawings, and repair options.
  - During project: including conditions and field drawings, photography, submittals, and physically labeling new material
  - Post project: including photography, completion reports, labeling and storage provisions for architectural fragments

How does Historic New England apply the preservation philosophy in daily practice?

- The preservation philosophy is a broad reaching document and does not directly address many of the issues that face a project manager day-to-day so Historic New Englandôs Property Care team has developed a series of best practices, or White Papers, to better articulate our approach and solutions to specific issues.
- The White Papers are generally divided into three sections: Philosophy Statement, Guidelines, and Technical Information. Most White Papers contain both a Philosophy Statement and a section for Guidelines but not all topics contain Technical Information. Recently, Property Care staff have been drafting template specifications as a starting point for each White Paper topic.
    - Philosophy Statement: the overall approach to a topic
    - Guidelines: the basic steps or best practices we are striving to achieve
    - Technical Information: the expansion of the guidelines with more detailed information
- Historic New England thinks of the White Papers as living documents to be continually refined based on our practical experiences. However Historic New England also realizes that our approach to an issue may not be the only approach and embraces these differences and welcomes discussion on any preservation topic.

If I am trying to protect the building but I think a feature was poorly designed or constructed, do I have to repeat previous mistakes?

- Start with the premise that everything is historic until proven otherwise ï including ñmistakesò or ñdesign flaws:ò who are we to say they are mistakes?
- Our philosophy says we should ñrecognize and preserve the design and craftsmanship that has uniquely shaped a resource over time.ò Design details, especially ones that might be deemed ñmistakesò, tell a lot about the history and evolution of construction techniques and give ñcharacterò
- Historic New Englandôs sites are <u>museums</u>, our mission is to preserve the historic architecture, landscapes and design elements. Our goals are different than those of a typical homeowner with an old house.

How are Exceptions Determined?

- If it is felt that the feature truly is poorly designed and is actively causing damage, careful planning should identify a solution that retains the spirit of the design flaw while eliminating the potential for damage.
- The planning process should incorporate an understanding of WHY the historic detail should be changed. Questions to answer during this process include:
    - What is the origin, significance and context of the detail?
    - What or where is the failure point?
    - If we leave the detail what risks are entailed?
    - If we change the detail, will we affect the integrity of the feature and how will we ensure its preservation?

  - If we change the detail, can we maintain the integrity of the design but still protect the building and how will that be accomplished?
  - What are short and long term cost ramifications of the change?

Who can Approve an Exception to the Preservation Philosophy?

- The White Papers are designed to outline not just the preferred approach but also possible approaches that may be in direct violation of the philosophy but have been determined to be acceptable exceptions.
  - Even though the White Papers outline possible exceptions the Project Manager still needs to outline why it is acceptable to stray from the philosophy.
- The Team Leader of Property Care has the authority to grant exceptions to detail changes that do not affect the interpretation or presentation of the site.
- The Proactive Preservation Interpretation and Planning (PPIP) task force has the authority to grant exceptions to detail changes that affect the interpretation or presentation of the site.

How does Historic New England decide what time period to present to the public?

- Historic New England respects and retains changes that have occurred at the site over time, and is extremely conservative when repairing a structure. We recognize that everything about the building can contribute to its history and strive to preserve all aspects of the site.
- We no longer strip back properties to their earliest period for the purpose of presenting the earliest stage of the houseôs occupation. We strive to present the entire history of a property, including how it changed over time.
- The period of presentation takes into account changes that have been made to the landscapes, buildings, and furnishings.
- This practice? Policy? means that we may retain an asphalt roof (perceived as modern) and not install a wood shingle roof (perceived as historic), depending on the period we are interpreting at the site.
- The Proactive Preservation and Interpretation Planning (PPIP) task force is responsible for decision making in all interpretive questions.

What is the Proactive Preservation and Interpretation Planning (PPIP) Task Force?

- The Proactive Preservation Interpretation and Planning (PPIP) task force is an internal group of Historic New England staff with representatives from across the organization with expertise in building and landscape preservation, collections and conservation, interpretation and visitor experience, and marketing and fundraising. These representatives are drawn from each of four teams that reflect the organizational structure at Historic New England: Collections Services, External Affairs, Property Care, and Visitor Experience. Over the past twelve years, Historic New England has established through PPIP a successful multidisciplinary process that:
  - determines the period of presentation and interpretation for each property;
  - reviews annual projects and activities to ensure the overall presentation and conservation of each property is consistent and;
  - provides high level project management and integrated work plans to focus fundraising efforts and staff resources on selected properties.

It is through this process that the group balances the different treatment needs within the overall context of the site and the stories being told.

How does PPIP determine the period of presentation and interpretation?

- As part of the PPIP process, each site is assigned a period of presentation and interpretation to guide activities on site. This statement outlines how to approach various components of the site: landscape, building exterior, interiors and objects, stories, tours, and visitor services.
- As part of this process, each component of the site is explored, key elements or cornerstones of interpretation are established, and methodologies for treatment are determined.
- Through the PPIP process, these decisions are not made individually within each team; rather, all of the stakeholders discuss, react to and influence each otherôs initial thoughts on approach.
- This is a lengthy process for each property, sometime taking several years to complete, as background research needs to be completed and thought through, and care needs to go into the decision making process. The PPIP goal is to establish an interpretive and planning road map for that property for the next twenty years or more.

How does Historic New England ensure the overall presentation of each property is consistent?

- As has been made clear, Historic New Englandôs general approach to the sites is to respect the historic fabric and materials that are there and, as in the case more typically of the building preservation work, when an exterior treatment like the roof or paint needs to be renewed or replaced, that it be replaced in kind, with the same material or in the same color that was on the building.
- Every year, PPIP reviews the projects each team is planning at the sites to ensure the appropriateness of the project in relation to presentation of the property. This is done regardless of whether any changes to the status quo are considered.

- The genesis of PPIP in the late 1990s was related to a simple painting project. Property Care was preparing to paint the Quincy House in the yellow base color with white trim it had long been painted. For many years other teams in the organization had been moving towards a 1880s interpretation of the house, which required a different color. Prior to the central unifying process of PPIP, there was little cross-team discussion of work plans and overall interpretation. As scaffolding was being deployed at the Quincy House, discussion began amongst the teams about the opportunity to paint the house in its 1880s paint scheme. At the end of the project the house was painted in its 1880s palette and PPIP was formed to provide better coordination for future projects.
-

What happens if an interpretive question comes up during a year?

- In any given year there may be many questions raised through routine projects. Certain changes need to be confirmed by PPIP before work can proceed while some are in the discretion of the team leader.
- At the Quincy House noted above, for example, an asphalt shingle roof recently needed to be replaced. With the overall interpretive goals for the property clarified through the PPIP process, it was suggested to change the roofing shingles from asphalt to the wood shingles clearly shown in 1880s photographs of the house. As this material change was consistent with the interpretation of the house, it was endorsed by PPIP and the change was instituted.

The Preservation Philosophy and Landscape Management

If buildings, landscapes, and objects are to convey their full meaning, it is essential that their authenticity be protected and cherished. The patterns of wear, methods of construction, historic materials, and irregularities of age communicate the uses to which these sites have been put and document the changes. Because this physical evidence is valuable, Historic New England believes that the collections in its care must be treated in the most conservative manner possible, whenever possible, through stabilization, conservation and traditional maintenance rather than restoration and reconstruction.

Historic New England strives to retain all original materials. When materials must be replaced, either to safeguard the life of the object, plant or building, or because they are beyond repair or saving, the first priority is to replace them with the same kind of material. If this is impossible, the reasons for not doing so must be clearly articulated and existing treatment protocols followed. All measures taken, regardless of approach, are thoroughly documented.

What is Historic New England's preservation philosophy?

- Historic New England preserves our buildings and landscapes as artifacts for current and future generations to study and enjoy.
- We research the sites as needed, to keep as much of the property intact without replacing material.
- This philosophy has evolved over the 100-year history of the organization. How we approach the preservation of the sites today sometimes differs from how our founder William Sumner Appleton approached the preservation of the buildings in his time. The overall intent is the same ï to preserve the properties and to make as few changes to them as possible so that they retain their historical significance.

How does the preservation philosophy apply to the landscape?

- Each landscape is assigned a period of interpretation. This date, or span of dates, represents the historic period in which we are trying to maintain the property to convey.
- The landscape is constantly growing and evolving which means an exact duplicate of the historic period is never possible. For example, even with annual pruning shrubs and trees often do not appear exactly as they were in the period of interpretation.
- Until otherwise determined by the team leader ï all plants and features must be considered historic. Never remove a plant or feature from the landscape without approval from the team leader and never add a new plant or feature without approval from the team leader.
- Archaeological resources are abundant on historic properties and any excavation could damage these artifacts and destroy their context. Generally, digging in pre-existing garden beds or tree locations will not affect sub-surface resources. If any artifacts are uncovered during the course of work ï the project should stop, the artifact needs to be

documented with relation to where it was found and how deep it was found, and a determination by the team leader needs to be made about continuing work.

How does one make management decisions within the context of a historic landscape?

- Decisions to add or remove vegetation or features can alter the historic context or result in the loss of historic material.
- Specific management plans identifying the historic characteristics and goals (Cultural Landscape Reports) exist for some, but not all, properties. Approved cultural landscape reports provide the details necessary for ongoing management of that site in the period of interpretation.
- Unfortunately, many sites do not yet have the appropriate historical landscape management plans. That means any decision could destroy context or historic material. Maintain the status quo unless otherwise determined.
- Always assume all materials and features, including plants, shrubs, trees, garden ornament, garden beds, parterres, terraces, etc., are historic.
    - Example: A preservation manager may ask you to remove a vine from a building or a remove a shrub in close proximity to the foundation. Both may be causing damage to the building and it appears reasonable to remove them. However both may be important interpretively to the site ï the building always had vines or that shrub was planted in 1890. Removals require approval from team leader.
- Never add a new feature to the landscape (new garden bed, garden pot, tree shrub) without approval from the team leader.
    - Example: A site manager asking for a garden bed around the sign results in a new feature. New features require approval from the team leader property care.
- Never change materials (plants, path surfaces, etc.) without approval because these materials may be purposeful.
    - Example: Norway maples are classified today as an invasive but were common back in the early 20th century. It may feel right to cut down a Norway maple because it is an invasive however, deeper discussion needs to be had because the tree is part of the story of the property.
    - Example: The path material is very gravelly, visitors are having trouble walking and you think you should remove the gravel and make a change to help the visitor. Great idea, however this change of material needs to be discussed to determine the impact on the interpretation and authenticity of the site.
- It is not realistic to restrict all activities and require permission for every action. For example:
    - Replacing annuals ñin kindò (replacing with the exact same variety of the same plant) is acceptable as long as it is within the established operations of the site.
    - Perennials periodically need to be divided and removed from garden beds to maintain garden proportions and good health. Once thinned out, adding the surplus plant material to a different garden bed where the plant is not currently or

starting a new bed is not approved.

- Woody shrubs and trees need to be pruned and should be to maintain good health however one should always be targeting a historically accurate look. If in doubt, less is better until a determination can be made.

How are changes to the landscape determined?

- Many of our sites have a high number of plants or features that actually are not from the period of interpretation. How can that be rectified?
    - Recommending a change to the historic landscape requires research and documentation. Some questions to answer during this process include:
        - When did the plant or feature originate?
        - What is the significance of the plant or feature?
        - What is the context of the plant or feature?
        - Why do we want to change the plant or feature
        - If we change the plant or feature - how do we affect the integrity of the site?
        - If we change the plant or feature - how can we maintain the integrity of the site?
        - What are the costs associated with the project?

What are the industry terms used when discussing preservation work?
Regardless of Historic New Englandôs internal preservation philosophy, its work is often judged on a local, state and national level based on how it adheres to the current regulatory parameters set in the Secretary of Interiorôs Standards for the Treatment of Historic Properties. Since 1978, with revisions in 1983 and 1995, these federally-established standards have formed the regulatory basis for all public preservation projects and set policy in most preservation jurisdictions and in other preservation non-profits.

The four treatment approaches outlined by the standards are Preservation, Rehabilitation, Restoration, and Reconstruction, outlined below in hierarchical order:

- **Preservation:** is the retention of the landscapeôs existing form, features and materials, provided that such actions will not result in a degraded landscape condition or threaten other historic resources
- **Rehabilitation:** is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values
- **Restoration**: focuses on the retention of materials from the most significant time in a property's history, while permitting the removal of materials from other periods.
- **Reconstruction:** the fourth treatment, establishes limited opportunities to re-create a non-surviving site, landscape, building, structure, or object in all new materials.

Historic New England often uses the term ñpreservationò loosely to cover a broad span of activities that include what the Secretary of the Interior might qualify as ñpreservationò projects or ñrestorationò. All activities undertaken by Historic New England fit within one of the categories.

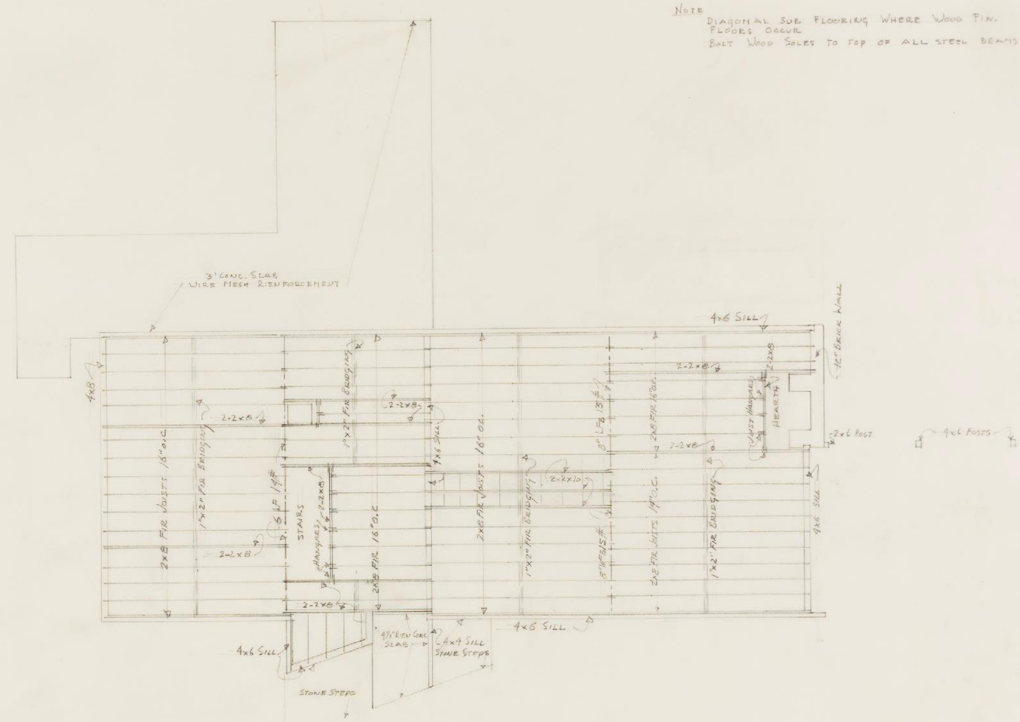
The full version of Historic New Englandôs philosophy towards preservation can be found on the website or in the Policy and Procedures Manual

The Property Care team produces White Papers to document our approaches to management within the context of the philosophy. Copies of approved white papers are available on the website or on the shared network drive. There are many documents in draft format.

Additional Resources 02

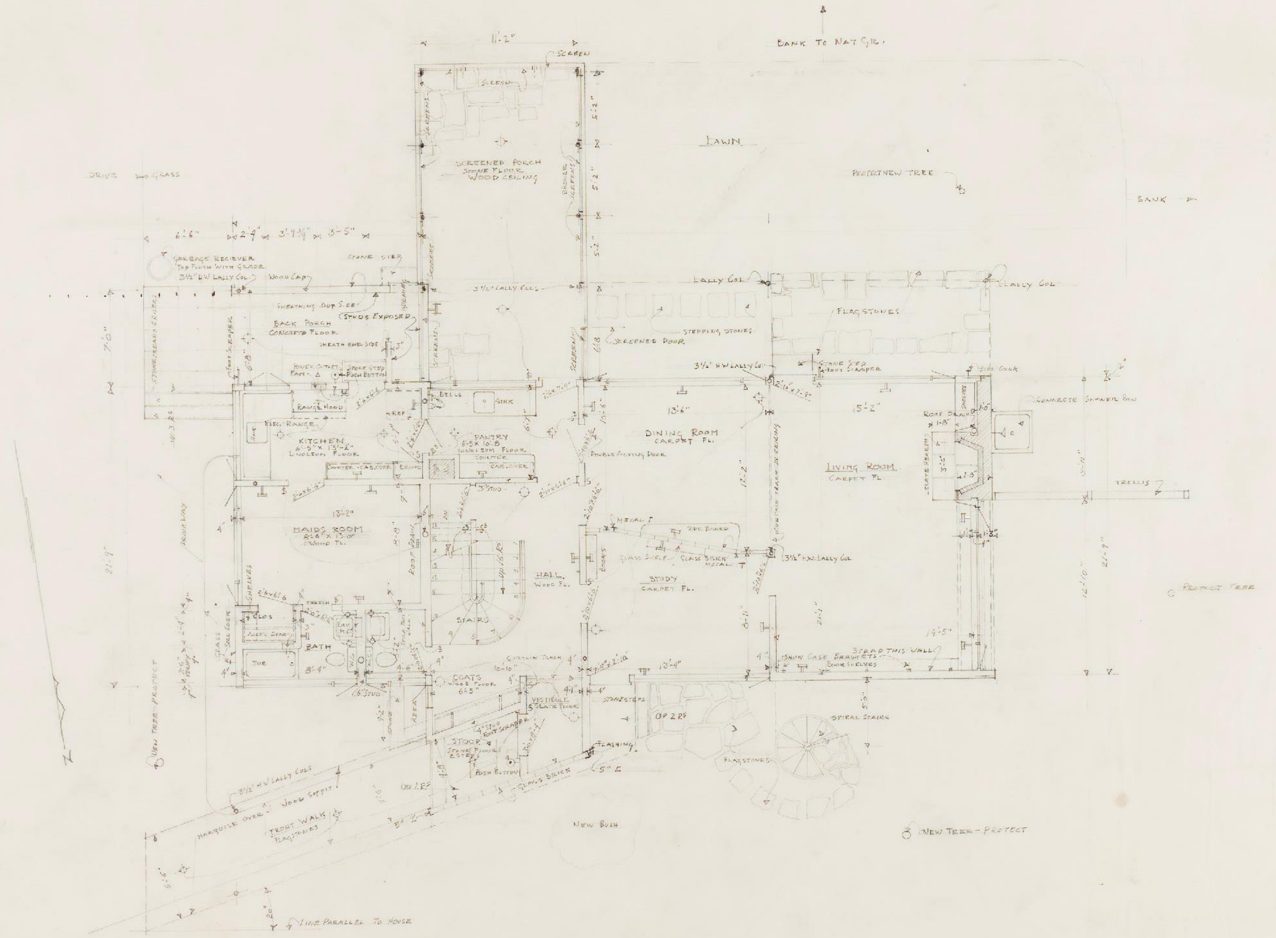
Original Plans for the Gropius House, 1938
Walter Gropius and Marcel Breuer
Located in the Busch-Reisinger Museum, Harvard Art Museums

NOTE
DIAGONAL SUB FLOORING WHERE WOOD FIN. FLOORS OCCUR
BOLT WOOD SOLES TO TOP OF ALL STEEL BEAMS



FIRST FLOOR FRAMING PLAN - SCALE 1/4" = 1'-0"

8

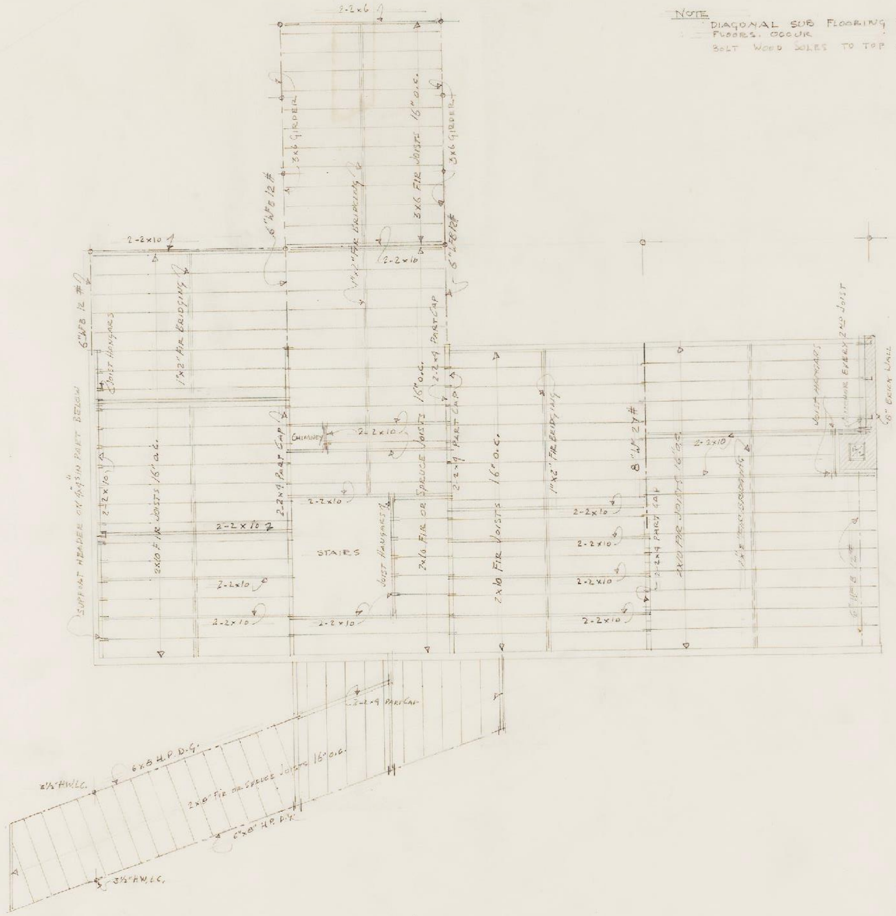


FIRST FLOOR PLAN 1/4" = 1'0"

REVISED MAR. 29, '38.

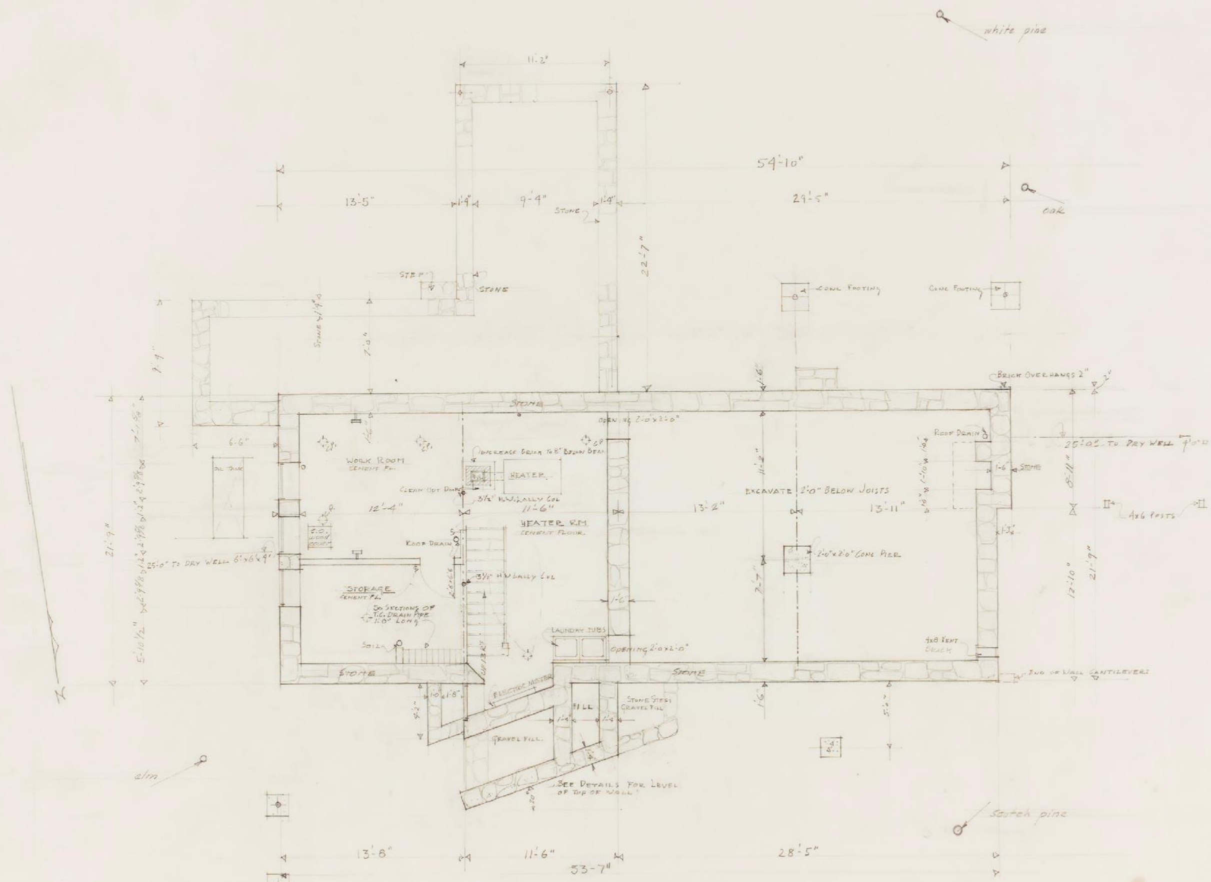
3

NOTE
DIAGONAL SUB FLOORING WHERE WOOD FIN. FLOORS OCCUR.
BOLT WOOD SOLES TO TOP OF ALL STEEL BEAMS



SECOND FLOOR FRAMING PLAN SCALE 1/4" = 1'-0"

9

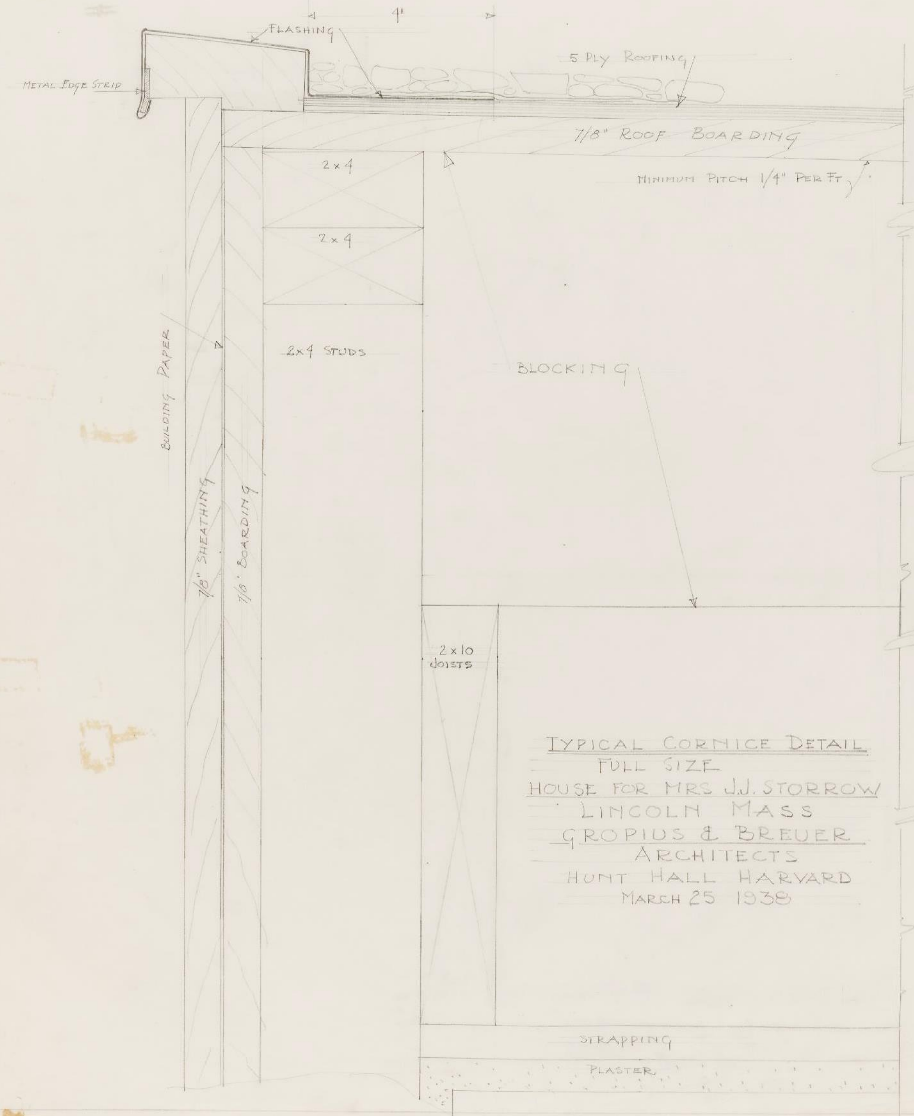


BASEMENT FLOOR PLAN SCALE 1/4" = 1'0"

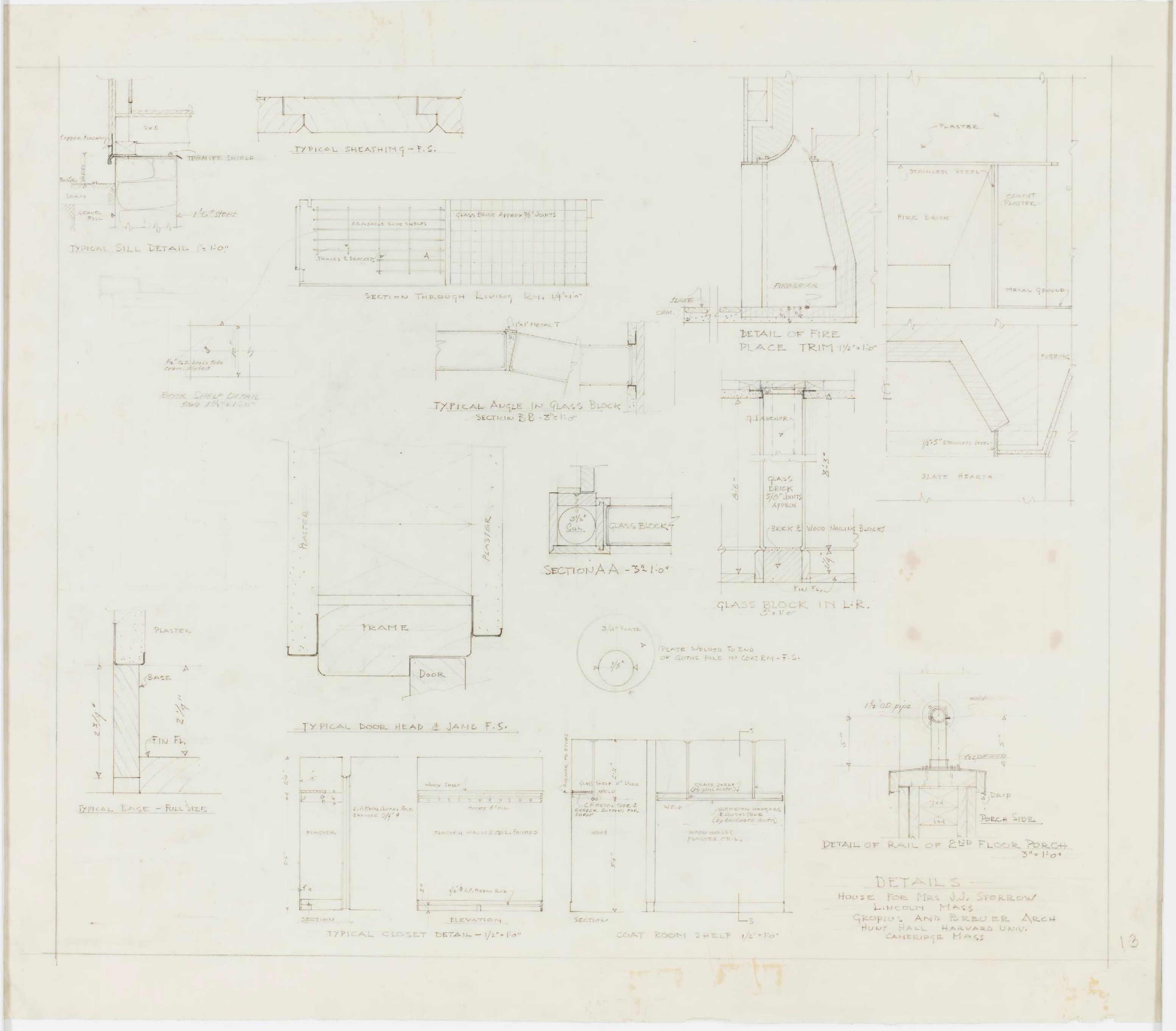
REVISED - MAR. 29, '38

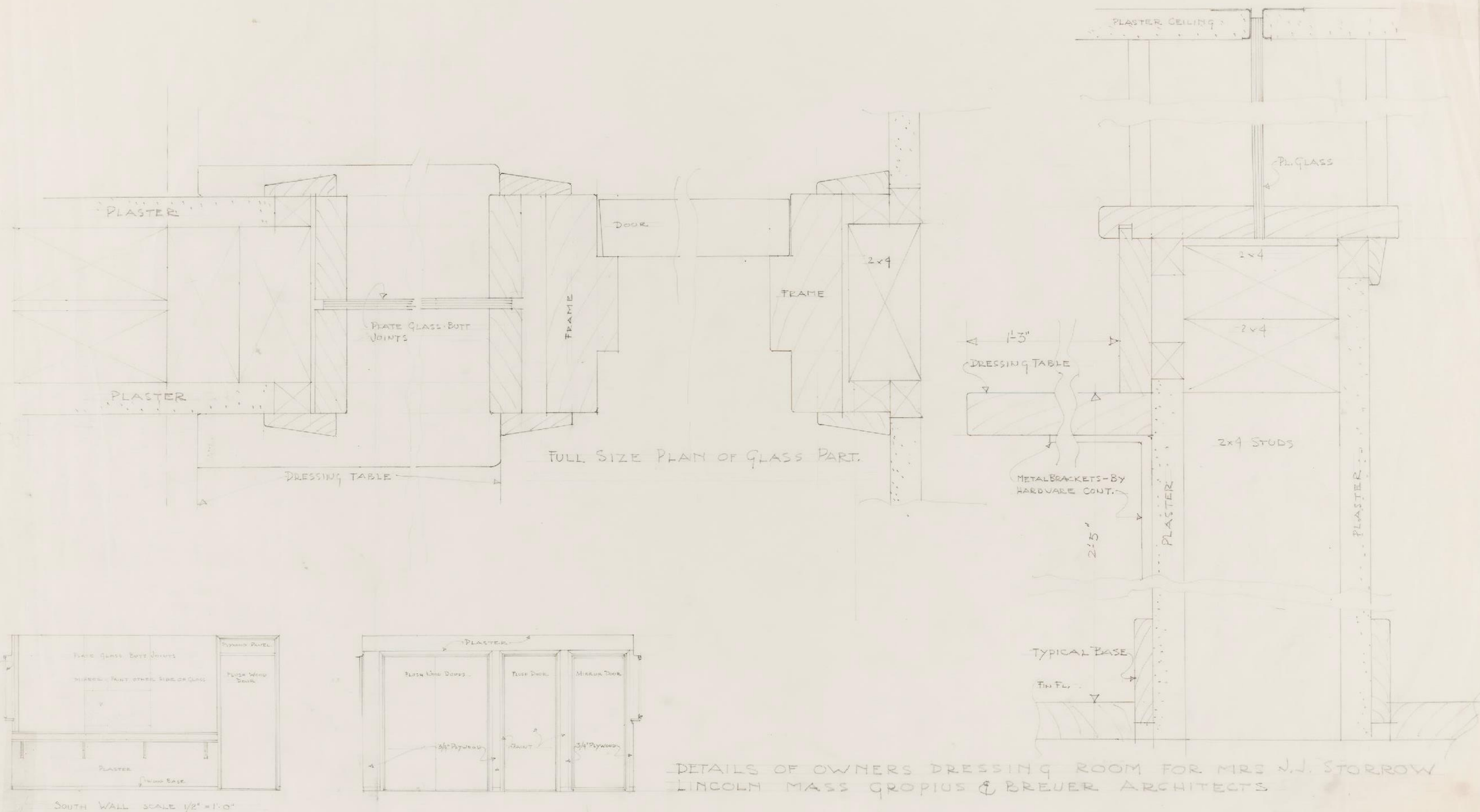
HOUSE FOR MRS J.J. STORROW
GROPIUS & BREUER ARCHITECTS
HUNT HALL HARVARD UNIVERSITY

2

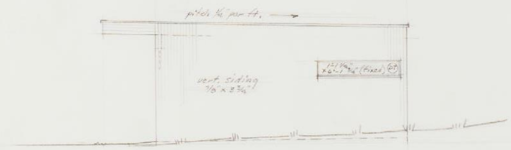

FLASHING
1"
5 PLY ROOFING
METAL EDGE STRIP
7/8" ROOF BOARDING
MINIMUM PITCH 1/4" PER FT
2x4
2x4
2x4 STUDS
BLOCKING
BUILDING PAPER
7/8" SHEATHING
7/8" BOARDING
2x10 JOISTS
TYPICAL CORNICE DETAIL
FULL SIZE
HOUSE FOR MRS J.J. STORROW
LINCOLN MASS
GROPIUS & BREUER
ARCHITECTS
HUNT HALL HARVARD
MARCH 25 1938
STRAPPING
PLASTER

17


TYPICAL SILL DETAIL 1½"=1'0"
TERMITE SHIELD
COPPER FLASHING
GRAVEL FILL
TYPICAL SHEATHING - F.S.
SECTION THROUGH LIVING RM. 1/4"=1'0"
ADJUSTABLE GLASS SHELVES
GLASS BRICK APPROX 3/8" JOINTS
BOOK SHELF DETAIL
TYPICAL ANGLE IN GLASS BLOCK
SECTION BB - 3"=1'0"
DETAIL OF FIRE PLACE TRIM 1½"=1'0"
PLASTER
STAINLESS STEEL
CEMENT PLASTER
FIRE BRICK
FIREBRICK
METAL GROUND
SLATE
FURRING
SLATE HEARTH
GLASS BRICK 5/8" JOINTS APPROX
BRICK & WOOD NAILING BLOCKS
FIN FL.
GLASS BLOCK IN L-R. 3"=1'0"
GLASS BLOCKS
SECTION AA - 3"=1'0"
PLASTER
FRAME
DOOR
TYPICAL DOOR HEAD & JAMB F.S.
PLATE WELDED TO END OF CLOTHS POLE IN COAT RM - F.S.
PLASTER
BASE
FIN FL.
TYPICAL BASE - FULL SIZE
1½" OD pipe
SOLDERED
DRIP
PORCH SIDE
DETAIL OF RAIL OF 2ND FLOOR PORCH 3"=1'0"
SECTION
ELEVATION
TYPICAL CLOSET DETAIL - 1/2"=1'0"
SECTION
COAT ROOM SHELF 1/2"=1'0"
DETAILS
HOUSE FOR MRS J.J. STORROW
LINCOLN MASS
GROPIUS AND BREUER ARCH
HUNT HALL HARVARD UNIV.
CAMBRIDGE MASS
13

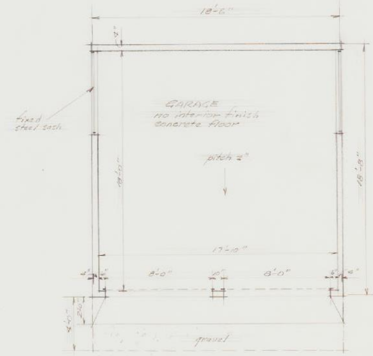


DETAILS OF OWNERS DRESSING ROOM FOR MRS N.J. STORROW
LINCOLN MASS GROPIUS & BREUER ARCHITECTS



SOUTH-WEST ELEVATION (N.E. ELEV. SIMILAR)
Scale 1/4"=1'-0"

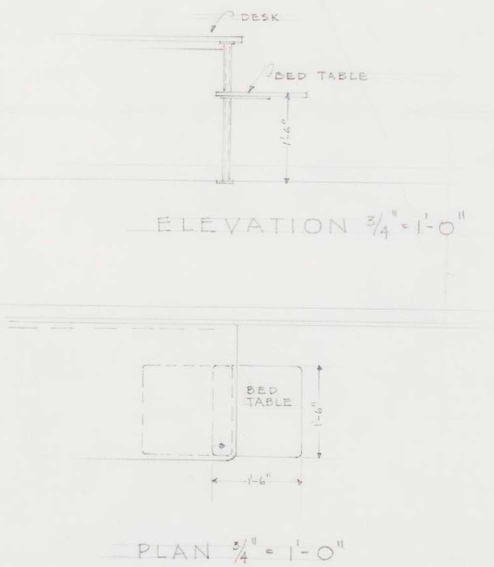
NORTH-WEST ELEVATION
Scale 1/4"=1'-0"

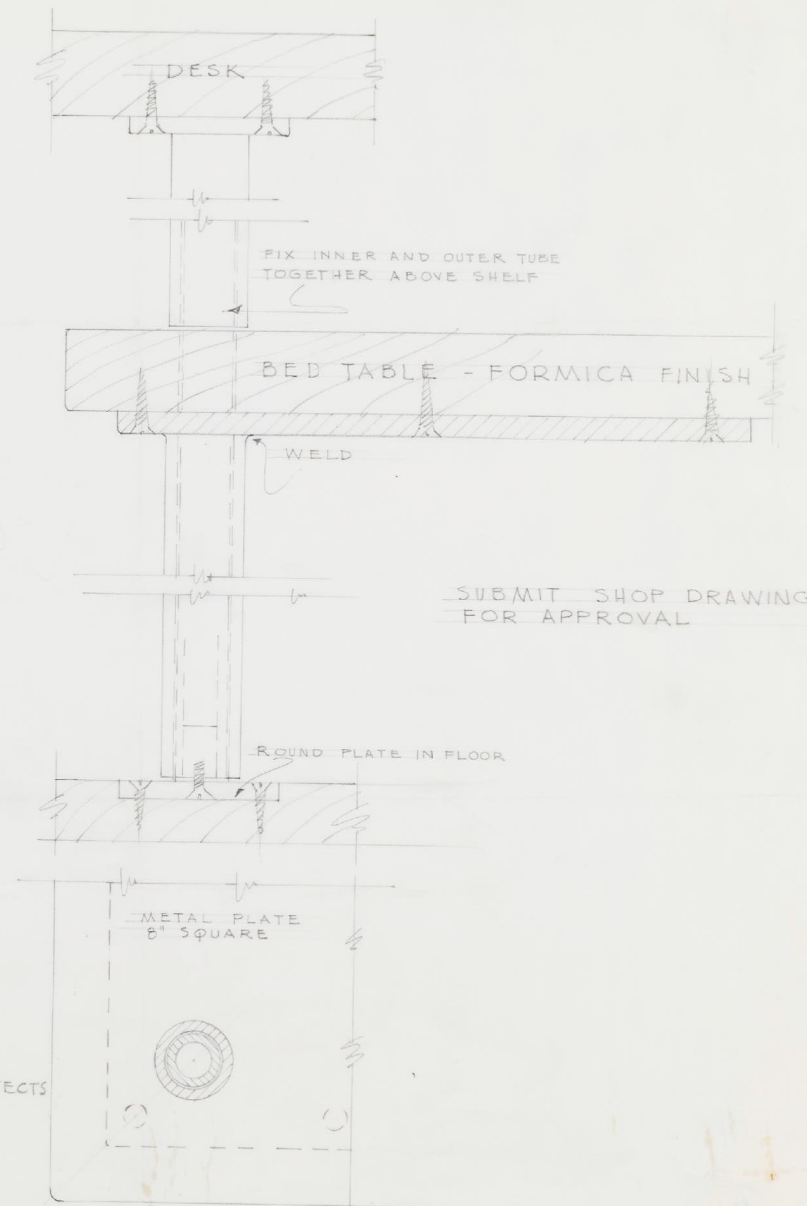


PLAN
Scale 1/4"=1'-0"

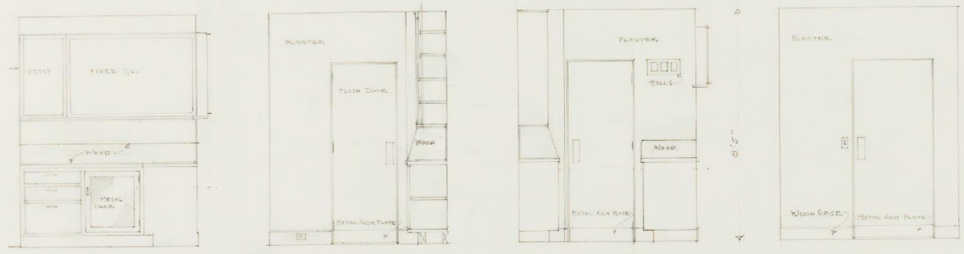
PROVISIONAL PLAN
GARAGE FOR MRS J. J. STORROW
GROPIUS & BREUER, ARCHITECTS
HUNT HALL, HARVARD UNIVERSITY

14





F·S·D· TABLE LEG
GUEST R'M FURNITURE
— STORROW HOUSE —
GROPIUS & BREUER
ARCHITECTS



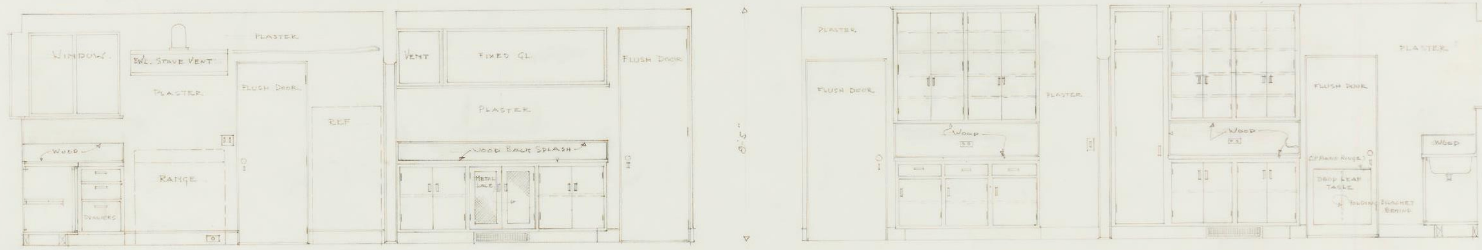
EAST　WEST
KITCHEN ELEVATIONS

EAST　WEST
PANTRY ELEVATIONS

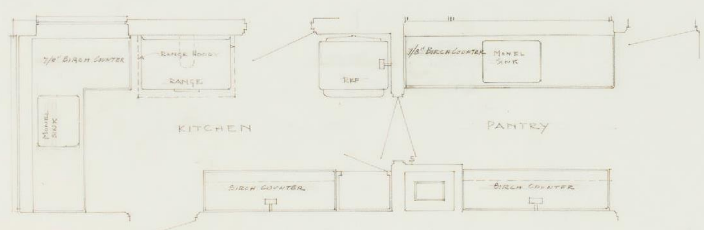
NOTES
HARDWARE INCLUDED IN HOUSE HARDWARE ALLOWANCE.

HANG CABINETS ON 7/16" IRON RODS. ALL RODS TO HAVE AN ALUMINUM TUBE COVER FROM BOTTOM SHELF TO CEILING.
ALL DOORS TO HAVE AN APPROVED FRICTION CATCH.

CHROME PLATED PUSH & KICK PLATES ON BOTH SIDES OF DOORS IN EAST & WEST PANTRY WALLS

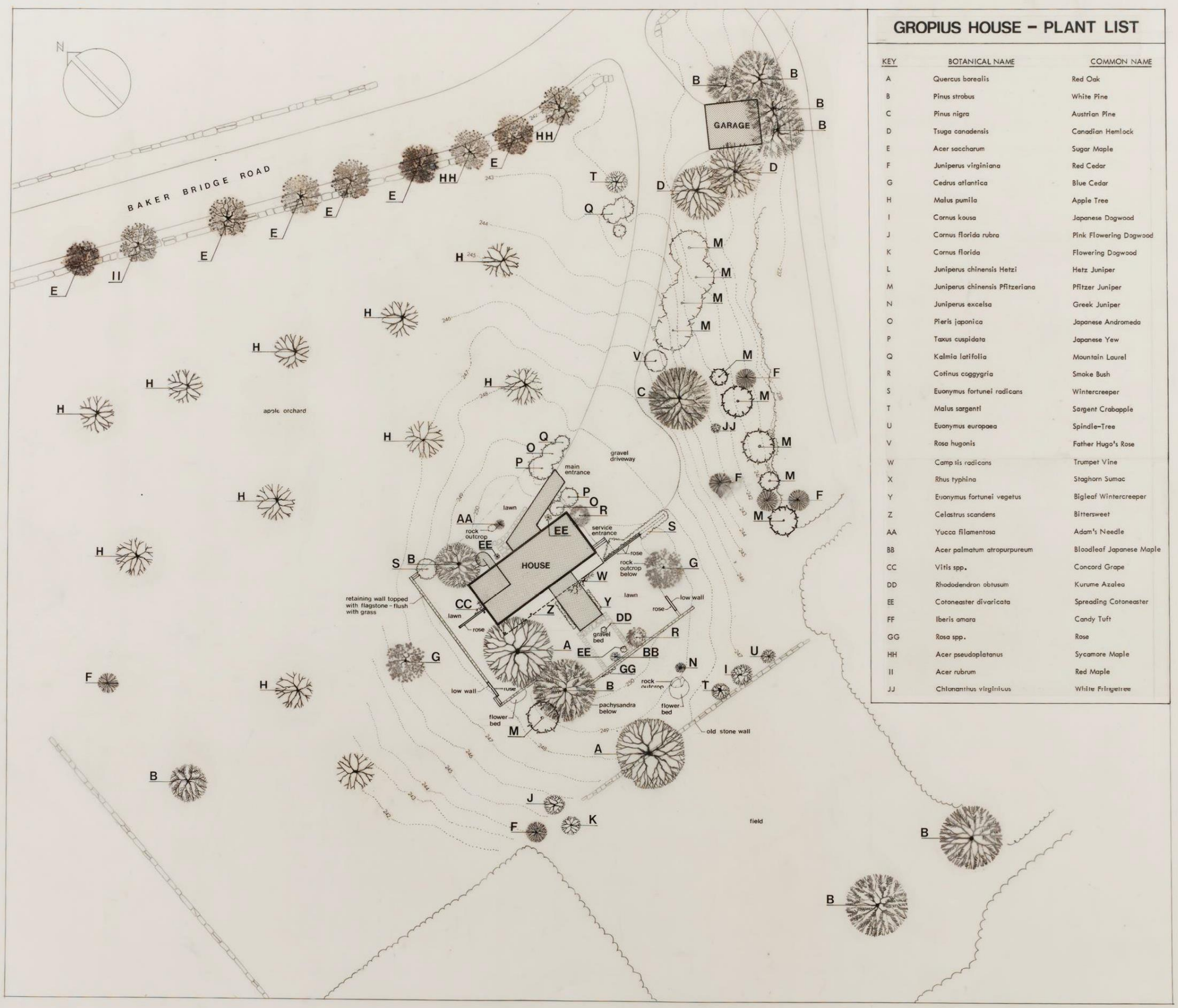


SOUTH ELEVATION　　NORTH ELEVATION



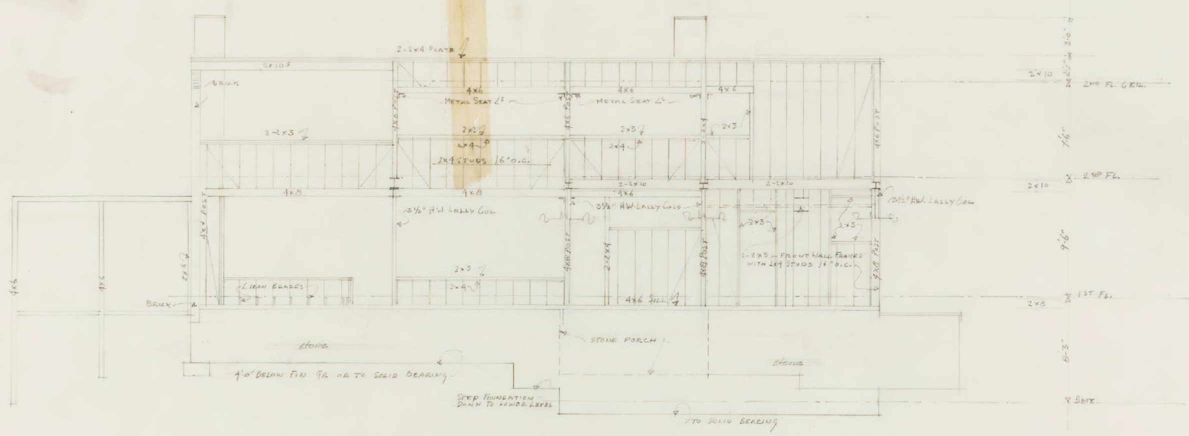
KITCHEN　PANTRY

1/2" KITCHEN DETAILS SH NO 18
FOR
MRS. J. J. STORROW
LINCOLN MASS
GROPIUS AND BREUER ARCH.
HUNT HALL HARVARD UNIVERSITY

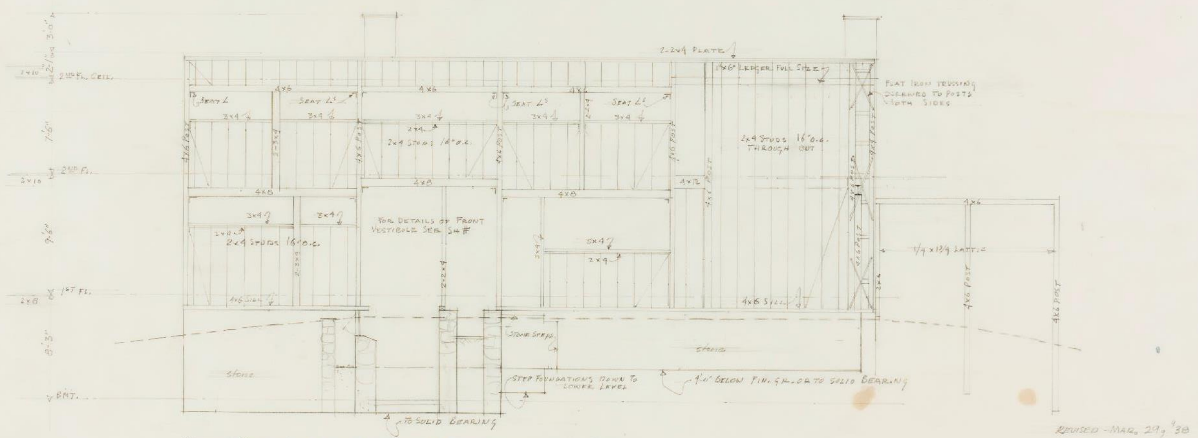


GROPIUS HOUSE - PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME
A	Quercus borealis	Red Oak
B	Pinus strobus	White Pine
C	Pinus nigra	Austrian Pine
D	Tsuga canadensis	Canadian Hemlock
E	Acer saccharum	Sugar Maple
F	Juniperus virginiana	Red Cedar
G	Cedrus atlantica	Blue Cedar
H	Malus pumila	Apple Tree
I	Cornus kousa	Japanese Dogwood
J	Cornus florida rubra	Pink Flowering Dogwood
K	Cornus florida	Flowering Dogwood
L	Juniperus chinensis Hetzi	Hetz Juniper
M	Juniperus chinensis Pfitzeriana	Pfitzer Juniper
N	Juniperus excelsa	Greek Juniper
O	Pieris japonica	Japanese Andromeda
P	Taxus cuspidata	Japanese Yew
Q	Kalmia latifolia	Mountain Laurel
R	Cotinus coggygria	Smoke Bush
S	Euonymus fortunei radicans	Wintercreeper
T	Malus sargenti	Sargent Crabapple
U	Euonymus europaea	Spindle-Tree
V	Rosa hugonis	Father Hugo's Rose
W	Camp sis radicans	Trumpet Vine
X	Rhus typhina	Staghorn Sumac
Y	Euonymus fortunei vegetus	Bigleaf Wintercreeper
Z	Celastrus scandens	Bittersweet
AA	Yucca filamentosa	Adam's Needle
BB	Acer palmatum atropurpureum	Bloodleaf Japanese Maple
CC	Vitis spp.	Concord Grape
DD	Rhododendron obtusum	Kurume Azalea
EE	Cotoneaster divaricata	Spreading Cotoneaster
FF	Iberis amara	Candy Tuft
GG	Rosa spp.	Rose
HH	Acer pseudoplatanus	Sycamore Maple
II	Acer rubrum	Red Maple
JJ	Chionanthus virginicus	White Fringetree



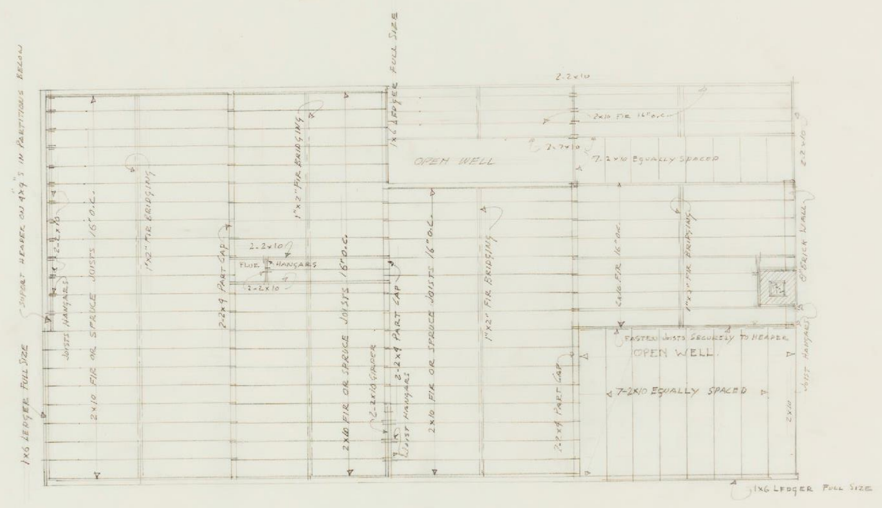
SOUTH (REAR) ELEVATION SCALE 1/4" = 1'-0"



NORTH (FRONT) ELEVATION FRAMING SCALE 1/4" = 1'-0"

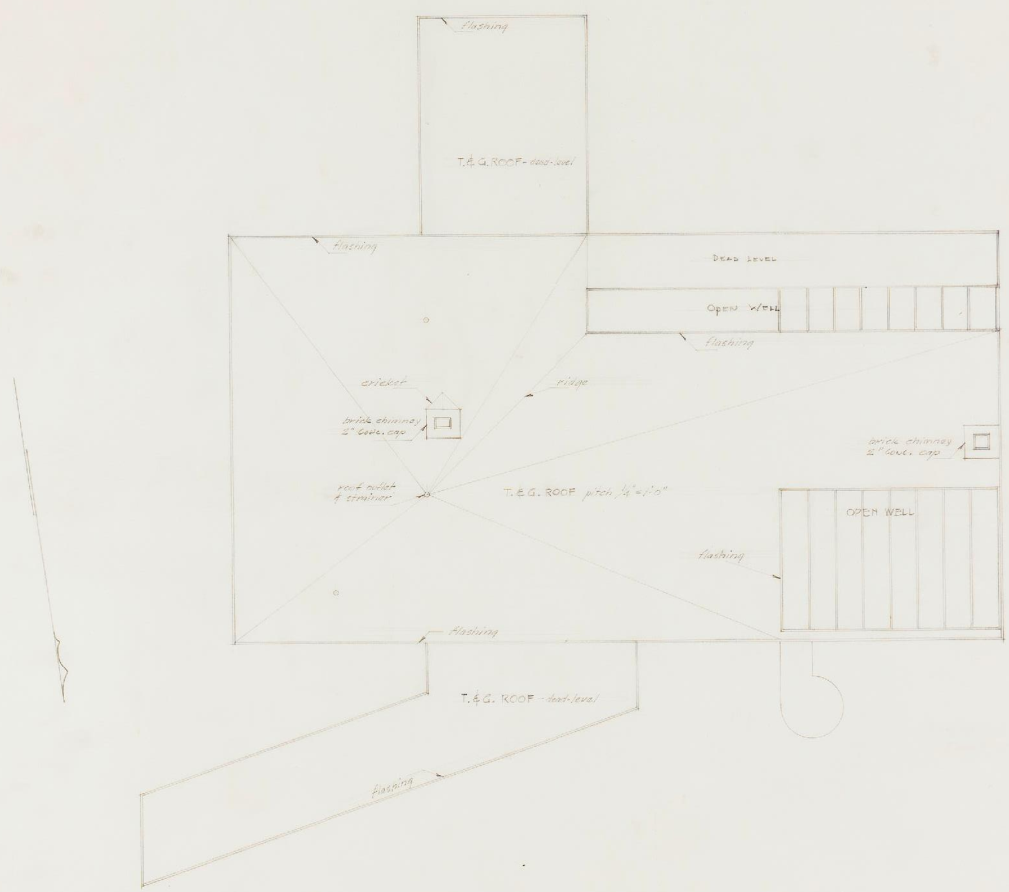
REVISED - MAR. 29, '38

11



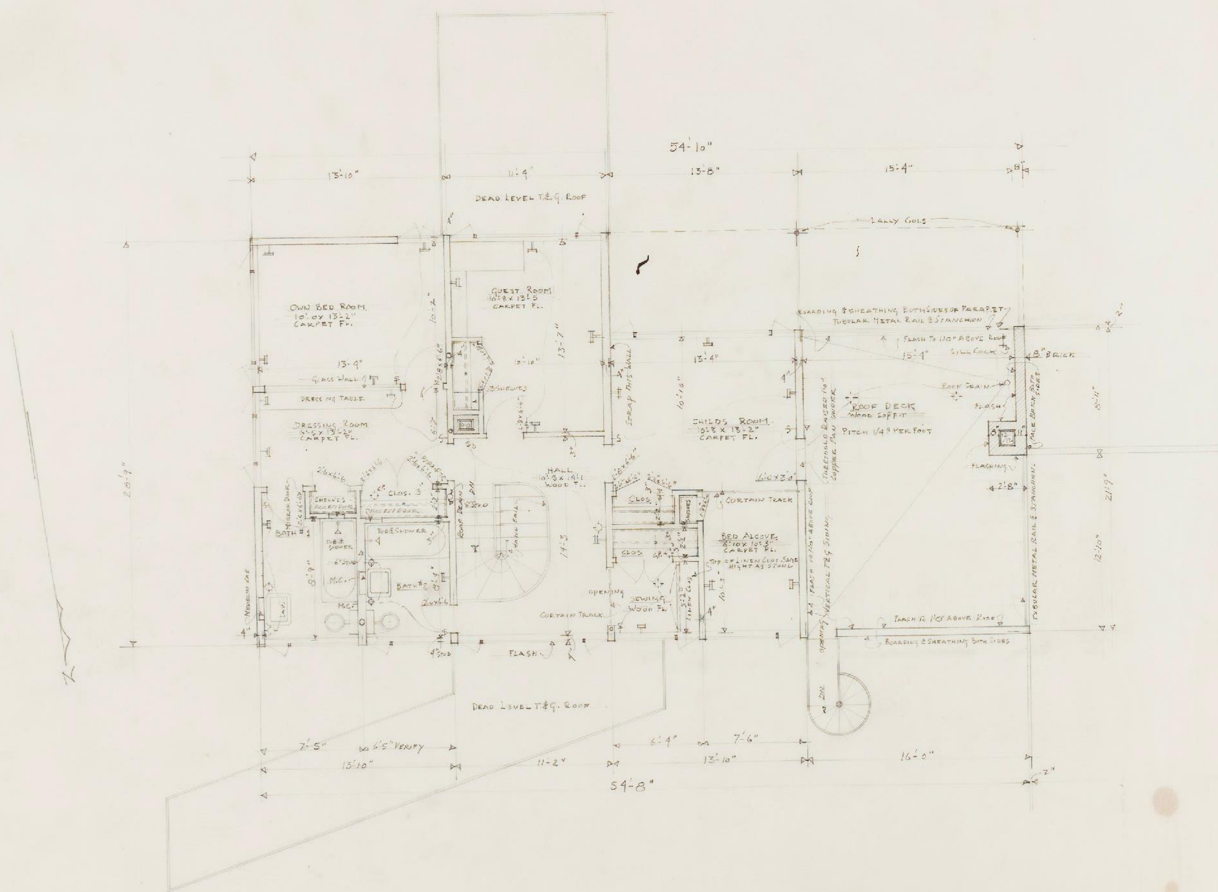
ROOF FRAMING PLAN SCALE 1/4" = 1'0"

10



ROOF PLAN scale 1/4"=1'-0"

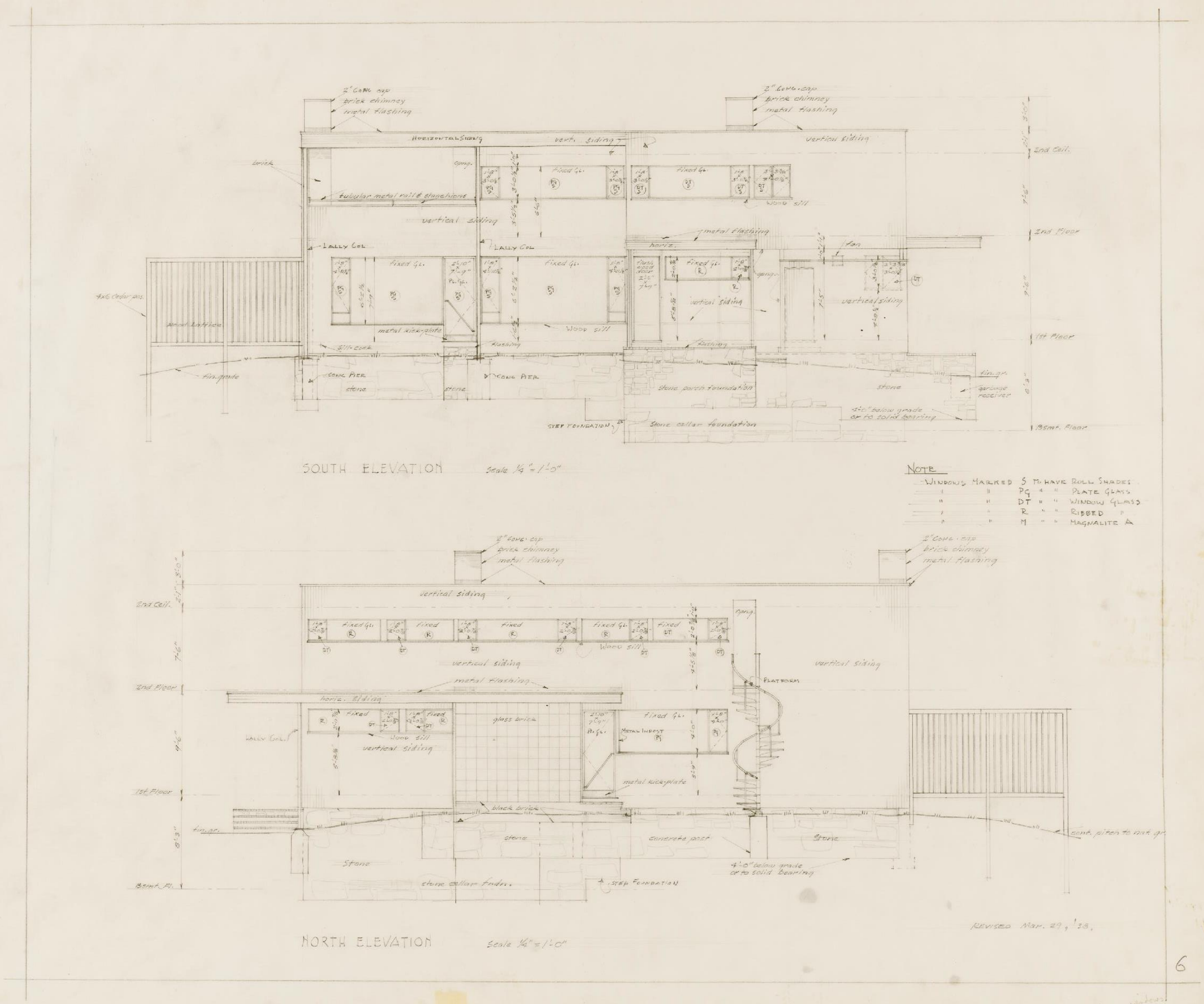
5

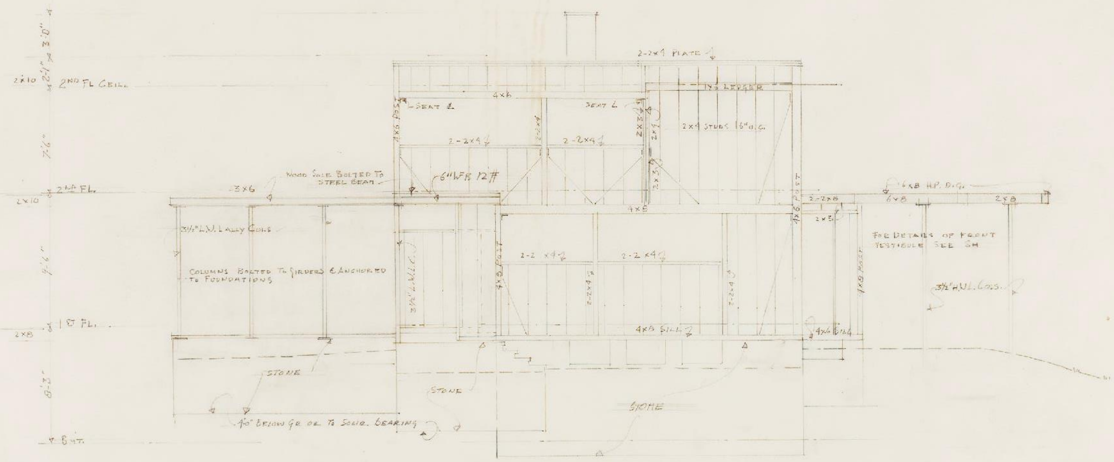


SECOND FLOOR PLAN SCALE 1/4" = 1'0"

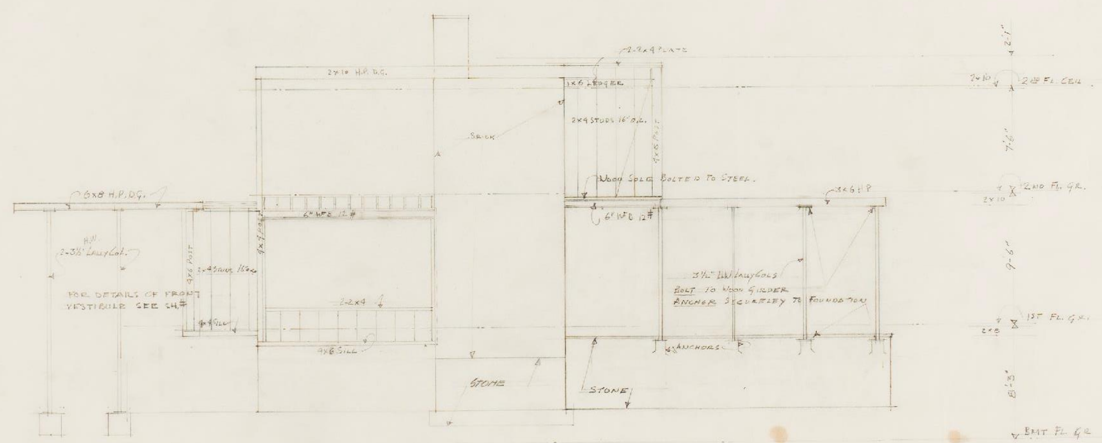
REVISED MAR. 24, '38.

4


2" Conc. cap
brick chimney
metal flashing
Horizontal Siding
vert. siding
vertical siding
2nd Ceil.
2nd Floor
1st Floor
Bsmt. Floor
brick
tubular metal rail & stanchions
Fixed Gl.
Wood sill
metal flashing
Lally Col.
vertical siding
metal kickplate
Flashing
fin. grade
Conc. Pier
stone
Stone porch foundation
Stone cellar foundation
Step foundation
garbage receiver
4'-0" below grade or to solid bearing
SOUTH ELEVATION
Scale 1/4" = 1'-0"
NOTE
WINDOWS MARKED S TO HAVE ROLL SHADES
" " PG " " PLATE GLASS
" " DT " " WINDOW GLASS
" " R " " RIBBED "
" " M " " MAGNALITE A
horiz. siding
glass brick
Metal Inlet
Platform
black brick
concrete post
stone cellar fndn.
NORTH ELEVATION
Scale 1/4" = 1'-0"
REVISED Mar. 29, '38.
6



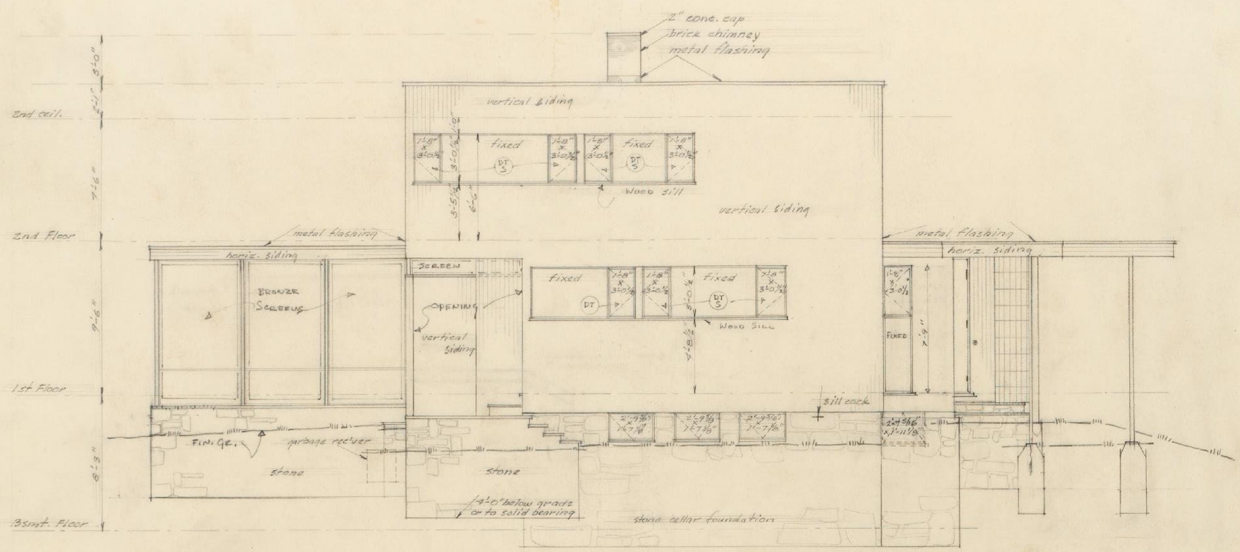
EAST ELEVATION FRAMING SCALE 1/4" = 1'0"



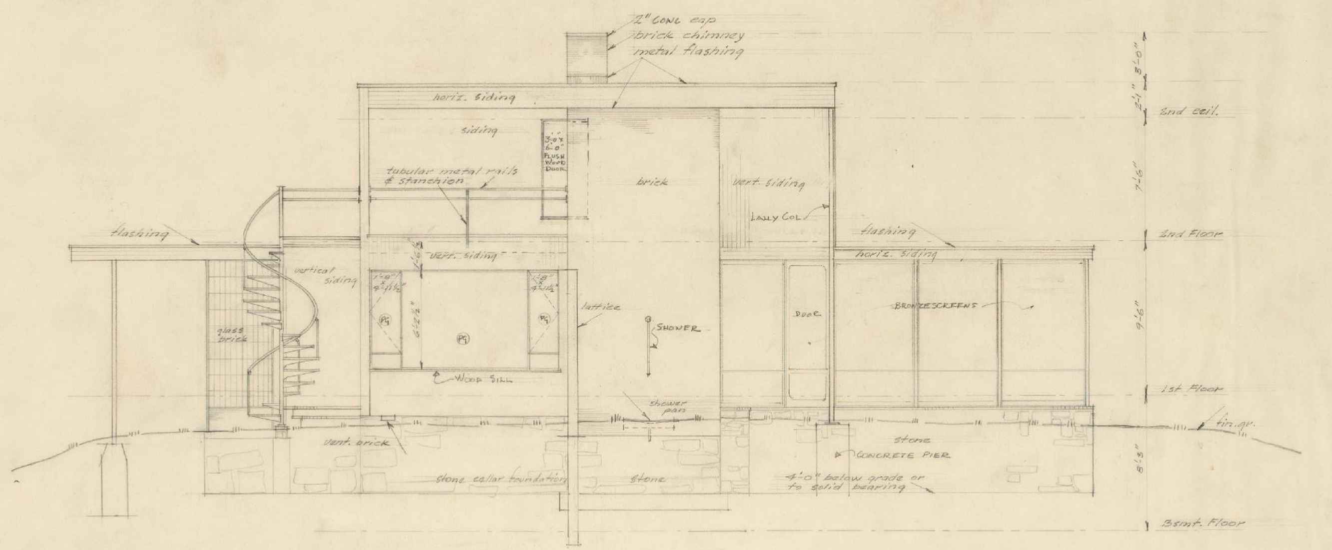
WEST ELEVATION FRAMING SCALE 1/4" = 1'-0"

REVISED - MAR. 29, '38

12

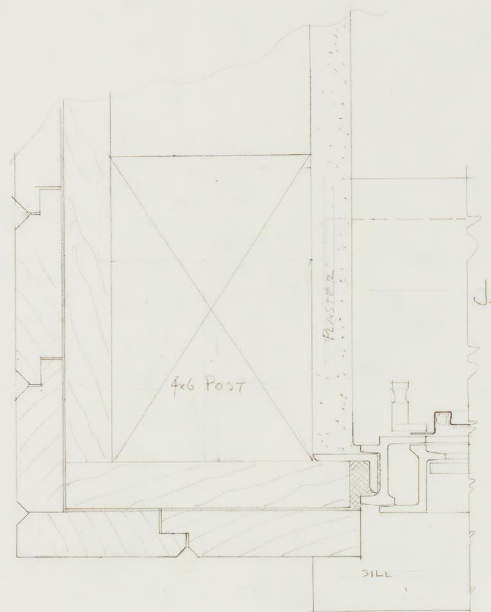


EAST ELEVATION Scale 1/4" = 1'-0"



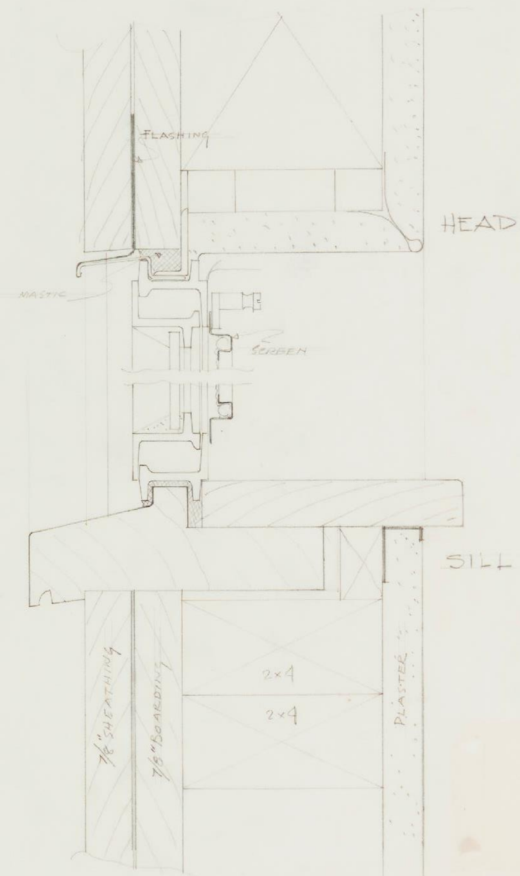
REVISED MAR. 29. '38

WEST ELEVATION Scale 1/4" = 1'-0"



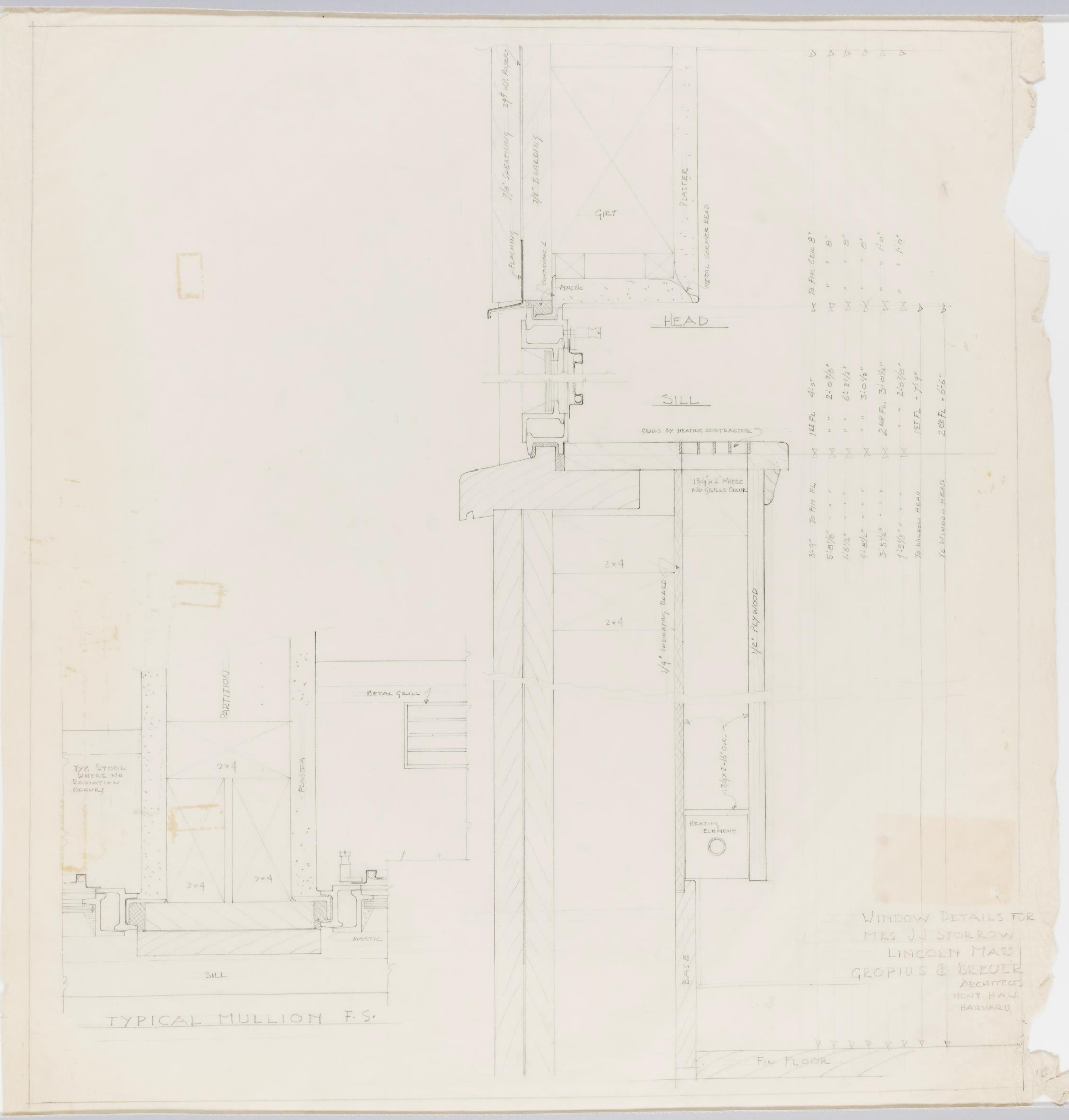
TYPICAL CORNER AT WINDOWS F.S.

GROPIUS & BREUER ARCH.
HUNT HALL HARVARD
DETAILS FOR STORROW HOUSE
LINCOLN MASS

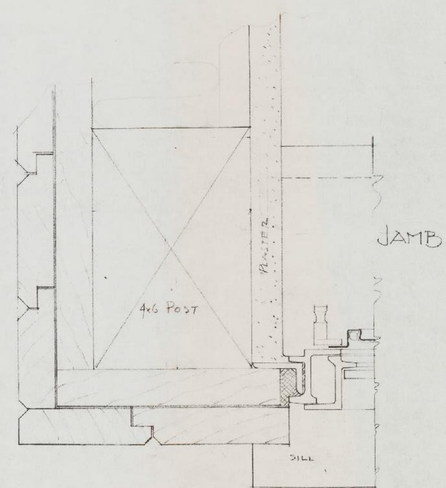


TYPICAL WINDOW DETAIL F.S.

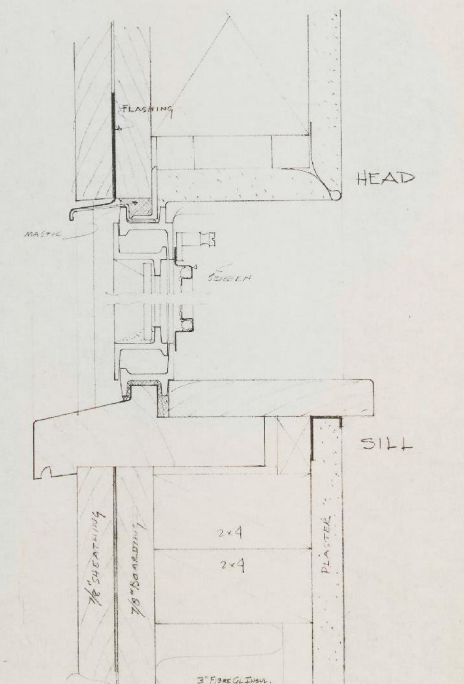
15



WINDOW DETAILS FOR
MRS J J STORROW
LINCOLN MASS
GROPIUS & BREUER
ARCHITECTS
HUNT HALL
HARVARD
HEAD
SILL
GIRT
PLASTER
METAL CORNER BEAD
MASTIC
FLASHING
GRILLS BY HEATING CONTRACTOR
2×4
1/2" INSULATING BOARD
1/2" PLYWOOD
HEATING ELEMENT
BASE
FIN FLOOR
3'-9" TO FIN FL. 1ST FL 4'-0" TO FIN CEIL 8"
5'-8 1/8" 2'-0 7/8" 8"
1'-6 1/2" 6'-2 1/2" 8"
4'-8 1/2" 3'-0 1/2" 8"
3'-5 1/2" 2ND FL. 3'-0 1/2" 1'-0"
4'-5 1/8" 2'-0 7/8" 1'-0"
TO WINDOW HEAD 1ST FL - 7'-9"
TO WINDOW HEAD 2ND FL - 6'-6"
PARTITION
METAL GRILL
TYP. STOOL WHERE NO RADIATION OCCURS
MASTIC
SILL
TYPICAL MULLION F.S.



TYPICAL CORNER AT WINDOWS F.S.

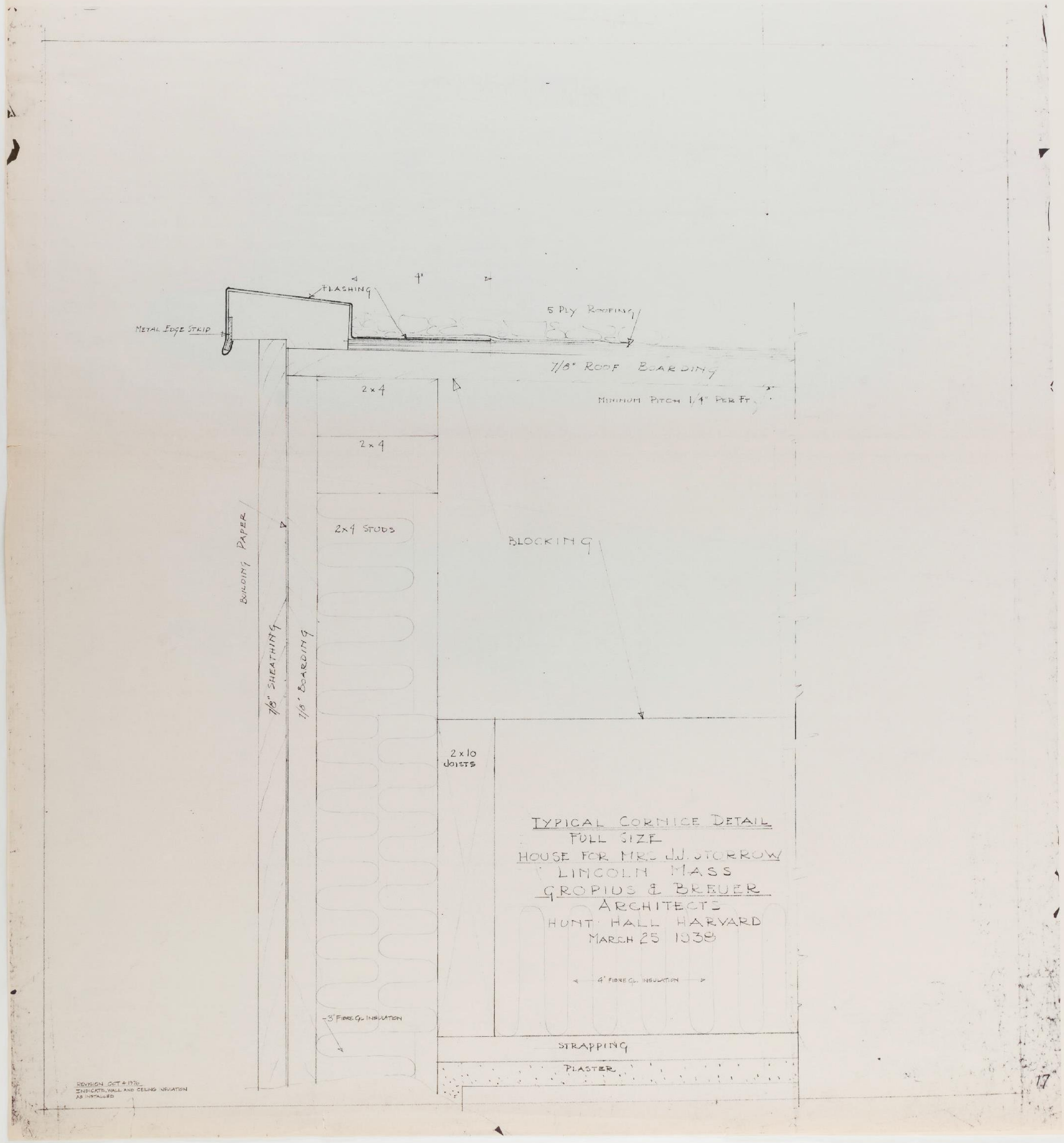


TYPICAL WINDOW DETAIL F.S.

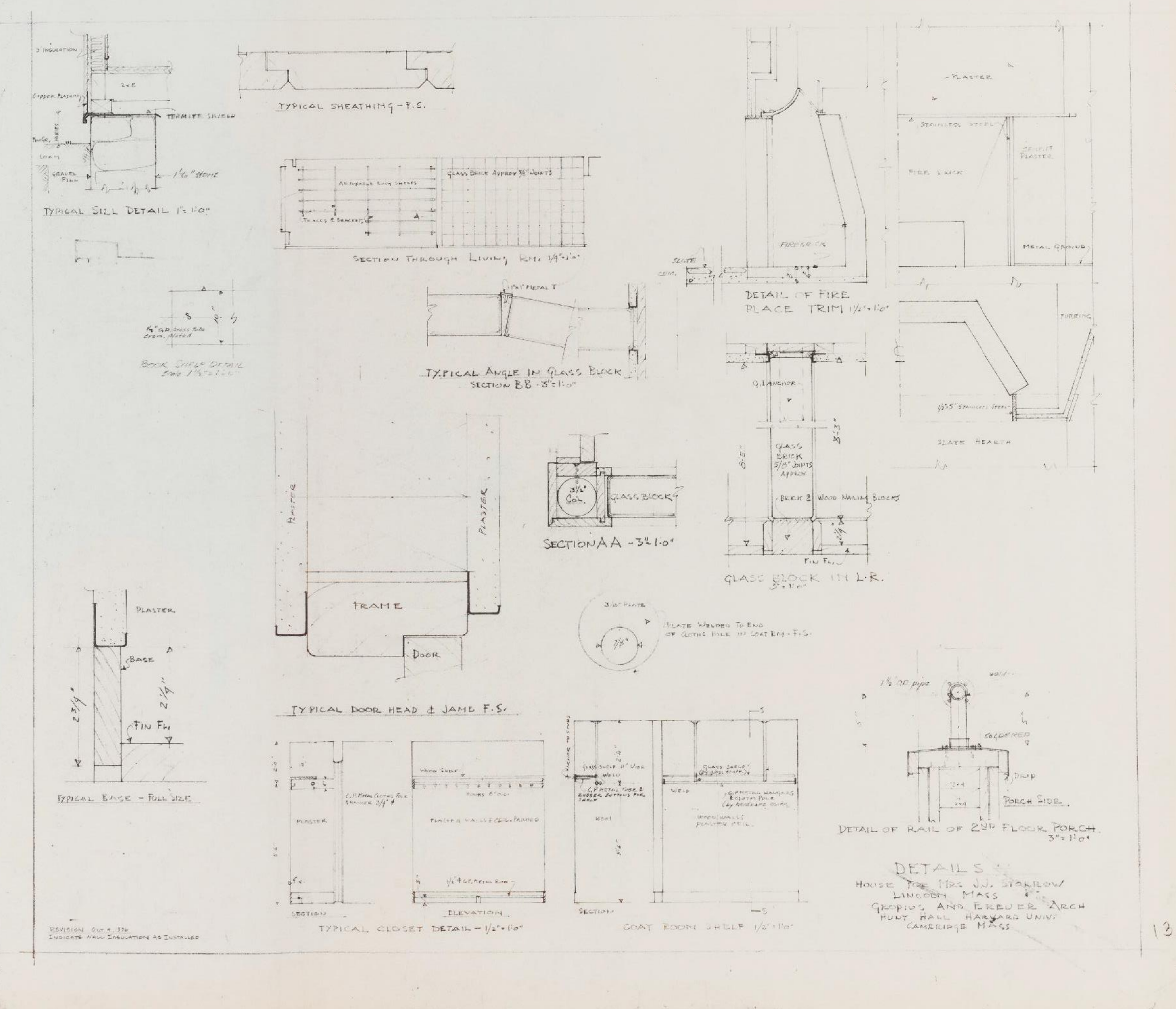
GROPIUS & BREUER ARCH.
HUNT HALL HARVARD
DETAILS FOR STORROW HOUSE
LINCOLN MASS

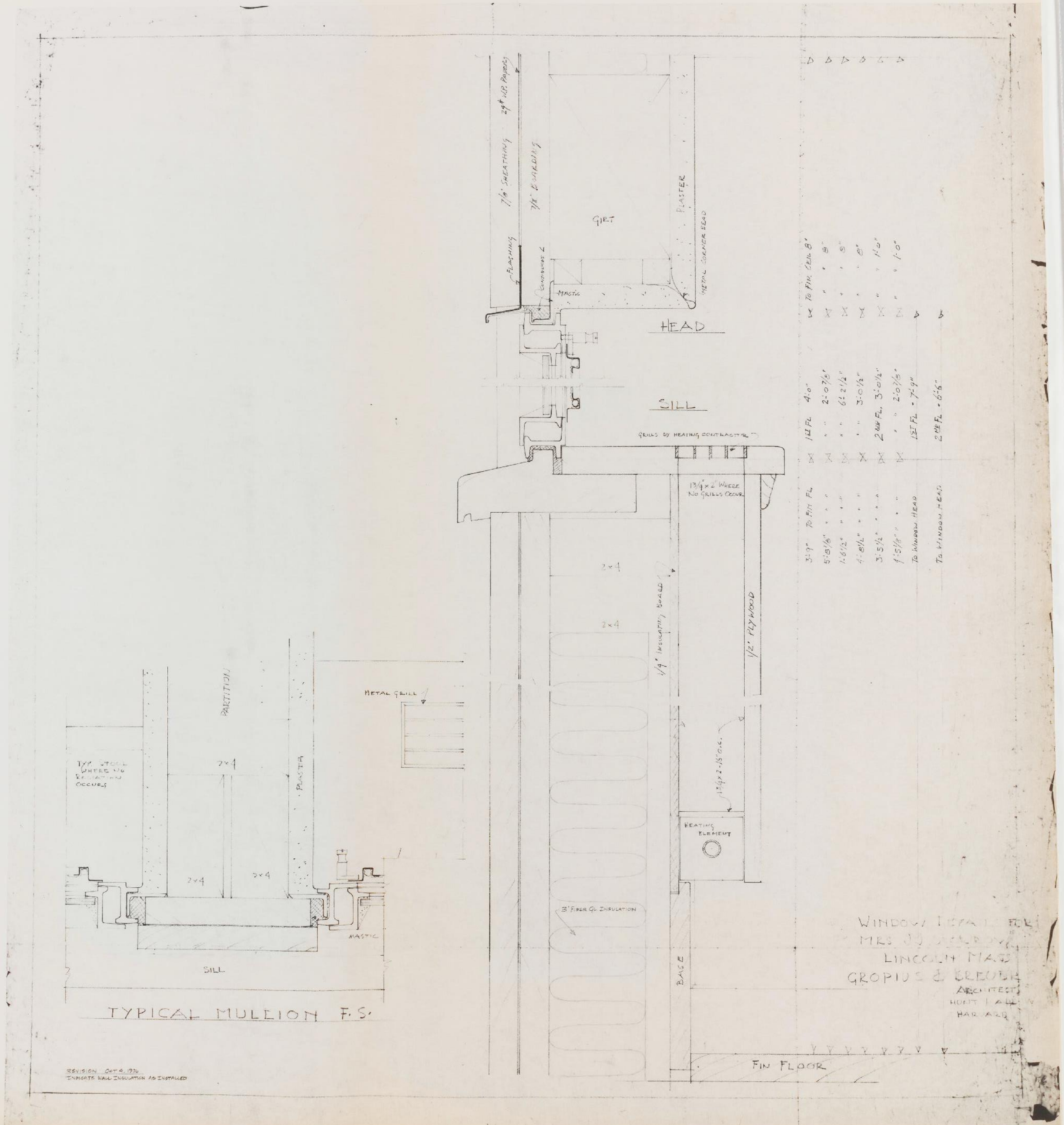
REVISION OCT 4 1976
INDICATE WALL INSULATION AS INSTALLED

15



4"
FLASHING
5 PLY ROOFING
METAL EDGE STRIP
7/8" ROOF BOARDING
2x4
MINIMUM PITCH 1/4" PER FT.
2x4
BUILDING PAPER
2x4 STUDS
BLOCKING
7/8" SHEATHING
7/8" BOARDING
2x10
JOISTS
TYPICAL CORNICE DETAIL
FULL SIZE
HOUSE FOR MRS. J.J. STORROW
LINCOLN MASS
GROPIUS & BREUER
ARCHITECTS
HUNT HALL HARVARD
MARCH 25 1938
4" FIBRE GL. INSULATION
3" FIBRE GL. INSULATION
STRAPPING
PLASTER
REVISION OCT 4 1976
INDICATE. WALL AND CEILING INSULATION
AS INSTALLED
17

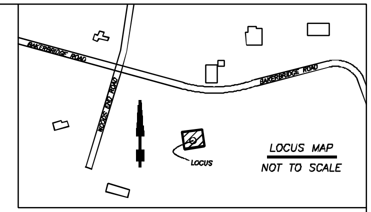

TYPICAL SILL DETAIL 1½"=1'0"
TERMITE SHIELD
TYPICAL SHEATHING - F.S.
SECTION THROUGH LIVING RM. 1/4"=1'0"
GLASS BLOCK APPROX ⅜" JOINTS
BOOK SHELF DETAIL
TYPICAL ANGLE IN GLASS BLOCK
SECTION BB - 3"=1'0"
DETAIL OF FIRE PLACE TRIM 1½"=1'0"
PLASTER
STAINLESS STEEL
FIRE BRICK
METAL GROUND
SLATE HEARTH
GLASS BLOCK IN L.R.
GLASS BRICK
WOOD NAILING BLOCKS
SECTION AA - 3"=1'0"
GLASS BLOCK
PLATE WELDED TO END OF GUTHE POLE IN COAT RM - F.S.
FRAME
DOOR
TYPICAL DOOR HEAD & JAMB F.S.
PLASTER
BASE
FIN FL.
TYPICAL BASE - FULL SIZE
SECTION
ELEVATION
TYPICAL CLOSET DETAIL - 1/2"=1'0"
COAT ROOM SHELF 1/2"=1'0"
DRIP
PORCH SIDE.
DETAIL OF RAIL OF 2ND FLOOR PORCH
3"=1'0"
DETAILS
HOUSE FOR MRS J.J. STORROW
LINCOLN MASS
GROPIUS AND BREUER ARCH
HUNT HALL HARVARD UNIV.
CAMBRIDGE MASS
13

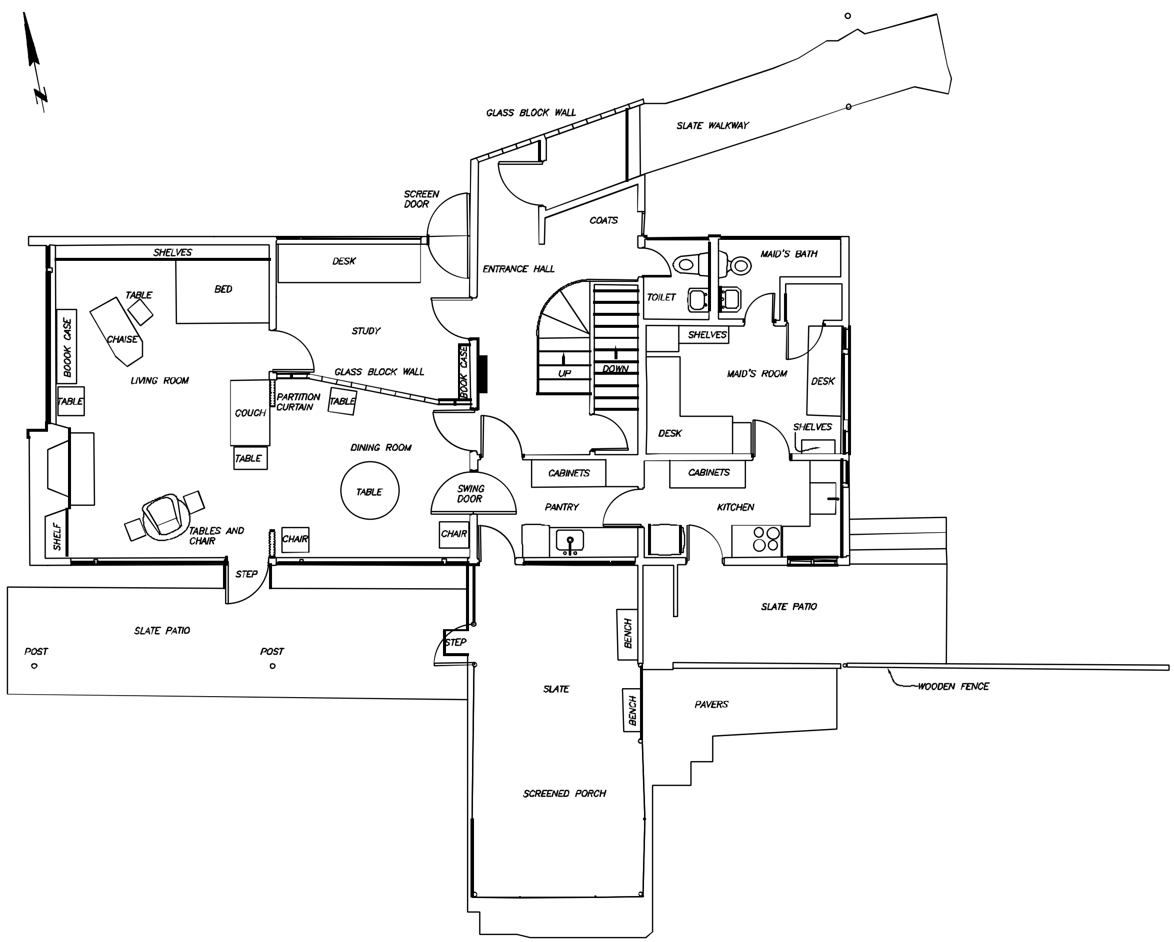


HEAD
SILL
GIRT
PLASTER
METAL CORNER BEAD
MASTIC
FLASHING
7/8" SHEATHING
7/8" BOARDING
GRILLS BY HEATING CONTRACTOR
1/2" PLYWOOD
1/4" INSULATING BOARD
2×4
3" FIBER GL. INSULATION
HEATING ELEMENT
BASE
FIN FLOOR
METAL GRILL
PARTITION
PLASTA
SILL
TYPICAL MULLION F.S.
WINDOW DETAILS FOR
LINCOLN MASS
GROPIUS & BREUER
ARCHITECTS
HARVARD

Additional Resources 03

Existing Conditions Plans, 2016
Feldman Land Surveyors





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

FIRST FLOOR PLAN
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

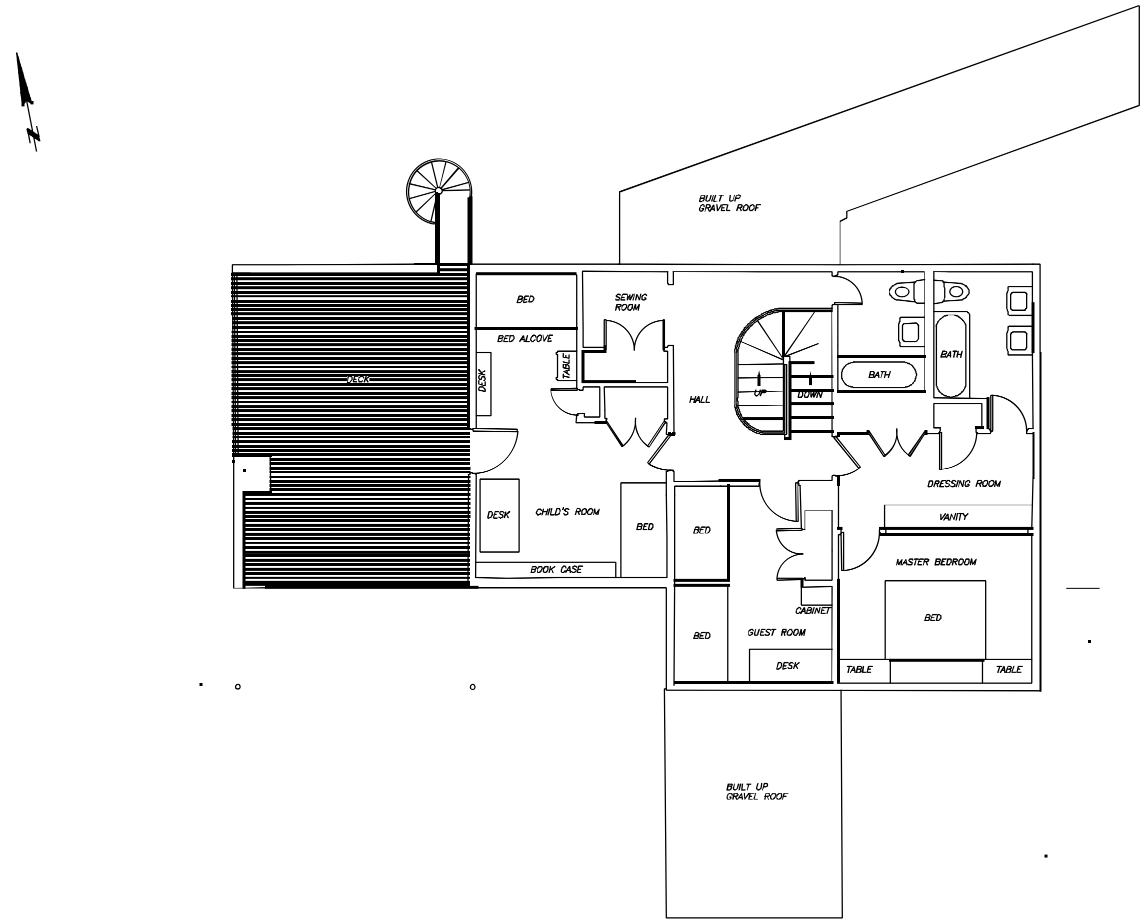
AUGUST 18, 2015

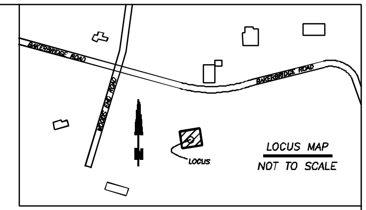
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

SCALE: 1"=4'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 1
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

SECOND FLOOR PLAN
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

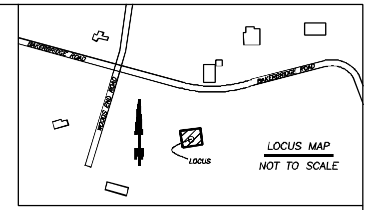
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

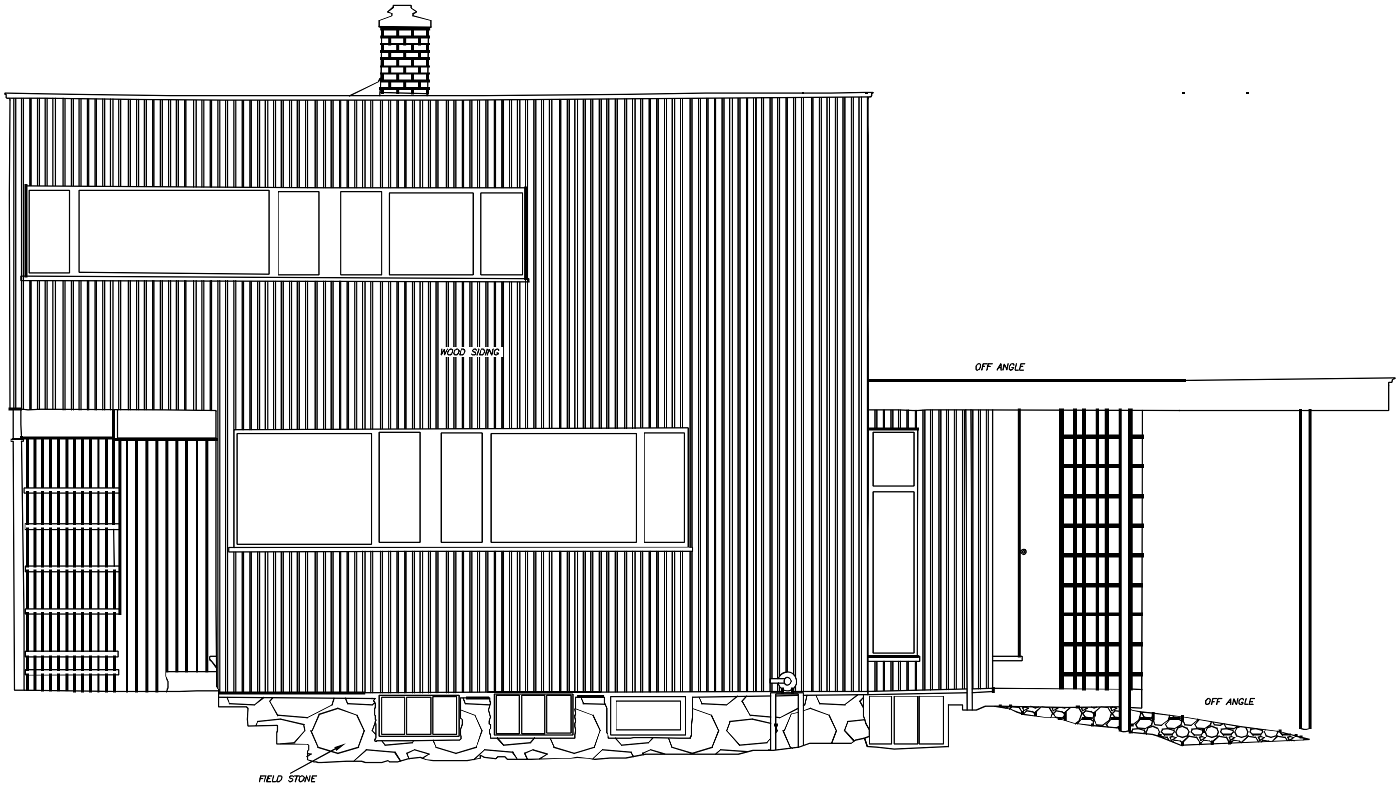
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN
LAND
SURVEYORS

SCALE: 1"=4'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 1
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING EAST EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

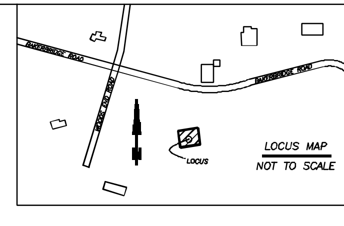
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

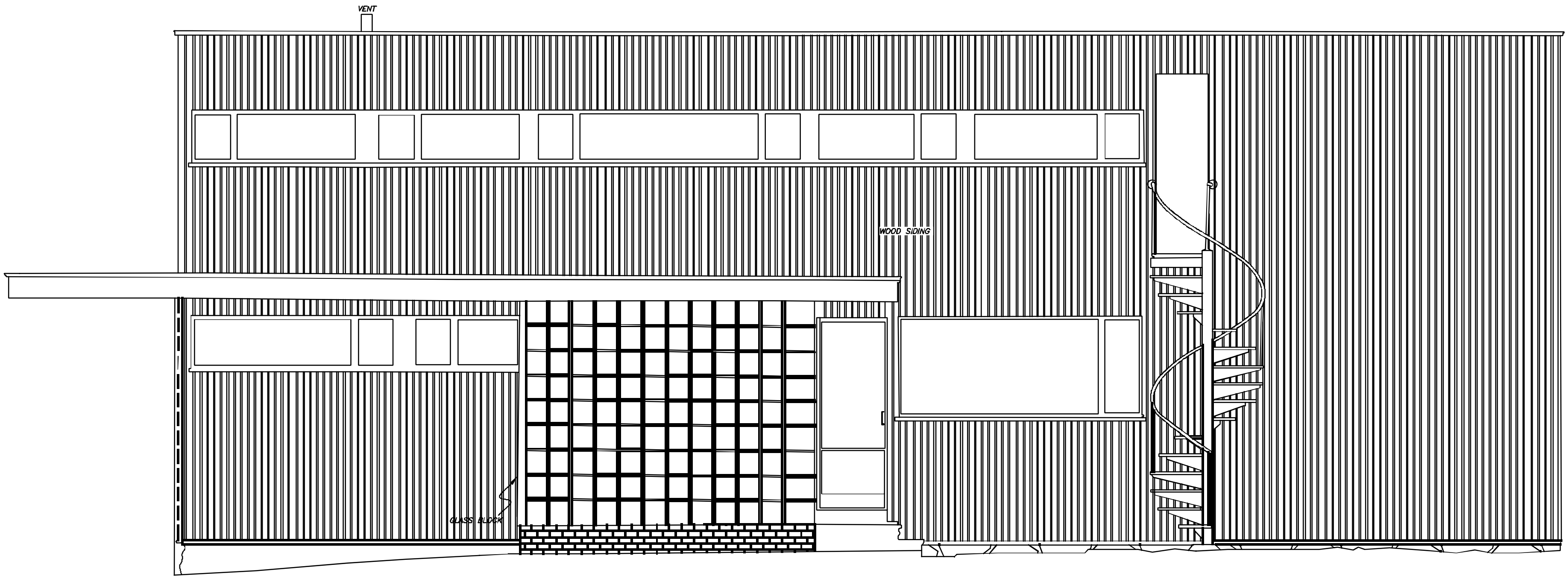
FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 3 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRG Gropius\M&U\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius East





NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING NORTH EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
PHONE: (617)357-9740
www.feldmansurveyors.com

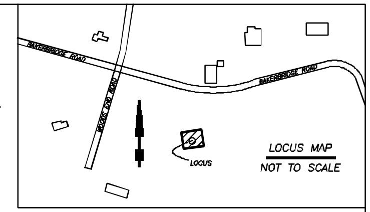
AUGUST 18, 2015

FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\MaU\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius North Ext Elev



NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC® NEW ENGLAND

Defining the past. Shaping the future.

PLAN SHOWING SOUTH EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

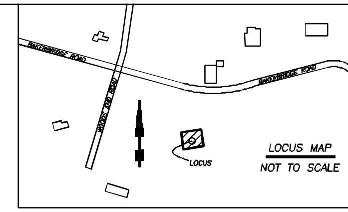
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

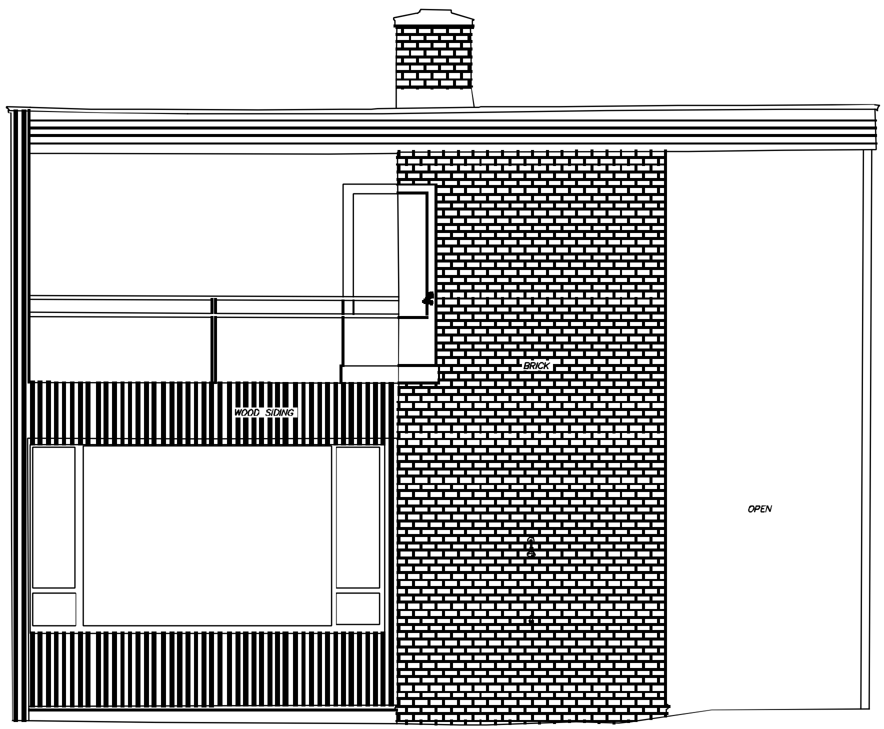
FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 2 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\HAB\2015 Preservation Planning\Scanning\DWG Resubmit 5=27=16\14789 == Gropius South Ext Ele





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING WEST EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

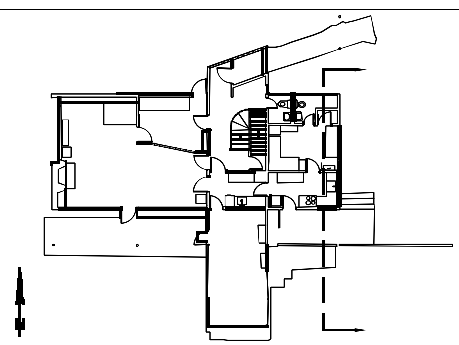
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 4 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789



KEYPLAN
NOT TO SCALE

NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING EAST INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

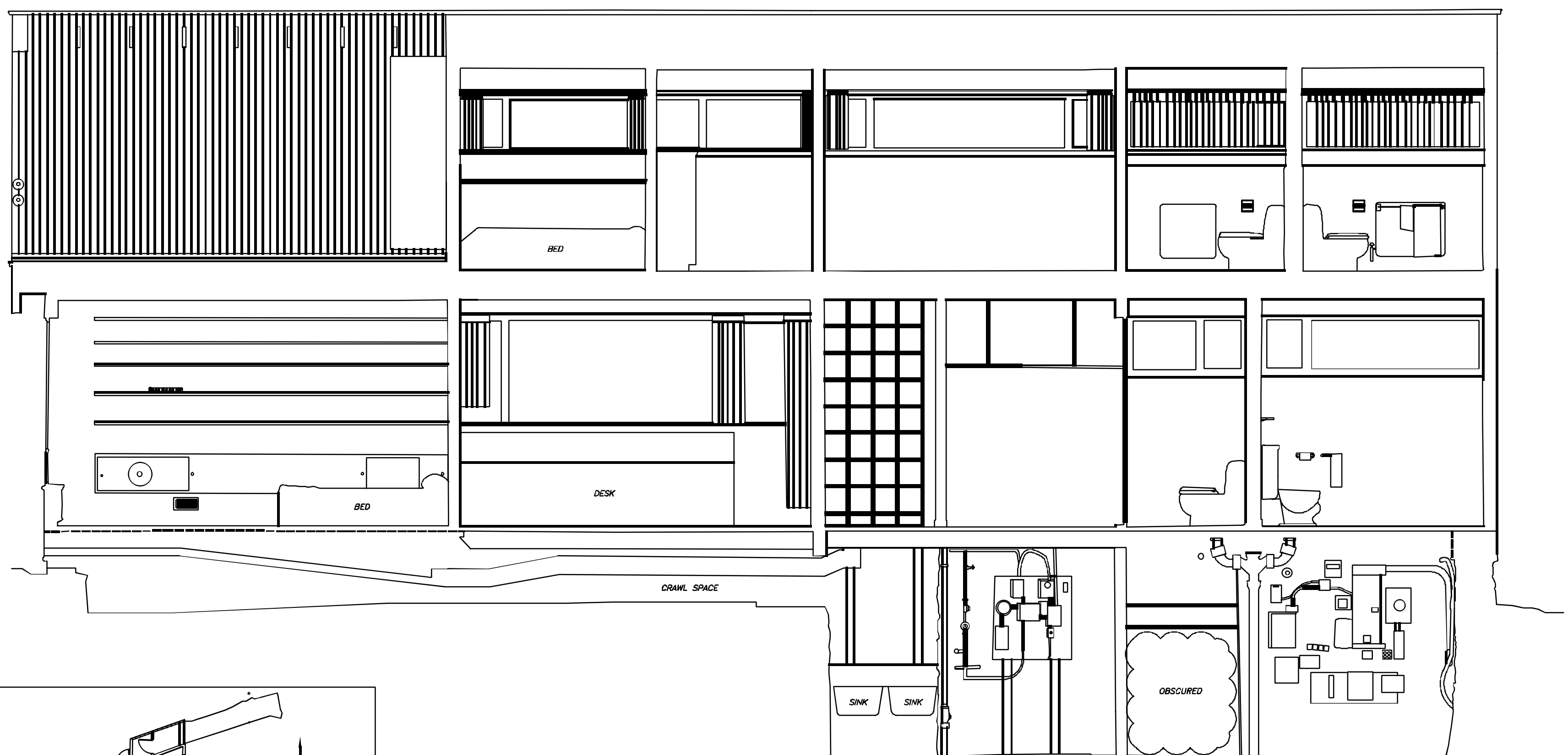
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

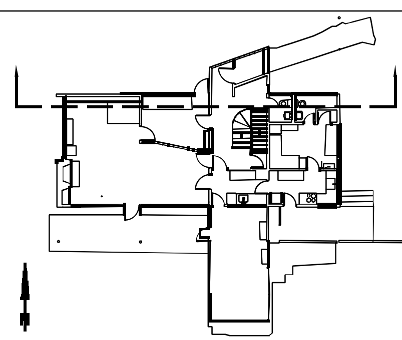
FELDMAN
LAND
SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 3 OF 4
CALC JTG	CADD	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\M&U\2015 Preservation Planning\Scanning\DWG Resubmit 8m27m16\14789 = Gropius Interior Elevation





KEYPLAN
NOT TO SCALE

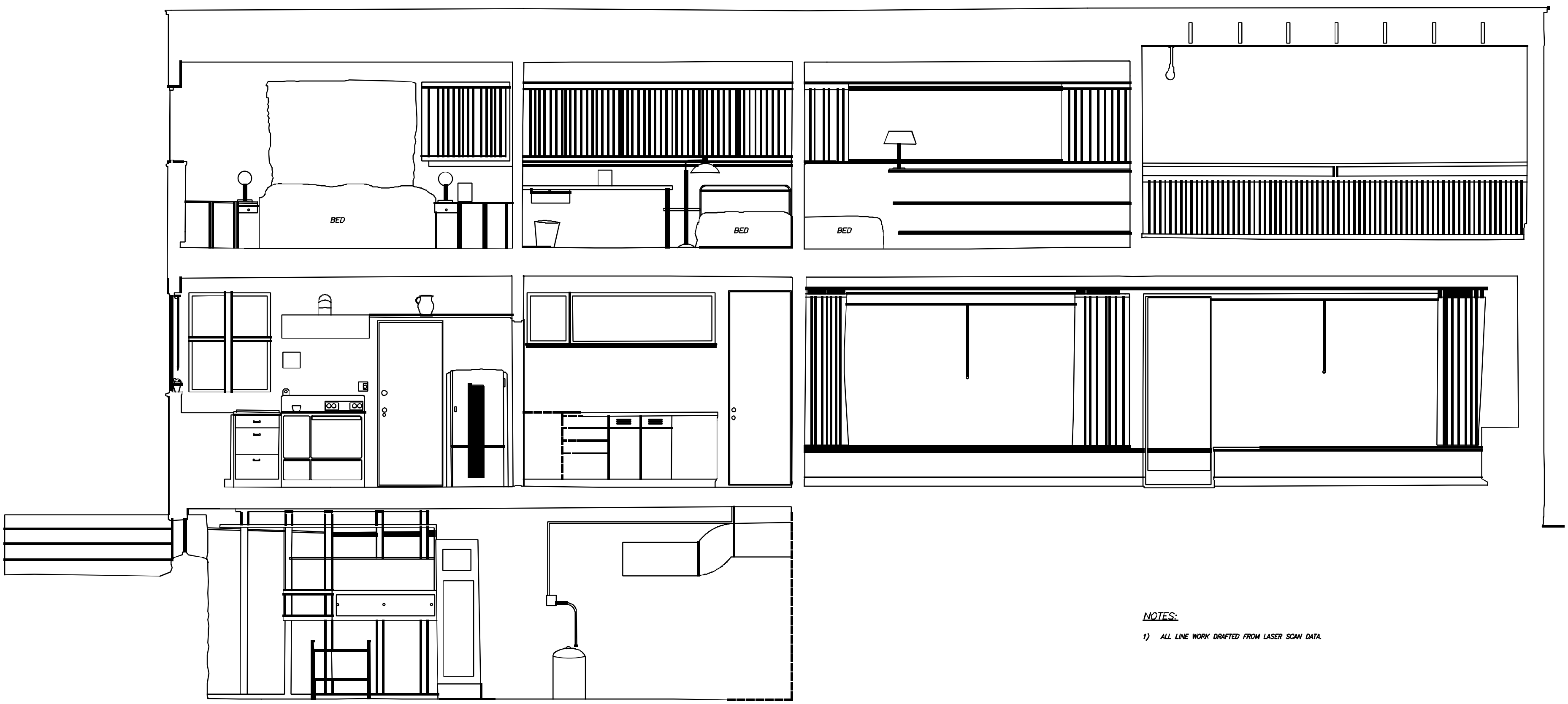
HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING NORTH INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com
FELDMAN LAND SURVEYORS

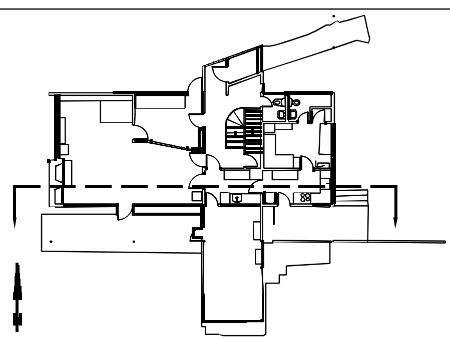
SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SWW	APPROVED	SHEET NO. 1 OF 4
CALC JTG	CADD JTC	FIELD CHECKED	CRD FILE	JOB NO. 14789



NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.



KEYPLAN
NOT TO SCALE

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING SOUTH INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

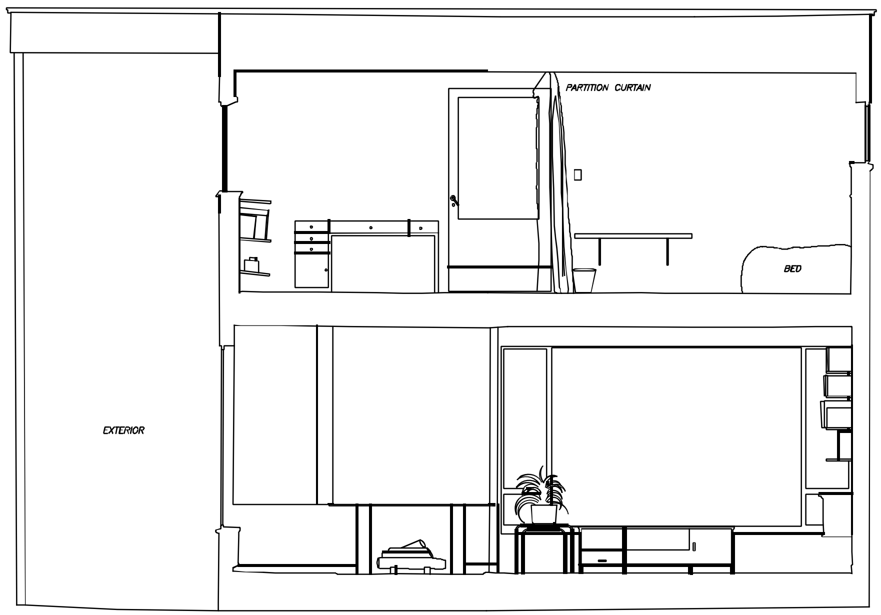
FELDMAN LAND SURVEYORS

2 0 1 2 4 8

SCALE: 1"=2'

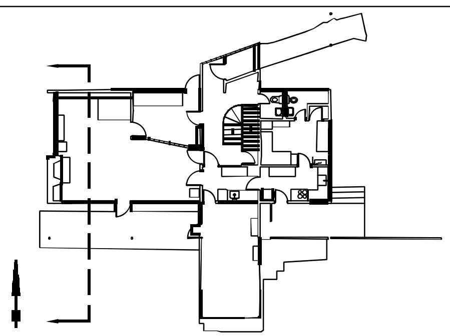
RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 2 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\ORG Gropius\M&E\2015 Preservation Planning\Scanning\ORG Resubmit 3-EX-PB\14789 — Gropius Interior elevation



NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.



KEYPLAN
NOT TO SCALE

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING WEST INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 4 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

Additional Resources 04

Historic Designations

Includes

- National Register of Historic Places Registration Form, Woods End Road Historic District, 1988
- National Historic Landmark Registration Form, Gropius House, 2001

NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Woods End Road Historic District

other names/site number

2. Location

street & number 68 Baker Bridge Road; 1, 5, 9, & 10 Woods End Road [N/A] not for publication

city, town Lincoln [N/A] vicinity

state Massachusetts code 025 county Middlesex code 017 zip code 01773

3. Classification

Ownership of Property
- [X] private
- [ ] public-local
- [ ] public-State
- [ ] public-Federal

Category of Property
- [ ] building(s)
- [X] district
- [ ] site
- [ ] structure
- [ ] object

Number of Resources within Property

Contributing	Noncontributing	
7		buildings
		sites
		structures
		objects
7	0	Total

Name of related multiple property listing:
N/A

Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this [X] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [X] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Valerie A. Talmage
Signature of certifying official

5/23/88
Date

Executive Director, Massachusetts Historical Commission;
State or Federal agency and bureau State Historic Preservation Officer

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Signature of commenting or other official

Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

- [ ] entered in the National Register.
  - [ ] See continuation sheet.
- [ ] determined eligible for the National Register. [ ] See continuation sheet.
- [ ] determined not eligible for the National Register.
- [ ] removed from the National Register.
- [ ] other, (explain:)

Signature of the Keeper

Date of Action

6. Function or Use Woods End Road Historic District, Lincoln, Massachusetts

Historic Functions (enter categories from instructions)

Domestic/single dwelling
Domestic/secondary structure

Current Functions (enter categories from instructions)

Domestic/single dwelling
Domestic/secondary structure
Recreation and Culture/museum

7. Description

Architectural Classification
(enter categories from instructions)

International Style
Federal Revival

Materials (enter categories from instructions)

foundation concrete
walls wood
shingle
roof tar and gravel
other stone

Describe present and historic physical appearance.

The Woods End Road Historic District is a residential development of seventeen acres located south of Baker Bridge Road in Lincoln, between Sandy Pond and the historic town center of Lincoln to the east, and Walden Pond in the town of Concord to the northwest. Baker Bridge Road is a winding, quasi-rural segment of a secondary artery transfering central Lincoln from Waltham to Concord. Situated in the remains of an apple and cherry orchard, the Woods End Road district extends from a low hill on the east to a ledge on the west, both of which slope toward Baker Bridge Road, the district's northern boundary. Five lots border Woods End Road, a cul-de-sac laid out in 1938 along a natural drainage point between hill and ledge. The higher elevation and a change in plant cover distinguish the district from its surroundings. Woods cover the outer slopes immediately adjacent to the district. Outlying lower areas consist primarily of woods and an orchard to the east, and wooded marsh to the south and west. A later residential development lies on lower land in a wooded setting across Baker Bridge Road.

The district represents the transformation of Lincoln farmland into residential use with the breaking up of several large estates beginning in the 1920s. Particularly prevalent along radial roads from Lincoln Center, clusters of wood-frame houses were constructed in formerly open meadows and wooded marshes. Conservation measures and zoning have ensured a balance between developed and open space.

The district contains seven buildings (five houses, two detached garages), all of which contribute to its architectural and historical integrity. All buildings were constructed in 1938 and 1939 and are compatible in size, scale, and materials. The district contains two types of houses. Four houses designed in the International Style are two stories in height and have flat roofs, vertical board siding, and asymmetrical plans and elevations. The fifth house, a measured copy of a Federal style house in Yarmouthport (Cape Cod), Massachusetts, is 2 1/2 stories in height with a gable roof and wood shingled exterior. Each house is architect designed. Most notable are three houses designed by Walter Gropius and Marcel Breuer during their first years in the United States. Three of the five houses were also designed to serve as the private homes of their respective architects.

[X] See continuation sheet

The houses occupy generous settings, with individual lots defined primarily by the sloping terrain and trees. Additions to contributing buildings generally consist of expanded living spaces in two of the houses; these additions do not significantly diminish the integrity of the district. All houses remain occupied; four are private homes and the fifth is maintained as a house museum.

The Gropius House (Lot #56:12 and 56:12.01, MHC #14, Photo #1) occupies a level area created at the top of the district's eastern hill. Designed by Walter Gropius and Marcel Breuer, Associated Architects and built by Casper Jenney, Jr. in 1938, the wood-frame house is two stories in height with a stone foundation, vertical redwood siding, and a flat tar and gravel roof. Ribbon windows on the north, east, and south elevations consist of fixed plate glass alternating with steel casement sash. All windows have wood sills. A chimney on the west elevation is brick laid in Flemish bond. The essentially rectangular massing of the house is broken by two projecting elements. On the primary (north) elevation, a one-story, flat-roofed entrance marquee supported by a glass block wall and metal columns abuts the wall surface at approximately a thirty degree angle. On the south elevation, a one-story screened porch with a flat roof projects at a right angle from the dining room. A metal spiral stair on the north elevation provides exterior access to the sun deck and an upstairs bedroom. The exposed roof joists over the sun deck run north to south and serve as brise-soleils, mitigating the intensity of the high summer sun while admitting light and heat from the low winter sun. The joist overhang the south elevation to shield the large plate glass windows of the living room in the same manner. The Gropius House incorporates only standard (stock) materials-- glass block, steel sash, doors and door hardware, interior fixtures-- readily available through building supply catalogues at the time of its construction. The chimney and other details such as the wood sills are painted grey in contrast to the white exterior walls. Although the house is asymmetrical in both elevation and plan, the use of a central hall is key to the interior arrangement of rooms. The Gropius House was carefully positioned on its site in order to maximize natural light and views, and all primary first floor rooms and second floor bedrooms have a southern exposure.

A one-story, wood-frame, two-car garage (1938) with a shed roof is located northeast of the house, at the base of the hill just inside the entrance from Baker Bridge Road. A gravel driveway leads from the garage to the house about one hundred feet up the hill. As the hill was nearly bare when house construction began, the Gropiuses subsequently planted trees, a lawn, and a small garden beyond the south porch. Natural features-- large boulders uncovered on the slopes of the hill and remnants of the orchard-- were preserved. A grove of trees on the south slope of the hill separates the Gropius House from the neighboring Ford House. The Gropius House is clearly

continued

visible from both Baker Bridge and Woods End Roads.

Across Woods End Road from the Gropius House and on the western ledge is the Loud House (Lot #56:15, MHC #122, Photo #2), the sole revival-style house built in the historic district. A measured copy of a ca. 1800 Federal period house on Cape Cod (76 Hallet Street, Yarmouthport, MHC #270, Northside Historic District), the Loud House was designed in September 1938 by local architect Constance Mumford Warren and built by Langille Brothers of Lincoln. The wood-frame house is 2 1/2 stories with an asphalt shingle gable roof and a brick center chimney. Cladding is grey wood shingles. Spacing among bays on the five-bay facade facing Woods End Road is slightly irregular as on the Cape Cod model. The entrance consists of a six-panel wood door and a semi-circular fanlight, flanked by pilasters, and topped with a pedimented door hood. Double-hung, 12/12 wood sash constitutes the predominant fenestration scheme. Constructed ca. 1945 on the north elevation is a 1 1/2 story, wood-frame, gable roof addition containing a two-car garage and an accessory apartment above. The addition is compatible with the house in size, scale, and materials. The plan of the Loud House is not a rigid interpretation of the Federal style. Decorative molding and the mantle in the living room, however, are measured copies of details found in the Yellow Room at the Concord Antiquarian Society museum; these details are adaptations of woodwork found in a ca. 1790 house in Charlestown, near Boston. Like its earliest neighbor, the Gropius House, the Loud House is visible from Baker Bridge Road, and its frontage on Woods End Road consists primarily of open space.

Southwest of the Gropius House, at the foot of the hill where the old apple orchard merges with the woods, is the Ford House (Lot #62:3, MHC #124, Photo #3), designed by Walter Gropius and Marcel Breuer, Associated Architects and built between June and September, 1939. Occupying the southernmost parcel of the Woods End Road Historic District, the wood-frame house is two stories in height with a concrete block foundation, vertical tongue-and-groove siding, and a flat tar and gravel roof. Originally white, the exterior siding is now painted a light grey. Metal casement sash and fixed glass form ribbon windows on the north and south elevations. A two-story projecting stairtower sheathed with vertical siding dominates the north elevation, and includes an opening for the house's main entrance at the base of its western wall. The only element on the west elevation facing Woods End Road is a projecting brick chimney; there are no windows to break up the wall surface on this elevation. On the south elevation, sun screens of redwood boards similar to those on the Gropius House shade a flagstone terrace outside the living room at the first floor level, and run the length of the elevation to shade all second floor windows. The house plan was designed to give primary living spaces on both floors a southern exposure, while secondary spaces-- corridors

continued

bathrooms, and stairhall-- were relegated to the northern side of the house. The original massing of the Ford House was changed with additions to the eastern end in the 1950s or 1960s. The original maid's room and bath were enlarged to accommodate a new kitchen. Casement windows in the former kitchen on the south elevation were replaced with sliding glass doors when that room became the dining room (see photo). Finally, a one-story, wood-frame addition with a flat roof, containing a single eleven foot by sixteen foot room, was constructed to connect the new kitchen with a new garage northeast of the house. The second floor remains substantially as built. These additions do not compromise the building's integrity to a significant degree.

A low granite wall constructed south of the house delineates the terrace of the Ford House while blending with the natural features of the landscape beyond. A small pond to the southeast was created upon the discovery of a spring in the 1950s. While an integral part of the house's surroundings, the pond was not present during the period of significance. Larch and japanese cherry trees, as well as azaleas, have been planted on the property over the years. The driveway approach to the house from the northwest is lined with shrubs. The house has views of the orchard to the north and a distant wooded ledge to the south.

The third house in the Woods End Road Historic District designed by the firm of Gropius and Breuer is the Breuer House (1939, Lot #56:14, MHC #123, Photo #4). Situated south of the Loud House on the ledge, Breuer's house is two stories, wood-frame, with vertical tongue-and-groove redwood siding and a flat tar and gravel roof. Ribbon windows of alternating fixed and casement sash are on the east and south elevations. A glass curtain wall constitutes the window on the south wall of the double-height living room. Wood, glass, and stone come together in the living room, where the fireplace is incorporated into the curved west wall constructed of fieldstone. Generally, building materials, hardware, and fixtures for the Breuer House were the same stock items Gropius and Breuer used in their two other Woods End House designs. Conceived as a bachelor's residence, the Breuer House has three main parts: a one-story screened porch on the western end, the double-height living room in the middle, and a two-story stack at the eastern end containing the dining room, kitchen, maid's room, baths, and bedrooms. The main entrance is located near the northeastern corner of the house and faces Woods End Road. Subsequent owners with families constructed two additions in the late 1960s and the 1970s: a one-story wing off the dining room on the east elevation and a two-story block on the north elevation. Both additions are wood-frame on concrete foundations with flat roofs. While the additions are not entirely in keeping with the architects' original scheme, the house's tripartite massing is still readily distinguished, particularly on the south elevation. A one-story, wood-frame, two-car garage (ca. 1939, Photo #4) is north of the Breuer House. The house, which is surrounded by open space and screened from adjacent lots by pine trees, has views over the wooded area to the west.

continued

South of the Breuer House is the Bogner House (Lot #56:13, MHC #125, Photo #5) designed by Walter F. Bogner for his family. The two-story house, which was built as a research problem and served as a model for the architect's later work in pre-fabrication, has a balloon frame on a modular basis. Vertical fir boarding is the exterior cladding, and Bogner maintained a natural wood finish by applying a preservative rather that painting the walls white as on the three other International Style houses in the district. The Bogner House has a flat tar and gravel roof and a chimney unobtrusively incorporated into a fieldstone wall that intersects the east elevation at a right angle. Most windows are steel casement sash of fixed plate glass. The north elevation, only 200 feet from the Breuer House, is nearly devoid of windows, with a single pair of casement windows in the kitchen. The essentially rectangular plan of the house includes a sun deck on the second floor, southwest corner, over the living room. The deck is topped with a grid of exposed joists. A continuous roof overhang on the south and west elevations shades the windows below from the high summer sun. On the main (east) elevation, a flat-roofed canopy supported by metal columns shields the approach to the entrance. The curvature of the northern end of this canopy, which also serves as the roof on the adjacent attached garage, follows the line of the approaching driveway. The only change in the house's exterior appearance since it construction in 1939 is a one-story frame addition to the garage that Bogner added in 1959.

Like the other International Style houses in the Woods End Road Historic District, the Bogner House is oriented for privacy, natural light, the best views, and integration with the landscape. The house is situated with views of the wooded slopes immediately west and south. A short fieldstone wall extends the line of the chimney wall and separates the entrance forecourt from the south garden. A wood trellis for wisteria is attached to the southeast corner of the house beyond the fieldstone wall.

Archaeology Description

While no prehistoric sites are currently recorded on the property, it is highly likely that sites are present. At least three sites have been reported in the general area (within one mile). The physical characteristics of the property, well-drained terraces nearly surrounded by wetlands and streams, would have made this an attractive area for native settlements and subsistence activities. Given the limited amount of historical development in this area and the fact that the natural features of the landscape were preserved during housing construction, it is highly probable that sites are present.

continued

There is also a potential for significant historical remains on the property. Background research, controlled testing, and excavation may help to determine whether or not remnants of agriculturally related remains exist on the property, which contained apple and cherry orchards at the time of house construction.

8. Statement of Significance Woods End Road Historic District, Lincoln, Massachusetts

Certifying official has considered the significance of this property in relation to other properties:

☐ nationally ☒ statewide ☒ locally

Applicable National Register Criteria ☐ A ☒ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☒ G

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
Architecture	1938-1945	
Community Planning and Development		
Social History		

Cultural Affiliation
N/A

Significant Person
Walter Gropius

Architect/Builder
Walter Gropius and Marcel Breuer, Associated Architects

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Woods End Road Historic District, Lincoln, Massachusetts, is a residential enclave of seven buildings surrounding a cul-de-sac on a partially wooded, hilly site. All buildings contribute to the integrity of the district. The district's architect-designed houses illustrate various solutions to the problem of designing a contemporary home in the late 1930s-- a time of stylistic transition in American residential architecture-- yet each house's exterior design displays an affinity with the New England tradition. Helen Osborne Storrow, whose humanitarian gestures and philanthropic activities were recognized throughout the greater Boston area in the early decades of the 20th century, funded the creation of the Woods End Road enclave, and retained ownership of all properties in the district until her death. Dominated by Harvard University professors deeply interested in architecture, planning, and social issues, the Woods End Road tenant community was the precedent for later cooperative communities of architect-designed houses in a neighboring town. Widely published in popular publications and professional journals, the Woods End Road houses are important for their contribution to a redefinition of the American House type by the mid-20th century. The district is of exceptional significance architecturally, containing three of the earliest houses designed in the United States by internationally known architects and recent emigres Walter Gropius and Marcel Breuer, including Gropius's own home where he resided for thirty-one years until his death in 1969. In its architecture and the relationship of buildings to each other and to the landscape, the district is a well-preserved, physically distinguishable entity. Retaining integrity of location, design, setting, materials, workmanship, feeling, and association, the Woods End Road Historic District fulfills Criteria B and C and Criteria Consideration G of the National Register of Historic Places and is significant at the state and local levels.

Located in a hilly, upland watershed area, Lincoln is an affluent suburban town on the historic western axis of Boston. Formed as the second precinct of Concord in 1746, the land within present town boundaries came from the Concord grant (1635), Weston (1713, formerly Watertown), and Lexington (1713, formerly Cambridge). Settlers in outlying sections of Lexington and Weston joined with the second precinct of Concord to petition for a separate town, incorporated

☒ See continuation sheet

as "Niptown", later Lincoln, in 1754. The town experienced steady growth following the mid-18th-century formation of a town center and the creation of local radial highways. Two-story Colonial, Federal, and Greek Revival wood-frame houses predominated through the mid-19th century. Notable growth in the 1880s occurred as wealthy Bostonians assembled country estates by redeveloping former farms, particularly in the vicinity of South Lincoln. These scattered estates and the small-scale expansion of the town center along major roads brought a full range of late 19th-century high-style architecture to Lincoln, with many Colonial Revival and Federal Revival houses in estate settings and more modest examples, including Queen Anne and eclectic 20th-century houses, at Lincoln Center and South Lincoln. Subdivisions of country estates beginning in the mid-1910s continued through ca. 1940, transforming open space along radial highways from Lincoln Center into residential enclaves containing Colonial and Federal Revival style houses, some bungalows, and the notable International Style houses of the Woods End Road Historic District.

Helen Osborne Storrow (born 1864) provided the impetus for the development of the Woods End Road enclave in the late 1930s. Mrs. Storrow was the wealthy widow of James Jackson Storrow (1864-1926), a senior partner in the prominent Boston banking firm Lee, Higginson & Co. at the time of his death. Mrs. Storrow's personal interest and financial backing were instrumental in the completion of certain projects begun by her civic-minded husband, most notably the 1928 enlargement and beautification project for the Charles River Basin, created in 1910 between Boston and Cambridge. Between World War I and the late 1930s, she provided financial and moral support to both the Massachusetts and the International Girl Scouts organizations, and as Chairman of the Home Department of the Eastern States Exposition, she financed the reconstruction of 18th-century buildings on exposition grounds in West Springfield, Massachusetts. The recreated 18th-century village has since been named Storrowton. Mrs. Storrow pursued a number of hobbies, including English country dancing, and helped organize a United States branch of the English Folk Dancing Society in 1914. Widely recognized for her philanthropic activities, Mrs. Storrow held advisory positions with civic and charitable organizations, and was the prime organizer and first president of The Woman's City Club of Boston.

Although her main residence was on Beacon Street in Boston, Helen Storrow maintained a country estate in South Lincoln, Massachusetts, consisting of more than 130 acres of property that she and her husband had accumulated in several parcels between 1896 and 1921. It was on nearly twenty acres of this property that the Woods End Road district was developed. The estate extended north and south of Baker Bridge Road, formerly known as Walden Road or in deeds as "the Road from Waltham to Concord." The Storrow mansion and stables were constructed ca. 1905 on the north side of Baker Bridge Road, approximately 3/4 of a mile west of Lincoln Center. Both buildings are now owned by the Carroll School.

continued

In 1937, Helen Storrow heard about Harvard University architecture professor Walter Gropius and his desire to build a house in Lincoln from a mutual acquaintance, architect Henry Shepley of the Boston firm Coolidge, Shepley, Bulfinch & Abbott. Gropius, who had just arrived from England to join the Department of Architecture at Harvard's Graduate School of Design, had been renting a Lincoln house on nearby Sandy Pond Road. Mrs. Storrow offered Gropius the opportunity to construct a house in an orchard on her estate. Mrs. Storrow financed the construction of the house, the design of which was left entirely up to Gropius, and rented the property to the Gropius family for monthly installments equalling six percent of the total construction cost. The Gropius's were also given an option to buy the property at a later date. These terms Helen Storrow also extended to John and Mary Loud, with whom she had become acquainted through her dancing interests. When another architect and Harvard professor Walter F. Bogner approached Mrs. Storrow in late 1938 regarding further development of her Lincoln estate, she allowed him to lay out a subdivision on her property, with a road between the Gropius and Loud Houses and six adjacent lots. One lot, at the corner of Baker Bridge Road, became the side yard for the Gropius House, another defined the property surrounding the Loud House, and houses were constructed on three others. The sixth lot, located at the southernmost end of the subdivision, consists of a steep slope that has remained undeveloped (since incorporated into the Ford House lot). The subdivision was approved by the Town of Lincoln in early 1939. Bogner chose a lot at the end of the cul-de-sac for his own house.

In addition to the Gropius, Loud, and Bogner Houses, Mrs. Storrow financed two more houses for Harvard Professors. Marcel Breuer, whose bachelor residence was built in 1939, was an Associate Professor of Architecture. James Ford, whose house was designed by Gropius and Breuer and also built in 1939, was a Professor of Sociology. Ford and his wife, Katherine Morrow Ford-- an author and architectural consultant for House and Garden magazine-- shared an intense professional interest in the betterment of housing design and conditions in the United State in the years preceding World War II. Since the rent and ultimately the purchase price of each house were based on the total construction cost, the future tenants were induced to economize in design and construction.

The development of Helen Storrow's orchard was an architectural experiment. Unlike other Lincoln subdivisions of the period, in which lots were plotted and sold outright, Mrs. Storrow retained ownership of all buildings constructed on her estate. She imposed no restrictions, however, regarding the appearance of the buildings, and instead gave the prospective tenants and their architects complete freedom to design as they chose. The result was a visually cohesive district containing various solutions to the problem of designing a contemporary house on a limited budget. Although Mrs. Storrow found Gropius's architecture "somewhat startling," (Storrow letter to Gropius, 1937) she welcomed the opportunity to introduce his alien architectural design to the New England landscape. The Gropius's believed that without Mrs. Storrow's help, they never would have been able to get a mortgage on a house

continued

of "such 'outrageous design'" as was finally produced (Ise Gropius, 3). Mrs. Storrow's openmindedness, interest, and support permitted the construction of the earliest enclave of International Style houses in Massachusetts.

Similarly, the development of the Woods End Road Historic District is significant as a social experiment. The tenants organized themselves early on under the leadership of Walter Bogner, and dealt with such common concerns as a petition to pave their road and maintenance. It was the tenants who dubbed the quiet cul-de-sac "Woods End Road," a reference to the point at the end of the road where the old orchard merged with the wood to the south. Such a cooperative effort among residents of a single development is not known to have occurred in Lincoln before the formation fo the Woods End Road community. The success of its informal organization of tenants contributed to the creation a decade later of two incorporated cooperative communities in nearby Lexington, Six Moon Hill (1948, MHC #526-542, Area R) and Five Fields (1951, MHC #564-571, Area U). The houses of both communities were designed by professional colleagues of Walter Gropius, and the thirty-house complex at Six Moon Hill especially was inspired by the Woods End Road Enclave. The Woods End Road Historic District may also be of national significance, but insufficient documentation prevents its evaluation in a national context at this time.

The Woods End Road district exhibits three solutions to a single design problem: a house in a contemporary style that would be integrated with its surroundings, and would provide for modern conveniences while still respecting traditional values of house and home. Above all, economy of construction was an incentive in the design process. Stylistically, the district's five houses reflect the competition for dominance between traditional and progressive architectural styles in the United States between the World Wars. Each house, however, incorporates references to traditional New England architecture.

The Loud House represents the revival-style approach to the house design problem. A resurgence in the popularity of revival-style architecture in this period can be attributed to the fact that the forms of America's Colonial and Federal styles especially were simple, functional, and classical-- traits characteristic of 1930s design (Wilson, 303). As the district's most traditional architectural design, the Loud House is important as a contrast to the four International Style houses.

The Bogner House reflects its architect's attempt to interject a sense of romanticism into what he perceived as the dehumanized machine aesthetic of the International Style as it was first practiced in Europe, then in America in the 1920s and early 1930s. Incorporating texture and earth-tones into the exterior design through the use of fieldstone and unpainted wood siding, the Bogner House is more fully integrated with the landscape than International Style houses of the late 1920s, whose white, ferro-concrete forms distinguished them from their natural surroundings. In planning his house, Bogner merged his conceptual understanding of the New England Colonial house

continued

plan-- a rectangle with an axis containing living units held together by a hearth (Cormier, 35)-- with an appreciation for the flexibility of the International Style's elevations and open space plan. This flexibility of elevation and plan allowed Bogner to experiment with design on a modular system, indicative of his developing interest in pre-fabrication.

The most architecturally progressive solution to the house design problem at Woods End Road is seen in the three Gropius and Breuer designs, which adapt the accepted European version of the International Style to the New England landscape. The three houses are similar to Bogner's in that they reflect but do not attempt to imitate New England's colonial architecture. Gropius and Breuer utilized wood-frame construction, wood sheathing painted white, and stone or brick hearths as prominent design features. The central hall of the otherwise nontraditional Gropius House plan is further evidence of Gropius's desire especially to acknowledge the New England tradition. Like the Bogner House, the Gropius, Ford, and Breuer Houses exhibit the three major distinguishing aesthetic principles of the International Style: a sense of volume as opposed to solidity; regularity as opposed to symmetry; and detail achieved through the intrinsic elegance of materials, technical perfection, and fine proportions as opposed to applied ornament (Hitchcock and Johnson, 13). These four houses, in their vernacular interpretations of the International Style, reflect a 1930s shift in the direction of the style's development in Europe, away from the 1920s "white box" of ferro-concrete construction and smooth structured surface. The Gropius, Ford, Breuer, and Bogner Houses at Woods End are among the earliest buildings in the United States to display this trend toward the vernacularization of the International style.

Each of the architects of the five houses in the district was associated, by training or professionally, with the faculty of the Department of Architecture at Harvard University. Harvard played a major role in the move from historicism and electicism to a more progressive architectural style in the United States during the 1930s. The departments of architecture, landscape architecture, and city planning were combined to form a new Graduate School of Design in 1935. Dean Joseph Hudnut invited first Walter Gropius, then Marcel Breuer, to Harvard in 1937 in a conscious effort to rouse the architecture department out of its traditional, Beaux-Arts saturated past. Once Gropius and Breuer arrived in the United States, Harvard could boast the presence of two key Bauhaus personalities and practitioners of the International Style on its architecture faculty. As professors, Gropius and Breuer especially and Bogner to a lesser extent were at the forefront of reforming architectural design and education in the United States, in the late 1930s.

Born in Providence, Rhode Island, in 1899, Walter Bogner was trained in architecture in Austria and at Harvard, where he taught from 1928 until his retirement in 1966. Bogner, deeply involved in urban planning issues, designed few private houses, focusing instead on institutional buildings and housing complexes. He worked extensively in the standardization and pre-fabrication of houses, and his own house in Lincoln served as a model for

continued

his experiments in standardization. At Harvard, he worked closely with colleagues Breuer and particularly Gropius, who shared Bogner's interest in the planning (as opposed to the purely aesthetic) aspects of architectural design. Bogner credits himself with the establishment of the Lincoln Planning Board (Martin), and he was the chief organizer of the tenants in the Woods End Road community.

A lesser known aspect of Bogner's teaching duties at Harvard involved his role as a lecturer and design critic for the Cambridge School of Architecture and Landscape Architecture. The Cambridge School, founded in 1916 by Harvard architecture professor Henry Atherton Frost, offered professional training in architecture and landscape architecture to women, who were not permitted to attend Harvard. Independent at first, the Cambridge School later affiliated with Smith College, a women's college in Northampton, Massachusetts, for the purpose of awarding graduate degrees. The majority of the school's instructors, however, continued to come from Harvard. Constance Mumford Warren (1930-), architect of the Loud House on Woods End Road, enrolled at the Cambridge School in 1926, withdrawing one term short of completing the course in April 1928. Constance Warren married shortly thereafter and moved with her husband to South Lincoln, where she lived until the early 1940s. It was at this time that she likely became acquainted with John and Mary Loud, who were renting a house in Lincoln prior to their construction agreement with Helen Storrow. Constance Warren's Colonial and Federal Revival houses in Lincoln include four houses on Trapelo Road east of Lincoln Center in addition to the Federal reproduction designed for the Louds at Woods End. These five houses are evidence of the Cambridge School's emphasis on residential buildings, and its requirement that beginning students learn design techniques by executing measured drawings of historic dwellings (Anderson, Women, 31). The source of Warren's Woods End Road design was a ca. 1800 Cape Cod house the Louds admired. Constance Warren went on to work for the Boston Redevelopment Authority in the 1960s.

Before coming to Harvard in 1937, Walter Gropius led an active and internationally known architecture career in Europe. Born in Berlin in 1883, he was chief assistant there in the architecture office of Peter Behrens from 1907-1910. He then had a private practice for four years before serving as an officer in the German Army during World War I. During the prewar years Gropius earned an international reputation for his Fagus Factory at Alfeld (1911). The revolutionary Fagus Factory incorporated elements that would eventually define the International Style, among them glass curtain walls, unrelieved cubic blocks, and corners left free of visible supports. Gropius merged the state's academies of art and applied art at Weimar into a single institution under the name "Bauhaus" (House of Building) in 1919, and served as director from 1919-1925 at Weimar and from 1925-1928 at Dessau. The emphasis of the Bauhaus training shifted from craft to industrial design during Gropius's tenure, and his design for the school's new building complex

continued

at Dessau (1925) parallels the Fagus Factory as a premier example of the fusion of architecture and industrial design. With Hitler's rise to power, Gropius left Germany for England in 1928, where he practiced with architect Maxwell Fry after 1934, designing little of distinction before he left England to teach at Harvard in 1937. Gropius's earliest buildings in the United States were designed in partnership with Marcel Breuer from late 1937 to 1941.

Marcel Breuer was born in Hungary in 1902 and came to study at the Bauhaus in 1920, graduating in 1924. Breuer served as Master of the Bauhaus carpentry shop from 1924-1928, and is perhaps best known for his experiments in the design of tubular steel furniture. After four years of uncertain success in private architectural practice in Berlin, Breuer moved to London in 1935, where he maintained a brief partnership with architect F.R.S. Yorke. He also designed bent plywood furniture for a London manufacturer. Breuer emigrated to the United States after receiving an invitation to teach architecture at Harvard in 1937.

The firm of Walter Gropius and Marcel Breuer, Associated Architects, designed four houses in Massachusetts in 1938 and 1939 that define the architects' regional expression of the International Style once they arrived in America.
Woods End Historic District

Three of these houses are in the Woods End Road Historic District. The fourth, the Haggerty House (1938), is a beachfront home in Cohasset. These four houses-- the earliest buildings designed by either Gropius of Breuer in the United States-- constitute a homogenous group employing the traditional New England braced frame, wood sheathing, and local stone in walls and floors (Blake, 62). Other Gropius and Breuer-designed residences to display this vernacular idiom are the Chamberlain Cottage in Wayland, Massachusetts (1939, demolished), and the Frank House in Pittsburgh (1939-1940). The Frank House marked the first time the firm employed its regional expression of the International Style outside New England. This regional expression manifested itself only in houses, virtually the only building type for which the firm received commissions. With the completion of the Frank House, Gropius and Breuer's architectural style had begun to evolve, from an adaptation of the International Style that reflected a distinct regional building tradition, to an identifiable house type that eventually transcended regional boundaries. Four new American House types, all of which first appeared in the late 1930s and the 1940s, have been identified as having been "immediately and extensively influential in current building, and of major import for future developments": the New England vernacular version of the European International Style cultivated by Gropius and Breuer; Frank Lloyd Wright's "Usonian" houses; the extreme metal and glass constructions of Mies's Farnsworth House (designed 1946, built 1950), and Philip Johnson's Glass House (1949); and a West Coast redwood translation of the International Style (Jordy, 168). Residential design in this West Coast vernacular most likely began with architect Richard Neutra (1892-1970), who forsook the smooth stucco surfaces and steel construction of his avant-garde, 1920s International Style

continued

(Lovell House, Los Angeles, 1928) for the more indigenous redwood tradition when he was asked to do so by a client in 1939 (Drexler and Hines, 21). Gropius and Breuers' earliest residential buildings in the United States, which are well represented in the Woods End Road Historic District, are exceptionally significant for their role in the creation of a new, distinctly American approach to the International Style, and as prototypes for subsequent American residential designs beyond the New England region.

Gropius and Breuer's individual contributions to and influence over their firm's architectural designs have been debated. It appears that each man was the primary designer of his own house in the Woods End Road enclave. Gropius's house continues the machine-inspired, industrial orientation of his Bauhaus designs of the mid-1920s. In fact, the Lincoln house was conceived in part as a shell for the Gropius family's furniture, most of which was produced at the Bauhaus before Gropius resigned as director there in 1928. The design of the Lincoln house differs from that of the family's house at Dessau, Germany (1925) primarily in its wood-frame construction and the incorporation of natural materials in its exterior design. The Ford House shows little development from the Gropius House, except for the move toward a more irregular massing and a greater concern for texture on wall surfaces.

This increasing emphasis on texture in the firm's building-- an innovation in Gropius's accustomed approach to architectural design-- has been attributed to Breuer, who had already reached a critical turning point in the development of his architectural style before his professional association with Gropius in the United States. In partnership with English architect F.R.S. Yorke, Breuer designed the Gane Pavilion (1936) at the Royal Agricultural Fair at Bristol, a widely-acclaimed exhibition house used to display groupings of modern furniture. The building was significant as a demonstration of the aesthetic possibilities achieved by the use of traditional materials-- local stone, glass, wood-- in a modern structure. The continuously flowing space, glass curtain walls, and break from the confines of the rectangular box plan seen at the Gane Pavilion reappear in the Breuer House three years later. From 1936 on, Breuer routinely incorporated natural materials and wood framing in his architectural designs (Blake, 56).

In Lincoln, Gropius achieved a new standard for residential architecture, his own home serving as his definitive on the essence of a house (Cormier, 52). None of the residential projects with which Gropius was involved in later years reflect his personality and his aesthetic ideals as completely as his own house, where he resided until his death in 1969. In addition to its contributing status within the Woods End Road Historic District, the Gropius House is individually eligible for the National Register and significant at the local, state, and national levels due to its superior architectural integrity and its importance as the work of a master. Gropius, who retired from teaching at Harvard in 1952, was a founding partner of The Architects' Collaborative (TAC) in Cambridge, with which he was actively involved from its inception in 1945 until his death.

continued

In Breuer's case, his Woods End Road house design, his residency in Lincoln, and his eight-year tenure at Harvard University were all of a transitional nature. Whereas the Gropius House is merely a reinterpretation of the architect's former house in Germany in New England terms, the Breuer House represents a specific phase in Breuer's developing residential style. This style would become further defined with the design of two more houses for himself in New Canaan, Connecticut, built in 1947 and 1951. Breuer founded his own firm, Marcel Breuer and Associates, in New York in 1946. Like TAC, Breuer's office designed buildings primarily on the East Coast, receiving some international commissions in the late 1950s and the 1960s. Another similarity between the two firms is the nature of their commissions, which were largely for commercial and institutional buildings, with fewer residences in the years following World War II. Breuer, who retired in 1976, died in 1981.

By the late 1940s, the nature of the Woods End Road community had begun to change. Following Helen Storrow's death in November 1944, the trustees of her estate commenced the sale of the five rented Woods End properties to their respective occupants. Three of the community's original tenants, Marcel Breuer and James and Katherine Ford, had left by 1945. The Storrow trustees sold the Ford House in 1945 and the Breuer House in 1946 to new residents. These two houses, ownership of which passed through nine and three families respectively, have consequently sustained the greatest alteration of the district's five houses. Walter and Ise Gropius purchased their house in 1945; the house served as their sole American residence until Walter Gropius's death in 1969 and Ise's death in 1983. The Gropius House in now owned and operated as a house museum by the Society for the Preservation of New England Antiquities (SPNEA). John and Mary Loud purchased their house from the Storrow estate in 1947, and only recently has a second owner acquired the house. Walter Bogner continues to reside at the house he and his wife Edith purchased form the Storrow estate in 1947.

In 1970, the Woods End Road cul-de-sac was extended to provide access from Baker Bridge Road to property along a new cul-de-sac known as Minor Street. Much of this lower woodland south of Woods End Road has been preserved as undeveloped space. A single house constructed ca. 1975 along Minor Street is not visible from the historic district. The circle at the southern end of Woods End Road has been maintained.

Archaeology Significance

Since the patterns of prehistoric occupation in Lincoln are poorly documented, any surviving sites would be significant. Regional as well as local significance might result from sites found in this area and their possible association with sites along the Sudbury River, a known area of prehistoric activity located about one to two miles to the west.

Farm-related features (structures, trash pits, wells) are possible from the 18th to 20th centuries and could provide detailed information on the changing social, cultural,and economic patterns that characterized rural life in Lincoln.

9. MAJOR BIBLIOGRAPHIC REFERENCES

Public Sources:

Anderson, Dorothy M. "The Cambridge Connection: The Creation and Demise of a Smith Graduate School." Smith College Alumnae Quarterly, (Fall 1986), pp. 22-27.

Anthony, Beulah Brown. "The Massachusetts Home of Dr. and Mrs. Walter Gropius." American Home, (July 1939), pp. 21, 54, 57.

Blake, Peter. Marcel Breuer: Architect and Designer. NY: MoMA, 1949.

Bogner, Walter. "Prefabrication." Architectural Forum, 77 (Sept. 1942), pp. 78-81.

Cantacuzino, Sherban. Modern Houses of the World. NY: E.P. Dutton, 1964.

"Contemporary Interiors." Fortune, XXV (January 1942), p. 62.

Drexler, Arthur and Thomas S. Hines. The Architecture of Richard Neutra: From International Style to California Modern. NY: MoMA, 1982.

Emanuel, Muriel et als., eds. Contemporary Architects. NY: St. Martin's Press, 1980.

Fitch, James Marston. Walter Gropius. NY: George Braziller, 1960.

Ford, James and Katherine Morrow Ford. Design of Modern Interiors. NY: Architectural Book Publishing Co., Inc., 1942.

"Good Modern in an Old New England Orchard." House Beautiful, 81 (Dec. 1939) pp. 41-43, 75, 86.

Gowans, Alan. Images of American Living. Phila. and NY: Lippincott, 1964.

The Modern House in America. NY: Arch'l Book Publishing, 1940.

"Why I Planned My House This Way." House Beautification, 83 (April 1941), pp. 57-59, 102.

Women, Design, and the Cambridge School. West Lafayette, IN: PDA Publishers Corp., 1980.

Gropius, Ise. History of the Gropius House in Lincoln, Massachusetts. Boston: Society for the Preservation of New England Antiquities, 1977.

Gropius, Walter and Ise. "Time Mellows This Modern House." House and Garden, (January 1949), pp. 72ff.

continued

Herding, Klaus. The Decorated Diagram: Harvard Architecture and the Failure of the Bauhaus Legency. Cambridge: The MIT Press, 1983.

Hitchcock, Henry-Russell. Architecture: Nineteenth and Twenthieth Centuries in "The Pelican History of Art" series, Nikolaus Pevsner, ed. 4th edition (reprinted). NY: Penguin Books, 1981.

Hitchcock, Henry-Russell and Philip Johnson. The International Style. NY: W.W. Norton, 1966. [Originally published in 1932 under the title The International Style: Architecture Since 1922.]

"House in Lincoln, Mass. Walter Gropius and Marcel Breuer, Associated Architects." Architectural Forum, 71 (Dec. 1939), pp. 455-459.

Jordy, William H. The Impact of European Modernism in the Mid-Twentieth Century. Volume 4 of American Buildings and Their Architects. 4 vols. Garden City, NY: doubleday & Co., Inc., 1972.

"Lincoln Home for J. Ford: House in Massachusetts. Walter Gropius and Marcel Breuer, Architects." Architectural Record, 81 (March 1940), pp. 108-112.

Placzek, Adolf K., ed.-in-chief. MacMillan Encyclopedia of Architects. 2 vols. NY: The Fee Press/MacMillan Publishing Co., Inc., 1982.

"Professor Bogner Retires." Harvard Graduate School of Design Alumni Newsletter, (Nov. 1966), p.3.

Walker, George. Atlas of Middlesex County, Massachusetts. 3 vols. 1908.

Ware, Leonard. Helen Osborne Storrow 1864-1944. A Memoir. Northampton, 1970
Wilson, Richard Guy, Dianne H. Pilgrim, and Dickran Tashjian. The Machine Age in America 1918-1941. NY: Harry N. Abrams, Inc., 1986.

Wilk, Christopher. Marcel Breuer. Furniture and Interiors. NY: MOMA, 1981.

Unpublished Sources

Bogner, Walter. Interview with Margaret M. Martin, Lincoln Town Historian, March 27, 1985.

Cormier, Leslie H. "The Woods End Colony: An Architects' Refuge in America." Masters thesis. Brown University, 1983.

Jenny, Casper J., Jr. Letter to Mrs. Walter Gropius. April 27, 1973. SPNEA Archives.

Loud, John and Mary. Interview with Margaret M. Martin, Lincoln Town Historian, March 28, 1985.

continued

Massachusetts Historical Commission, with Lincoln Historical Commission. Inventory of the Historic Assets of the Commonwealth (Lincoln). 1981.

Lincoln Town Report. Typescript. 1984.

Middlesex County Registry of Deeds. Deeds to Storrow and Gropius et als.

Minuteks of Meetings of the Property Owners Along Woods End Road, July 3, 1945 and November 27, 1945.

Partnership Agreement, Walter Gropius and Marcel Breuer, February 25, 1938. SPNEA Archives.

Storrow, Helen O. Letter to Walter Gropius. October 27, 1937. Houghton Library, Harvard Univesity.

Warren, William Wallace (son of Constance Mumford Warren). Interview with Margaret M. Martin, Lincoln Town Historian, June 5, 1985.

9. Major Bibliographical References

Woods End Road Historic District, Lincoln, Massachusetts

[X] See continuation sheet

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [ ] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # ______
- [ ] recorded by Historic American Engineering Record # ______

Primary location of additional data:

- [X] State historic preservation office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Specify repository:
Massachusetts Historical Commission

10. Geographical Data

Acreage of property 17 acres

UTM References

	Zone	Easting	Northing
A			
B			
C			
D			

[X] See continuation sheet

Verbal Boundary Description

see assessors map

[ ] See continuation sheet

Boundary Justification

The district boundaries were drawn to include the five properties developed in the creation of the residential enclave at Woods End Road in 1938-1939.

[ ] See continuation sheet

11. Form Prepared By

name/title Betsy Friedberg, NR Director/MHC with Kathleen A. Kelly & Margaret Martin/Lincoln Historical Commission

organization Massachusetts Historical Commission date March 1988

street & number 80 Boylston Street telephone 617-727-8470

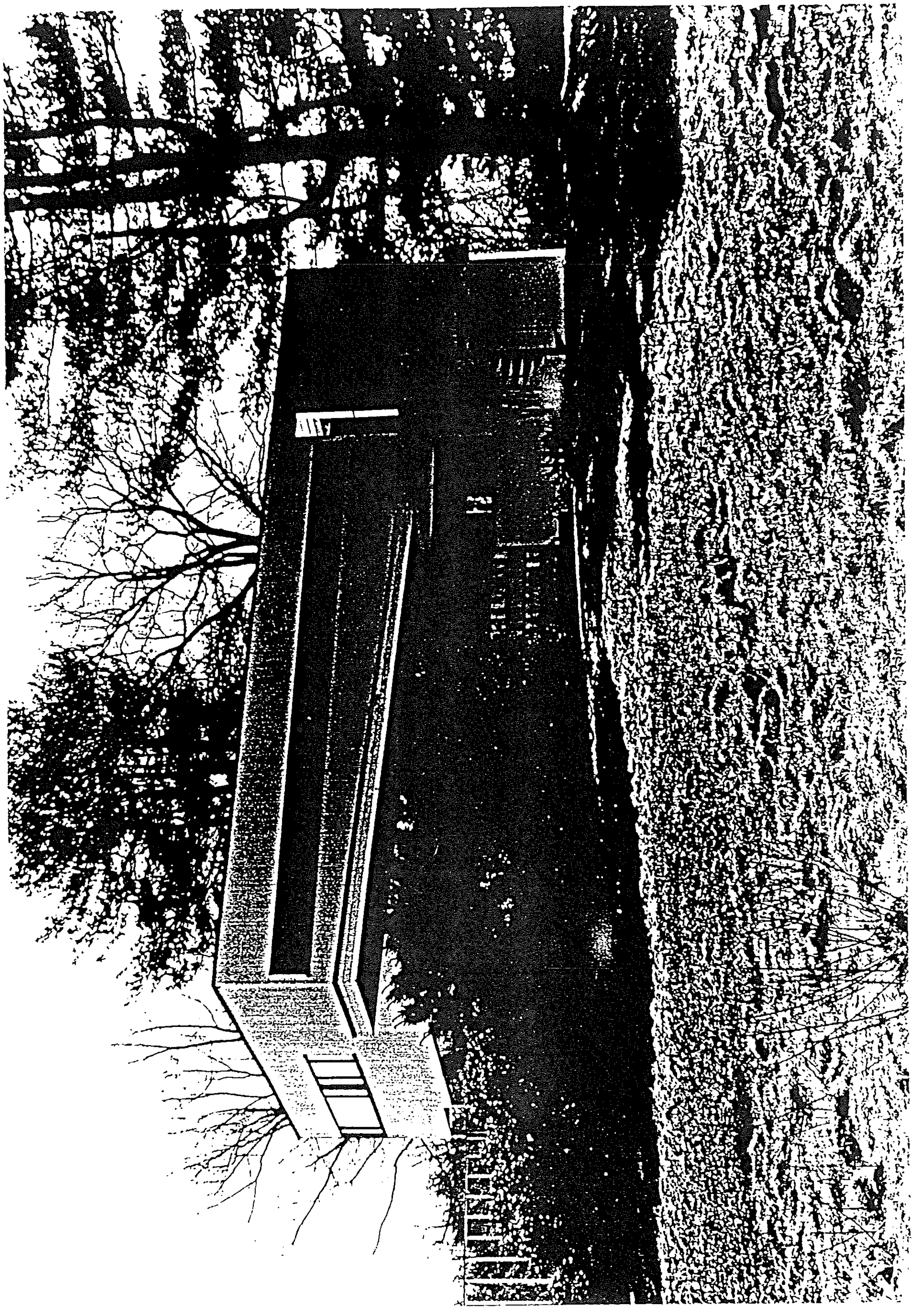
city or town Boston state Massachusetts zip code 02116

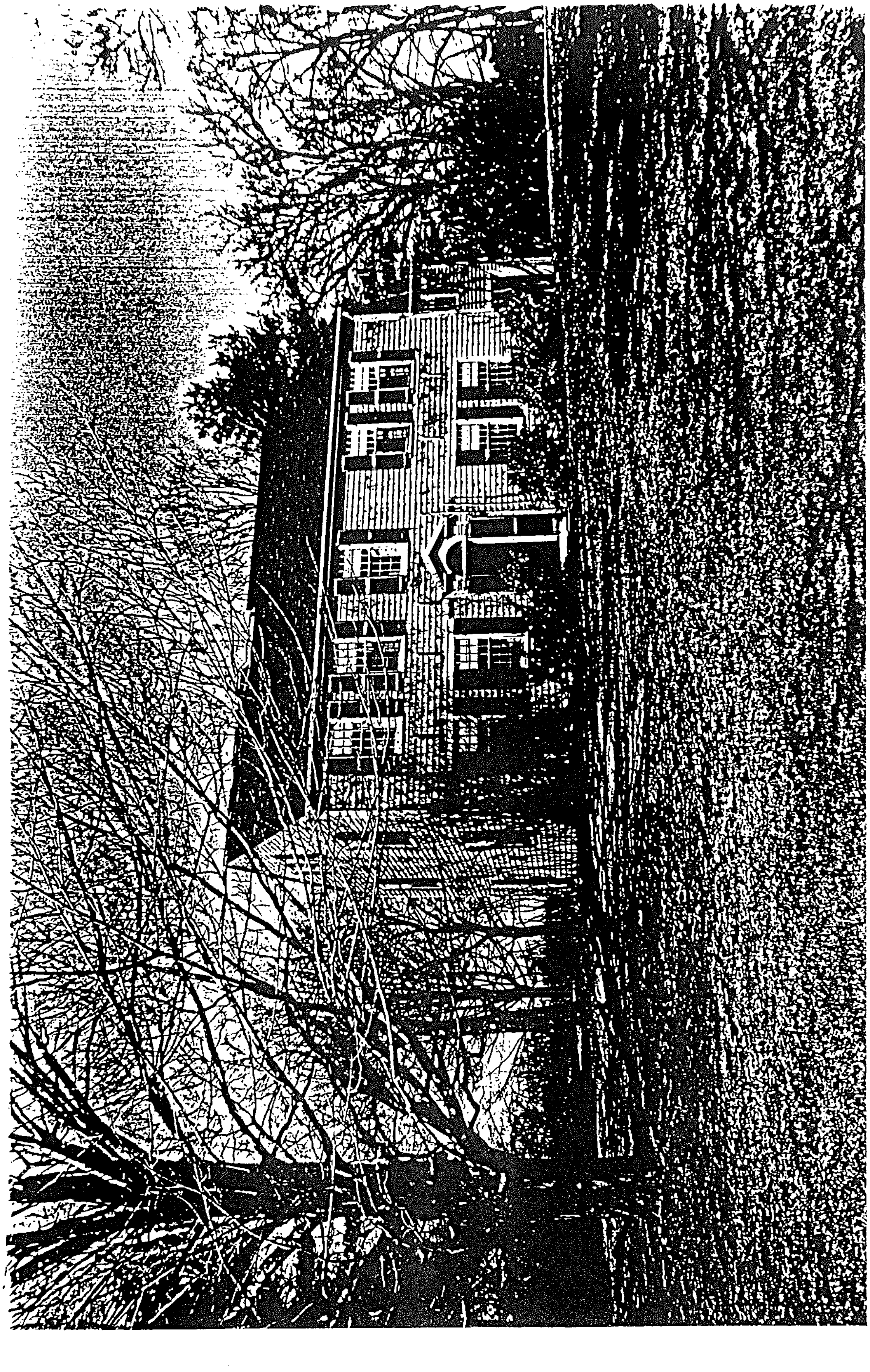
10. Geographical Data

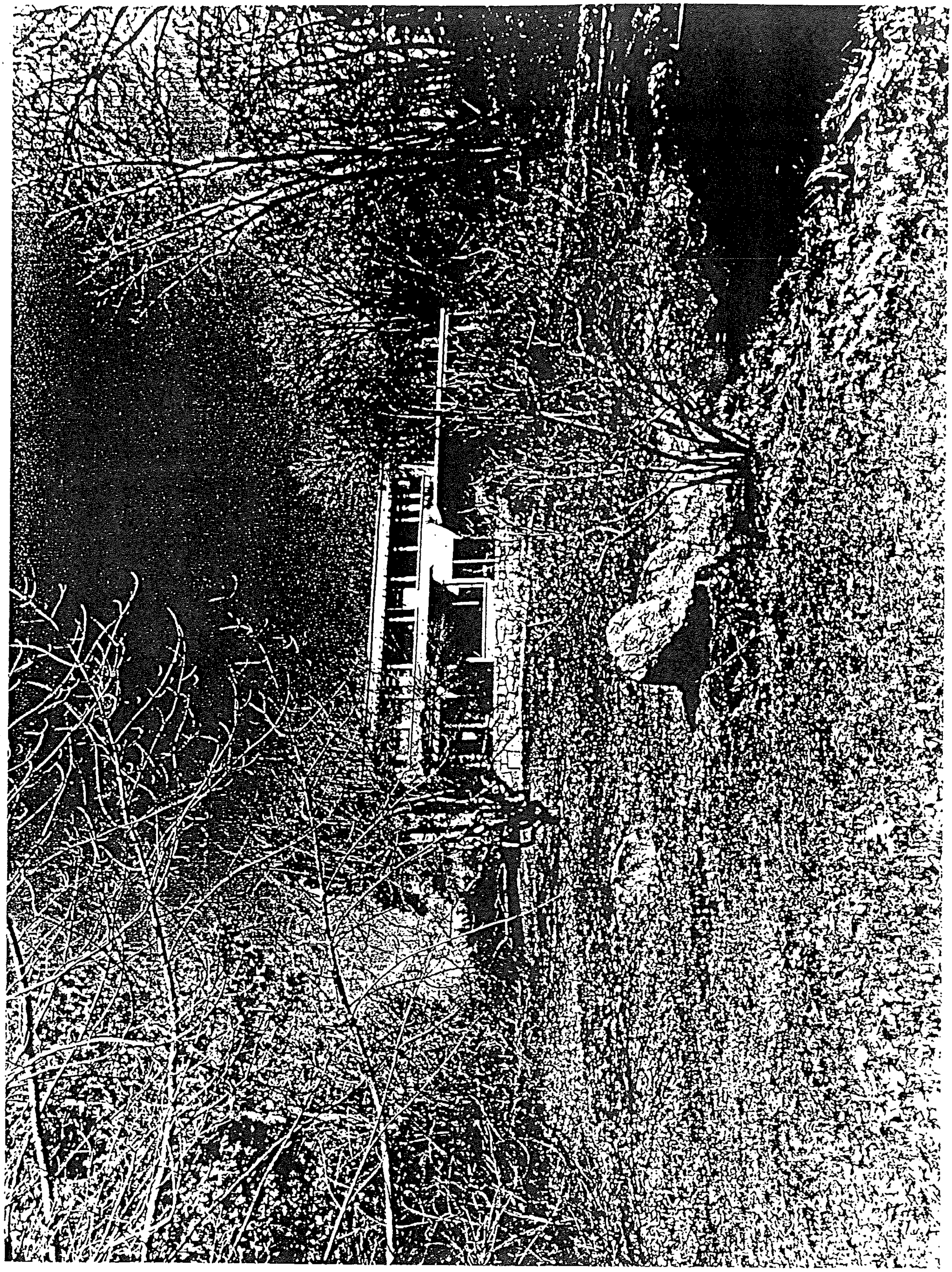
Concord Quad
Scale: 1:24000

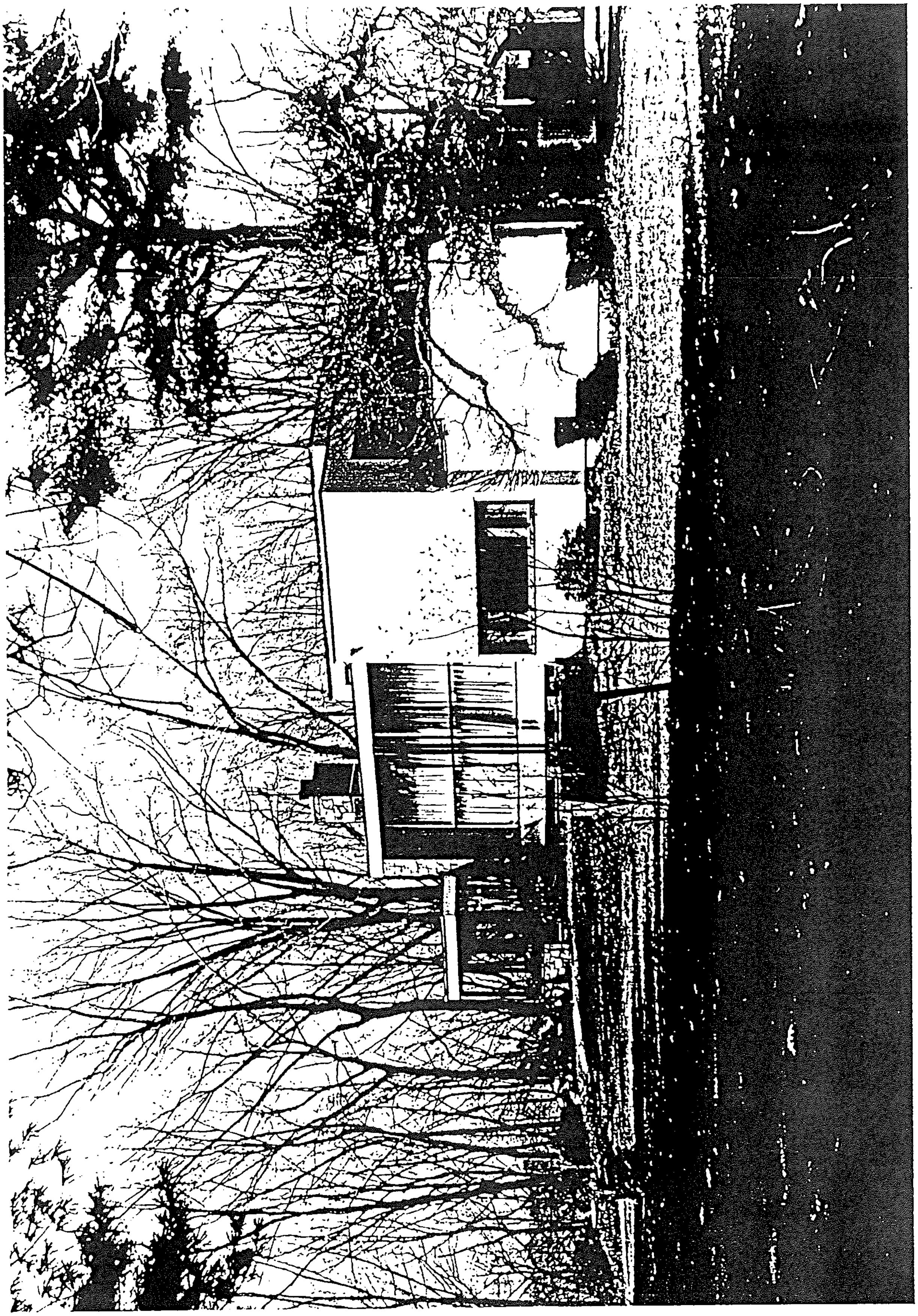
UTM References

Point	Zone	Easting	Northing
A	19	308630	4699630
B	19	308600	4699470
C	19	308420	4699450
D	19	308340	4699490
E	19	308390	4699710









DISTRICT DATA SHEET
WOODS END ROAD HISTORIC DISTRICT, LINCOLN

LOT #	MHC #	HISTORIC NAME	STREET ADDRESS	DATE OF CONSTRUCTION	STATUS	STYLE	TYPE OF RESOURCE
56:12, 56:12.01	14	Walter & Ise Gropius House	68 Baker Bridge Rd.	1938	C	International	B
		garage		1938	C	---	B
56:15	122	John & Mary Loud House	1 Woods End Road	1938-1939	C	Federal Revival	B
56:14	123	Marcel Breuer House	5 Woods End Road	1939	C	International	B
		garage		ca. 1939	C	---	B
56:13	125	Walter & Edith Bogner House	9 Woods End Road	1939	C	International	B
62:3	124	James & Katherine Ford House	10 Woods End Road	1939	C	International	B

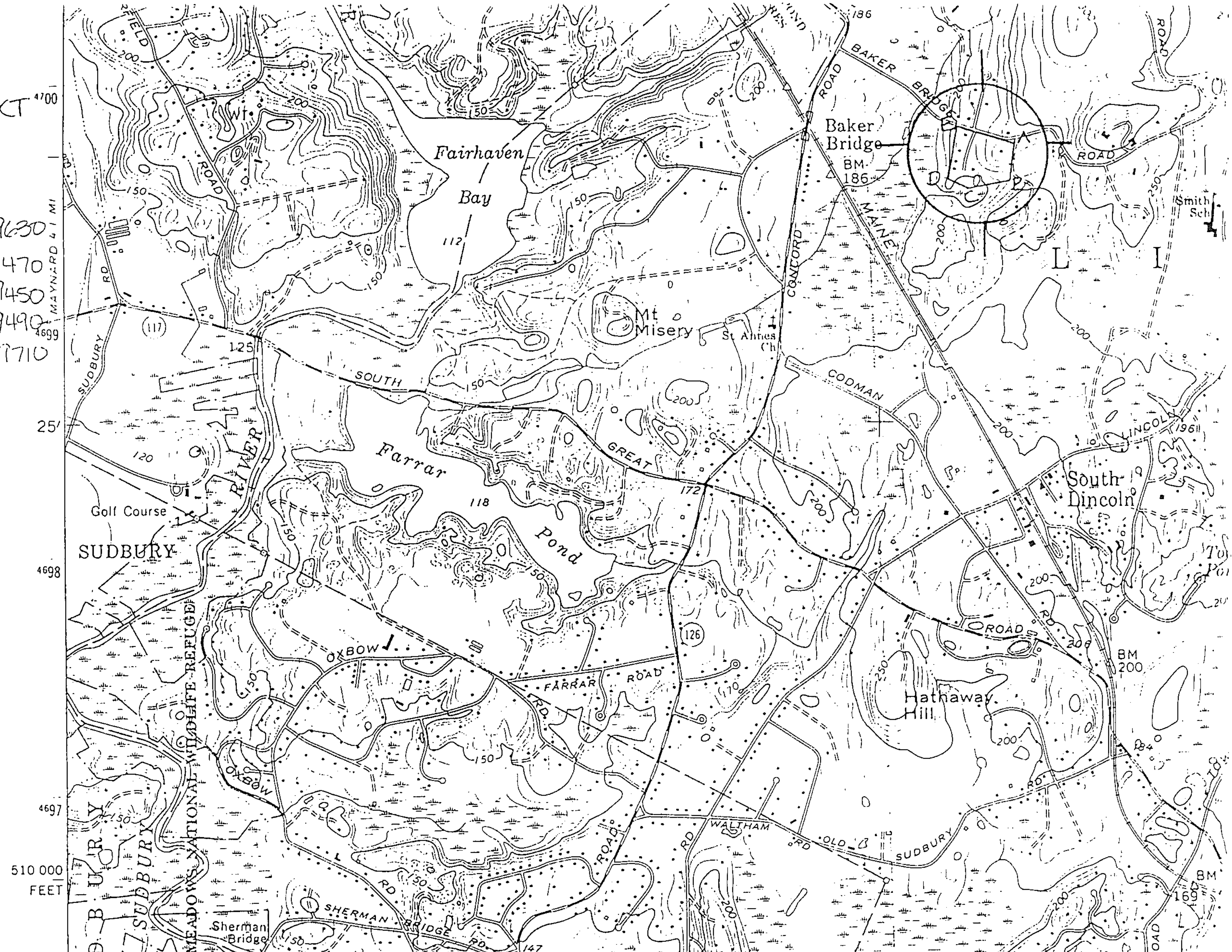
Key

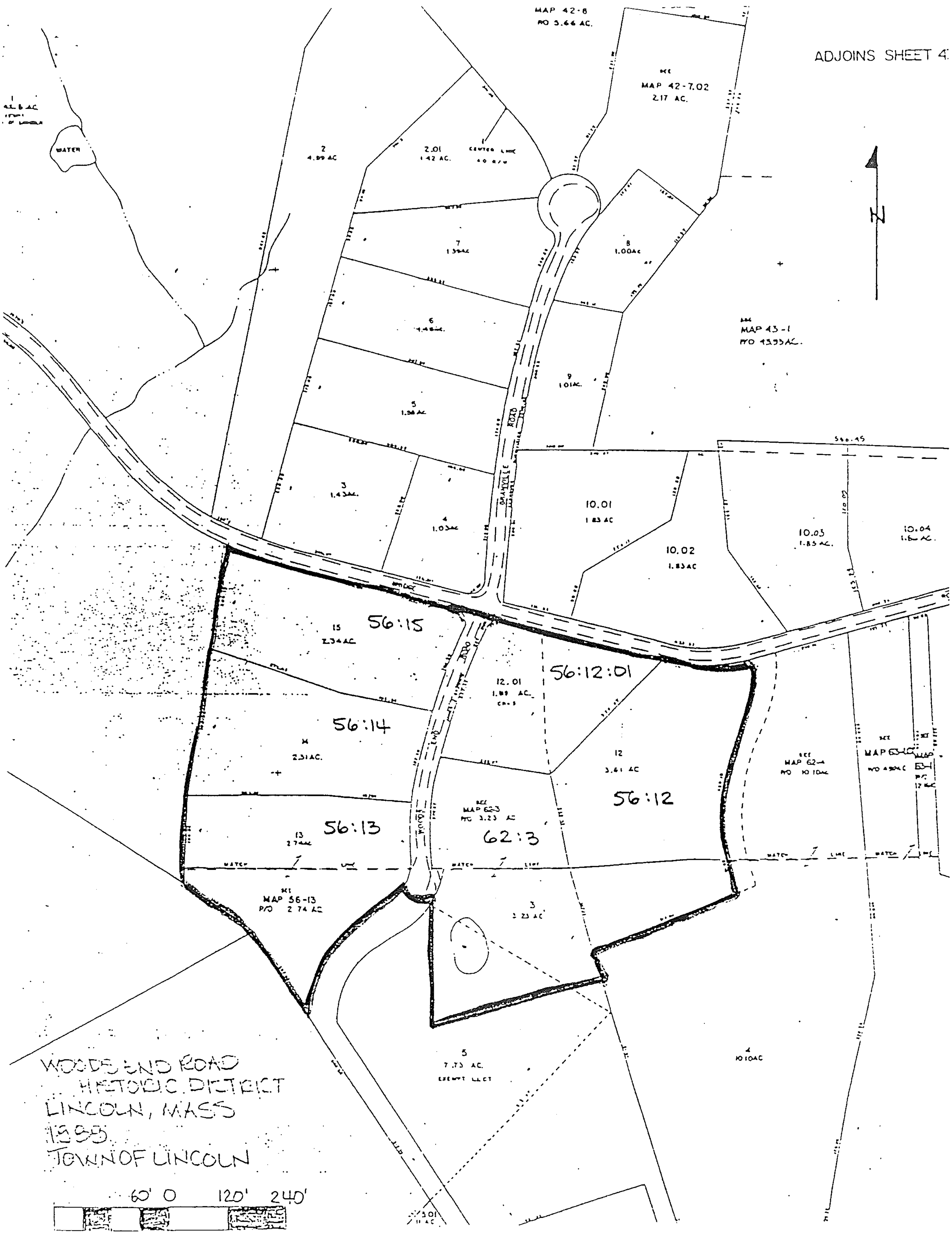
C = contributing, B = building

	contributing	noncontributing
Buildings	7	0

WOODS END ROAD
HISTORIC DISTRICT
LINCOLN, MASS.
CONCORD QUAD
1:24000

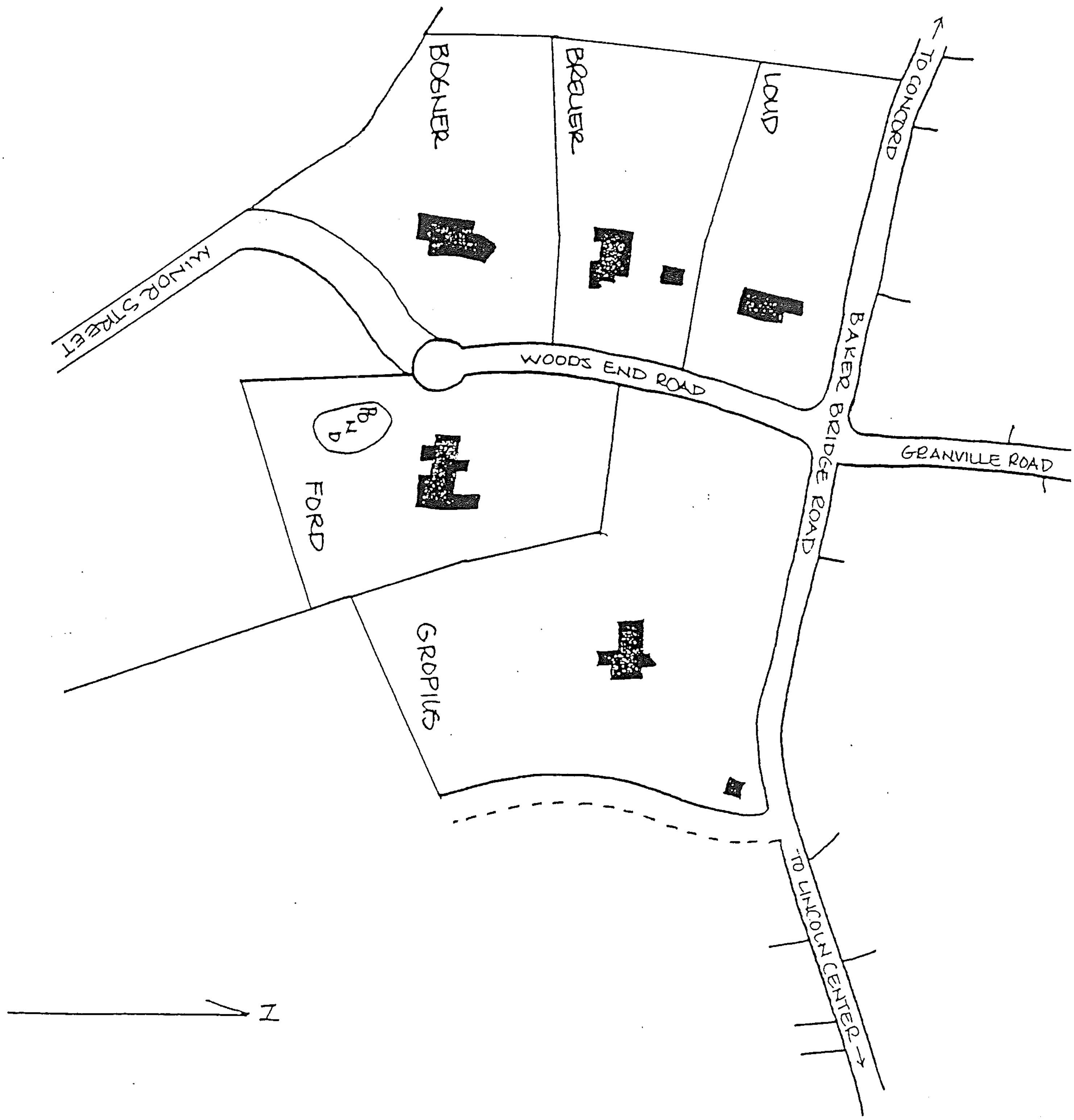
A 19 308630 4699630
B 19 308600 4699470
C 19 308420 4699450
D 19 308340 4699490
E 19 308[illegible]90 4699710




ADJOINS SHEET 4
MAP 42-8
P/O 5.66 AC.
MAP 42-7.02
2.17 AC.
WATER
2
4.99 AC
2.01
1.42 AC.
7
6
5
3
1.43 AC.
4
1.03 AC
8
1.00 AC
9
1.01 AC.
MAP 43-1
P/O 13.93 AC.
GRANVILLE ROAD
10.01
1.83 AC
10.02
1.83 AC
10.03
1.83 AC.
10.04
15
2.34 AC
56:15
56:14
2.31 AC.
13
2.74 AC
56:13
12.01
1.89 AC.
56:12:01
12
3.61 AC
56:12
MAP 62-3
P/O 3.23 AC
62:3
MAP 62-4
P/O 10.10 AC
MAP 56-13
P/O 2.74 AC
3
3.23 AC
5
7.73 AC.
EXEMPT LLCT
4
10.10 AC
MATCH LINE
WOODS END ROAD
HISTORIC DISTRICT
LINCOLN, MASS
1995
TOWN OF LINCOLN
60' 0 120' 240'
N

WOODS END ROAD HISTORIC DISTRICT
LINCOLN, MASSACHUSETTS

NOT TO SCALE
1988



GROPIUS

NATIONAL HISTORIC LANDMARK NOMINATION

NPS Form 10-900
USDI/NPS NRHP Registration Form (Rev. 8-86)
OMB No. 1024-0018

United States Department of the Interior, National Park Service
National Register of Historic Places Registration Form

1. NAME OF PROPERTY

RECEIVED JUN 01 2001

Historic Name: GROPIUS HOUSE

Other Name/Site Number:

2. LOCATION

Street & Number: 68 Baker Bridge Road

Not for publication:__

City/Town: Lincoln

Vicinity:__

State: MA County: Middlesex Code: 017 Zip Code: 01773

3. CLASSIFICATION

Ownership of Property		Category of Property	
Private:	X	Building(s):	X
Public-Local:	__	District:	__
Public-State:	__	Site:	__
Public-Federal:	__	Structure:	__
		Object:	__

Number of Resources within Property

Contributing	Noncontributing	
2	__	buildings
1	__	sites
__	__	structures
__	__	objects
3	__	Total

Number of Contributing Resources Previously Listed in the National Register: 2

Name of Related Multiple Property Listing:

Designated a NATIONAL HISTORIC LANDMARK on MAY 16 2000 by the Secretary of the Interior

4. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ____ nomination ____ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ____ meets ____ does not meet the National Register Criteria.

Signature of Certifying Official — Date

State or Federal Agency and Bureau

In my opinion, the property ____ meets ____ does not meet the National Register criteria.

Signature of Commenting or Other Official — Date

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

____ Entered in the National Register
____ Determined eligible for the National Register
____ Determined not eligible for the National Register
____ Removed from the National Register
____ Other (explain): ________________

Signature of Keeper — Date of Action

6. FUNCTION OR USE

Historic: Domestic Sub: Single Dwelling

Current: Recreation, education and culture Sub: Museum

7. DESCRIPTION

ARCHITECTURAL CLASSIFICATION: Modern Movement; International Style

MATERIALS:

Foundation:	Stone
Walls:	Vertical redwood siding
Roof:	Tar and gravel
Other:	Brick chimney

Describe Present and Historic Physical Appearance.

The Gropius House property consists of three contributing components: the house built in 1938 as the home of Walter Gropius, a founder of the modern movement in architecture and leader of the Bauhaus, and his family; a garage now remodeled to serve as a visitor's center; and a landscape incorporating significant designed features reflective of modern landscape design in its early phase. The Gropius House sits at the crest of a gentle hill that slopes up from Baker Bridge Road behind a low fieldstone wall which is set back 100 feet from the road. The house occupies the middle of its 5.51-acre site. The planned landscape immediately around the house transitions gradually to the preserved natural and agricultural landscapes of the property and its surroundings. To the southeast are views of a wetland; directly to the rear of the house are woods. To the west distant views of Mt. Wachusett and Mt. Monadnock are now obscured by trees, but were a feature of the landscape when the house was originally built. Walter Gropius (1883-1969) resided here until his death. His wife, Ise Frank Gropius, continued to live in the house until shortly before her death in 1983, having deeded the property to the Society for the Preservation of New England Antiquities (SPNEA) in 1980. Now operated as a house museum, the Gropius property is open to the public year round.

Located in the town of Lincoln, Massachusetts, an affluent suburb 17 miles northwest of Boston, the house is situated in a sparsely built-up portion of Baker Bridge Road, a winding road providing access from central Lincoln to outlying rural and natural areas, including Walden Pond, 1 1/2 miles away just over the border in Concord. The combination of large holdings of privately-owned land and the 25% of land area of the town that is held for conservation purposes (some of it in agricultural use) contributes to the rural character of this bedroom community of 8000. Eighteenth and nineteenth century wood frame houses are intermingled with more recent dwellings, including other examples of Modern Architecture. Notable among the latter are the four houses on Woods End Road bordering the Gropius property to the west built in 1938 and 1939 with which the Gropius House was listed on the National Register of Historic Places in 1988 as the Woods End Road Historic District. Three were designed by Gropius and his partner, Marcel Breuer, and one by their associate at Harvard, Walter Bogner.[1]

The firm of Walter Gropius and Marcel Breuer, Associate Architects, are listed as designers of the Gropius House, but the design was in reality the result of a collaborative effort that included Ise Gropius and even their twelve-year-old daughter, Ati. The Society for the Preservation of New England Antiquities, the property's present owners, have designated the house simply the Gropius House in recognition of that collaboration. The landscape design was the result of a similar collaborative effort. The contractor selected to build the house was Casper J. Jenney of Concord.

The house's structural system combines modern balloon frame construction with certain larger structural components such as 4" X 6" corner posts and 4" X 8" sills that hark back to the timber frame construction that prevailed in New England until the mid-nineteenth century. The house is constructed with "diagonally braced wood frame floors, walls, ceilings, and roof . . , 2" by 4" wall studs, 2" by 10"

[1]A fifth house, a replica of a Federal style house, built in 1938 completes the district. All of these houses were funded by Mrs. Storrow under conditions similar to those that she provided for the Gropiuses (see further information in Section 8).

roof and floor joists."[2] Steel I beams span the plate glass windows in the living area, and steel lally columns support the marquee, the porch roof and the roof overhang in the southwest corner.[3]

All components used to construct the house and the fittings for it were stock building materials or standard items available from catalogs: glass bricks, steel sash, doors and door hardware, lighting and plumbing fixtures. There were only two exceptions. Walter Gropius had the tubular metal handrail of the staircase molded and welded in situ to meet his specifications for function and aesthetic appeal. Exterior spot lights were also custom designed.[4] Stock items were selected for reasons of economy, but also because Gropius wanted to demonstrate that readily available American industrial products could be used to create elegant solutions to modern building design.[5]

The Gropius House is a two story, flat roofed, wood frame structure 2300 square feet in floor area, with white painted vertical redwood siding, a tar and gravel roof, and a stone foundation. A gray-painted exterior chimney on the west side is of brick laid in Flemish bond. Fenestration, arranged in horizontal bands or ribbons, is composed of fixed panes of glass alternating with casement sash, both with gray-painted steel frames. Windows are narrower on the principal elevation on the north for privacy and weather protection and wider on the other elevations where they provide access to views, passive solar heat and sunlight, a condition that reiterates the southern orientation of many Colonial houses in the region. Windows are largest in the living and dining areas, where three windows 6' high by 10'-11.5' wide act to minimize the barriers to the outdoors and create ever-changing patterns of shadows on the interior walls. The large windows on the south elevation are sheltered from the sun by an extension of the roof that functions as a brise-soleil in the summer. Open joists next to the house support the brise-soleil while, as Ise Gropius explained, keeping moisture from being trapped next to the house under the roof line.[6] The tongue-in-groove redwood siding gives the house's exterior a subtle texture, while the central roof drain that extends down through the house eliminates the need for exterior gutters and down spouts. A partial cellar extends under the kitchen and hallway. Elsewhere there is crawl space.

The house, as viewed from the street appears to be a rectangular box, set off by several contrasting elements appended to the exterior. Most notable is the flat roofed marquee at the main entrance, partly cantilevered and partly supported by two steel posts and a glass brick wall, that angles out at about 30 degrees toward the northeast. A gray-painted metal spiral staircase set against the solid wall of siding on the western part of the north side provides access to the upper deck and acts as sculptural relief to wall of plain siding behind it. Two white-painted trellises composed of vertical slats that extend from the sides of the building emphasizing the house's connection to the landscape while further softening the overall composition.

---

[2]Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 14.

[3]See the architects' specifications for the Gropius House in the Gropius manuscript collection in the SPNEA Library and Archives.

[4]Peter Gittleman, "The Gropius House: Conception, Construction and Commentary" (Master's thesis, Boston University, 1996), 43.

[5]Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 5.

[6]Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 8.

In reality, the building's mass is more complicated than a simple rectangle. The first floor foot-print is 21' 9" by 54' 8' in overall dimensions (a typical ground plan for the Colonial buildings that served as one inspiration for the structure). The second floor living space is in part deeper than 21' 9", its eastern two bedrooms being extended to the rear over the entrance to the kitchen and the porch below by 7 feet, while the west end is given over to a 21' by 14' deck. The void of the deck is concealed on the facade by a solid wall of siding interrupted only by the access opening for the spiral stairs. An 11' 6" by 23' screened porch extends out at right angles from the rear of the house.

The east elevation of the house, is a quasi-public side where the driveway and service access to the house are located. This facade is a simple rectangle with its features, ribbon windows and a covered entrance to the kitchen, arranged in an asymmetrical composition. The windows on the first floor on this elevation are an example of an instance where the women in the family prevailed in their wish to have larger windows in the kitchen and maid's room than had been planned originally.[7] The south and west elevations, adjacent to the garden and outdoor living areas, are the most complex in terms of contrasting textures and solids and voids. On the south elevation, the wall plane projects outward on the second story for the wider mass of the eastern bedrooms, and recedes where the deck is open. The strong rectangular eave line of the brise-soleil above helps to unify the design. The flat roofed, screened porch positioned to catch the summer breezes and leave the large windows unshaded extends out into the garden landscape. More than half of the west elevation is taken up by the large living room window and the open deck above. Metal pipe railings extend across the open parts of the deck. The roof of the deck is defined by open joists. The broad rectangular chimney extends upward and encloses part of the west side of the deck. The north wall of the deck was painted a salmon pink in 1949 that Bauhaus artists had selected to use as a background when exhibiting their paintings. While the color is an effective touch that offsets the shifting shadows on the wall and sunset views visible from the deck, the pink was chosen to reduce the glare from the wall, which had previously been white.[8]

The compact interior plan is arranged to provide ease of circulation, economy of space, orientation toward the south for all living spaces and bedrooms, and stacked plumbing for the house's 3 1/2 bathrooms.[9] The first floor within its modest footage incorporates a central hall, an efficient study, an ample L shaped living room and dining room, one-and-one-half baths, and a service area of pantry, kitchen and maid's room completely separated from the family portion of the house.

The house is organized around a two-story central hall eliminating the need for corridors. A curved staircase with chrome pipe balusters and a black metal pipe handrail ascends to the upper hall and is one of several curvilinear elements that act in elegant counterpoint to the rectilinear components of the house. The hall, lighted by the glass brick wall adjacent to the entry is sheathed in white painted clapboards installed vertically. Coats of varying textures and colors hanging in the open coat closet become, as the Gropiuses intended, a decorative element in the hall. The floor of the hall is of 12" by 12" pressed cork tile. Deterioration of the original tiles prompted SPNEA to replace the floor with new

[7] Ati Gropius Johansen, Recorded interview, March 26, 1995.

[8] Unsigned note on Walter Gropius's stationery explaining that the wall was painted in 1949 and that Lyonel Feininger, who was visiting at the time, supervised the painting. SPNEA Gropius file.

[9] The description of materials and fittings in this section is taken from Ise Gropius's *History of the Gropius House* (SPNEA, 1977).

tiles in 1988. This is the only instance where interior finish materials have had to be replaced. Elsewhere in the house finish materials are original.

From the hall, one enters the study. The double Bauhaus-designed desk on the north wall provided work space for the Gropiuses while the north window above gave a constant light. The south wall of the room is a slightly angled glass brick partition. The wall, which divides this space from the dining room, does not block light in either direction, but enhances the feeling of spaciousness of these small rooms. The living room, 14' 5" by 21' spans the west end of the first floor and forms one continuous space with the 11' by 13' 5" dining room. The two areas can, however, be separated by curtains. The large areas of glass on the west and south side open the rooms to the views outside, while the glass door provides ready access to outdoor living space. The fireplace with plain plastered chimney breast was put in, as Walter Gropius said, for its psychological appeal and as a backup in case of emergencies.[10] Book shelves filled with the Gropiuses□ collection of Bauhaus imprints line the north wall of the room above the day bed where Gropius frequently sat while reading. The walls and ceilings of the living room, dining room, study and the ceiling of the halls are covered with a sound-absorbing textured plaster made by the California Stucco Company.

The kitchen and pantry are minimal in size, but efficiently arranged. Standard 1938 kitchen equipment of white-glazed metal cabinets remains in place today. A large window of ribbed glass on the upper portion of the south wall fills the pantry with light. The dishwasher presented to the Gropiuses in 1938 by the General Electric Company was replaced in the 1960s. The stove and refrigerator were replaced slightly later. The pantry can be screened visually from the dining room when the table is being cleared by gray plastic curtains cut down from standard shower curtains. The maid's room and bath off the kitchen to the northeast became a second guest room after 1941 when many domestic workers took factory jobs and the Gropiuses were no longer able to hire a maid.

The second floor contains the master bedroom suite on the southeast lit by windows along the east wall and part of the south wall. The small master bedroom is divided from the dressing room by a plate glass partition, with mirror attached to it, over the dressing table. The partition enabled the dressing room to be heated separately from the bedroom, which the Gropiuses preferred cold for sleeping. The bathrooms were on separate heating controls so that they could be kept warm even at night.

The guest bedroom, the south central room, is just large enough to accommodate two beds head to foot and a desk. This and daughter Ati's room to the west have three foot high ribbon windows spanning their south walls and looking out on the garden. In Ati's room, a sleeping alcove on the north side can be curtained off from the rest of the room, this being both her bedroom and sitting room where she could entertain friends. The upstairs deck at the west end of the house is accessed through a glass door. The exterior spiral stairs leading from the ground to the deck were put in at Ati's request. She wanted to be able to have her friends visit without meeting or interrupting her parents.[11] An alcove off the second floor hall provides storage for linens and space for a sewing machine, that was originally closed off by a curtain. Throughout the house closets contain shelves as well as hanging space to eliminate the need for dressers.

[10] Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 8.

[11] Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 11.

The orientation of the house, the location of windows to catch views and light, the siting on the crest of the hill and the landscaping of the exterior were the result of long, careful planning, and attention to economy. The house reflects the Gropiuses' philosophy that aesthetic, psychological and spiritual appeal result from careful proportioning and honest use of materials and forms. The house was designed to accommodate much of the furniture built at the Bauhaus in 1925 for the Gropius's Dessau house, which they were able to persuade the German government, by then proud of the seminal influence of the Bauhaus, to let them export.

Color schemes for painted surfaces, upholstery curtains, and carpets are neutral beige's, grays, browns and off whites. These provide an effective foil to the wooden, chrome and plastic elements of the furniture, as well as to the shifting patterns of sunlight and shadow and changing qualities of light in the house that are one of its most appealing characteristics. Throughout the house are occasional touches of red and orange. Furnishings, works of art, lighting fixtures, dishes and natural objects were carefully selected by the Gropiuses for their aesthetic qualities and to reflect the design philosophy of the modern movement. These elements were an integral part of their conception for the house. The Gropiuses continued to alter and refine the installation of these elements through the course of their residence. The house is currently interpreted to the period from 1965 to 1969 to reflect the period in Gropius's later life when he had accumulated significant gifts from former students and colleagues in recognition of the important role he played in their lives, which he and Ise displayed in their house.

Furnishings in the house include pieces from the Gropiuses' Dessau house and from Gropius's office at the Bauhaus that were made in the Bauhaus workshops. Among these are the double desk in the study, the furniture in the master bed room and guest room, and the desk from Gropius' Bauhaus office that is in their daughter's room. Other pieces were designed at the Bauhaus by faculty and students. These include the dining room chairs made by Marcel Breuer in the carpentry workshop in 1925 and the round dining table designed by another Bauhaus student, Gustav Hussenpflug. The collection of Bauhaus furniture in the house is the largest assemblage of furniture from the school outside of Germany. There are, in addition, several pieces that were designed especially for the house, such as the built-in buffet in the dining room and the dressing table in the dressing room of the master bedroom. Both of these were made of a resin material known as Caffelite supported on chrome legs.

The Gropiuses continued to add or receive as gifts other examples of contemporary furniture by leading designers. Notable among these are the Isokon Long Chair in the living room, a lounge chair of molded plywood blond in color designed by Marcel Breuer and produced by the British firm of Isokon, and acquired by the Gropiuses in the late 1930s; the "Penguin Donkey" magazine rack in the study, also an Isokon piece; the molded plastic upholstered lounge chair designed by Eero Saarinen, known popularly as the "womb chair," which was a birthday gift from friends to Gropius in 1953; and the two stools in front of the fireplace designed by Sori Yanagi of Tokyo in 1956.

The use of light is one of the most distinguished aspects of the Gropius House. As their daughter, Ati, said, "They were gluttons for light."[12] This included not only the manipulation of natural light through the use of a glass brick partition between the dining room and study, light filtering curtains, and an exterior aluminum Venetian blind on the west window in the living room, but carefully selected fixtures.

[12] Ati Gropius Johansen, Recorded interview, April 21, 1989.

Notable among these are the Bauhaus designed adjustable lamps over the desk in the study, and the Kliegl spot light over the dining room table described by Walter and Ise Gropius thus:

> The Kliegl light in the ceiling above the dining room table is most successful. Simple glassware and pottery looks glamorous in the brilliant pinpoint illumination. Attention is centered on the table and food, while eyes remain protected from the glare.[13]

Throughout the house exquisite artworks from the Gropiuses' collection were displayed. Like the furniture, the works on display evolved over time as the Gropiuses acquired new works or as they refined or shifted their presentation. The art falls into several categories. There are works by Bauhaus artists Alexander Schawinsky, Herbert Bayer, Ladislaus Moholy-Nagy, and Joseph Albers made either during their residence at the Bauhaus, or later in their careers. The Plexiglas painting over the fireplace was made by Moholy in 1938 during his tenure as director of the New Bauhaus in Chicago (later the Institute of Design). The incised plastic work in the upper hall made in 1949 was given by the artist Joseph Albers to Gropius for his 70th birthday.[14] Works by well known artists of the modern movement include the Henry Moore drawing, *Underground Shelter with Figures,* that the artist, who became acquainted with the Gropiuses during their stay in England, gave to them in 1941.

Another group of works are by colleagues at The Architects Collaborative (TAC), by Gropius's students, or relate Gropius's architectural projects. There are a number of paintings by TAC colleague Louis McMillen. The tetrahedral kite in the living room was made by a student. The Joan Miro silkscreens in the guest room were of murals made for the Harvard Graduate Center and the UNESCO Building in Paris. A small bronze in the living room is a copy of Dimitri Hadzi's *Thermopylae* that was installed in the TAC-designed Kennedy Building in Government Center in Boston.

Other objects of cultural significance or natural appeal contribute to the decoration of the house while reflecting the Gropiuses' interests. These include photographs of sculptures, such as that of the archaic Greek Kouros in the hall, small ethnographic figures, and an extensive art history library. There is a collection of Japanese objects--fans, parasols and drawings--that illustrates the couple's appreciation of Japanese culture. "Walter and Ise Gropius's aesthetic regard for natural objects is demonstrated in the stones, seashells and dried flower arrangements used to decorate the house. . . . House plants formed an important part of the interior decor."[15] Plants, some of them surviving from the Gropius occupancy, are still featured in the house.

The two-car garage has a shallow shed roof, vertical redwood siding painted white, and small band of windows on the side and in the overhead doors. On the advice of Mrs. Storrow, the garage was built close to the road at the bottom of the gravel driveway that curves up to the east side of the house in order to minimize the amount of snow shoveling necessary. The garage was remodelled on the inside by SPNEA in 1997 to serve as a visitors' center, according to plans by architect Jeffrey Pond with advice

---

[13] Walter and Ise Gropius, "Time mellows this modern house," *House and Garden* (January 1949), 75.

[14] Information about the works of art in the Gropius House comes from Elizabeth Redmond, "Gropius House Furnishing Plan," SPNEA, 1988, 18-19, and Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 16-18.

[15] Elizabeth Redmond, "Gropius House Furnishing Plan," SPNEA, 1988, 18-19.

from Ati Gropius Johansen and her architect husband, John Johansen. When the overhead doors are closed the original appearance of the garage is maintained. When the doors are opened, the space for ticket sales, gift shop and exhibits is revealed through large glass window recesses behind the overhead doors.

The landscape that the Gropiuses planned reiterated the economy, simplicity and careful planning that characterized their approach to the house. The property when they began to plan their residence had an orchard of 90 apple trees on the slope in front of the house site. Early on, they determined to introduce a few trees to the house site for shade and visual definition of the building. According to their daughter, Ati, they went looking for appropriate trees on surrounding land belonging to the Storrows.[16] Before construction began, five trees were transplanted to the site.

The grade at the top of the hill was leveled before construction. The area immediately around the house was fashioned into a flat grassy plinth bordered on the south and west by retaining walls. This area became outdoor living space with areas designated for sitting defined by flag stones set into the grass and other areas given over to grass or plantings. While the retaining walls suggested the stone walls remaining elsewhere on the property that are remnants of its past use as farm land, the new retaining walls were topped with flat flag stones, a solution intended to make mowing easier. South of the screened porch two lally columns supporting a wooden beam were set into the landscape 20' south of the porch to act as a frame for distant views. Outside of the grassy plinth on the private sides of the house are areas that were less actively maintained where brush was kept down and natural features such as boulders were enhanced with plantings. On the south, this outer area was bordered by the remains of a farm stone wall. The Gropiuses, thus, fashioned the landscape into a series of spaces that progressed from the planned landscape immediately around the house to a less cultivated intermediate space further out and finally to the natural and agricultural landscape beyond that was present when they came. Never were planned features intended to create barriers between portions of the landscape. Borders were suggested by various means, but were always permeable, and the gradient between the house, its immediate surroundings and the less worked and natural landscapes beyond was always discernable. The retaining walls do not form a rigid rectangle. A vestige of a retaining wall on the east extends a short distance from the south retaining wall at right angles and terminates in a raised seating bench. The retaining wall along the south side extends beyond this return. Elements such as these were intended to suggest permeable spatial boundaries and informal closure between the house and its surroundings.

Landscape historians now recognize that the landscape reflects modernist spatial philosophy as much as the house does. Walter Gropius had, in fact, articulated in writing that spatial philosophy as early as 1933 (see Section 8), and his ideas surely guided the layout of the Gropius landscape. The distinction is that Walter and Ise Gropius were amateur gardeners not landscape architects. They came to their treatment of the landscape not through formal training but through the intuitive use of their spacial and aesthetic senses to shape and cultivate the landscape for their own enjoyment. As Ise Gropius remembered, "We did the landscaping ourselves over a long period of time."[17]

---

[16] Ati Gropius Johansen, Recorded interview, March 26, 1995.

[17] Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 18.

Plantings were as carefully chosen as any elements of the design for their aesthetic appeal and to enhance built or opportunistic features of the landscape. Day lilies and yukka were planted by the entrance, with the aluminum sculpture by R. E. Filipowski itself looking like a stylized shrub adjacent. Pink roses climbed the trellis, while bittersweet climbed lally columns and Concord grapes climbed the deck elements. A perennial border was planted in the garden bed south of the porch near the informal flag stone terrace outside the living room. Outdoor floodlighting maintained the continuity between the house and the landscape even after dark. The orchard was retained and pruned. The grass in the orchard was allowed to grow tall, except for a 12' wide strip adjacent to the driveway that was kept short.

A significant change to the landscape occurred after the Gropiuses took a trip to Japan in 1957. Thereafter, they replaced the perennial border beyond the porch with a Japanese inspired garden. A gravel bed was put in, azaleas and other plants were placed in an asymmetrical arrangement and a red-leafed Japanese maple tree was planted at the end of the bed.

Elements of the landscape have evolved and grown over time, and the apple orchard has all but disappeared. In recognition of its national significance, the Gropius property was selected in May of 1999 to receive a grant from the Save America's Treasures program. The funding will be used to replant the orchard in 2000, to restore other planted elements of the landscape to an appearance consistent with the Gropius period, and to continue repairs to the building's windows and roof. In 2000-2001 the Society for the Preservation of New England Antiquities completed most of the work on the building itself. This entailed repainting the exterior and interior, repairing the steel sash windows, and putting on a new roof. In 2001 they will begin working on the landscape which will include restoring the orchard and the Japanese garden.

The house has remained virtually unaltered over the years. Only the cork floors in the hall have required replacement. The house, given to SPNEA in 1980 and opened as a house museum in 1984 retains its furnishings, the most important collection of Bauhaus-designed furniture outside of Germany; works of art, many by leading members of the Modern Movement; its decorative treatments and finish materials virtually intact. The occasional repairs and refurbishing completed under SPNEA's direction have been carefully planne to preserve the appearance of the house as it was in the later years of Gropius's life (1965-1969), a period of interpretation chosen as most representative of the totality of the Gropiuses' lives in the house. Intrusions into the building fabric have been held to the minimum consistent with the overall conservation of the building and its finish materials. The landscape, recently identified as a distinguished and early example of modern landscape design, retains all key elements, with the exception of the apple orchard.[18] All of these considerations give the property integrity of location, design, setting, materials, workmanship, feeling, and association.

[18] See Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, Typescript, SPNEA Library and Archives.

8. STATEMENT OF SIGNIFICANCE

Certifying official has considered the significance of this property in relation to other properties:
Nationally: X Statewide:__ Locally:__

Applicable National Register Criteria:	A__ B X C X D__
Criteria Considerations (Exceptions):	A__ B__ C__ D__ E__ F__ G X
NHL Criteria:	2, 4
NHL Criteria Exception:	8
NHL Theme(s):	III. Expressing Cultural Values 1. Education 2. Visual Arts 5. Architecture, Landscape Architecture
Areas of Significance:	Architecture: Modern Architecture Landscape Architecture: Modern Landscape Design
Period(s) of Significance:	1938-1969
Significant Dates:	1938
Significant Person(s):	Walter Gropius
Cultural Affiliation:	N/A
Architects:	Walter Gropius and Marcel Breuer,Associate Architects
Builder:	Casper J. Jenney

State Significance of Property, and Justify Criteria, Criteria Considerations, and Areas and Periods of Significance Noted Above.

The Gropius House is nationally significant as the house of Walter Gropius and his family. Gropius was one of the founders of the Modern Movement in architecture, who designed several early masterpieces of the movement. He is perhaps most revered as a teacher and articulator of the modernist philosophy of architecture, design, urban planning and the social responsibility of architecture. His conception and direction of the Bauhaus from 1919 to 1928 garnered an international and long-enduring reputation for the school for its teaching methods and for its integration of design, crafts and industrial arts into one all-encompassing modernist vision.

In his role as Chairman of the Department of Architecture at the Graduate School of Design at Harvard from 1938 to 1952, he trained many leaders in the field of modern architecture including I. M. Pei and Paul Rudolph. As a partner in The Architects Collaborative from 1945 to 1969, he participated in the creation of many distinguished examples of Modern architecture. The Modern Movement, though now somewhat in eclipse, was broadly influential and shaped contemporary building design and the appearance of the built environment throughout the world in civic, commercial and industrial architecture and in residential design. The house that he and his wife conceived in 1937 was an expression of their personal interpretation of the Modernist philosophy, and it was, as I. M. Pei said, Gropius's "definitive statement of domestic architecture."[19] As such, the Gropius property is significant for its association with Walter Gropius and as an outstanding and influential example of Modern architectural and landscape design. Walter Gropius (1883-1969), ~~his wife, Ise Frank Gropius (d. 1983),~~ arrived in the United States in the spring of 1937 where Gropius was to take up duties as Chairman of the Department of Architecture at the Graduate School of Design at Harvard University. The Gropiuses' daughter, Ati (b. 1925), joined them in the summer. Gropius, born in Berlin and trained as an architect in Germany before World War I, secured his place as a founder of the Modern Movement in architecture by designing the Fagus factory in 1911 with Adolph Meyer. The Fagus factory was the first building where a steel frame and glass curtain walls were substituted for appearance of supporting exterior walls. The result was an elegant lightness and architectural economy unknown previously. As Sigfried Giedion said, "For the first time the trend toward transparency and absence of weight found undeniable architectural expression."[20] Gropius's temporary model factory for the "Werkbund" exhibition in Cologne in 1914 elaborated on these new potentialities.

Gropius, trained as a cavalry officer in his youth, served in World War I and was wounded. Even before he left the army, he conceived of the Bauhaus as a way of reconciling fine arts, and crafts in the service of modern industrial design. Disillusioned, like many intellectuals about Germany's prospects at the close of the war, he sought new solutions to the problems of architecture and design that would better serve society. He was appointed head of the Academy of Art and the School of Arts and Crafts in Weimar and transformed them into the Bauhaus school. As Mies Van de Rohe, teacher under Gropius and subsequent director of the Bauhaus said:

[19] I. M. Pei, as quoted in Stephen Games, "Crystal Visions," A documentary of the work of the architect, Walter Gropius (British Broadcasting Corporation, 1983), 30. Transcript, SPNEA Library and Archives.

[20] Sigfried Giedion, *Walter Gropius* (1954. Reprint, New York: Dover Publication 1992), 23-24.

> The Bauhaus was not an institution with a clear program, it was an idea and Gropius formulated this idea with great precision. He said, "Art and technology -- the new unity." He wanted to have painting, sculpture, theater and even ballet on the one hand, and on the other weaving, photography, furniture -- everything from the coffee cup up to city planning [included].[21]

The Bauhaus, fraught always with financial problems and scepticism from the outside and from within, nevertheless brought together leading artists and craftsmen as teachers, and trained students who influenced design and teaching throughout the civilized world, an influence that continues today. Gropius led the Bauhaus from 1919 until 1928 through the institution's move in 1925 to the more welcoming city of Dessau. The move enabled Gropius to mastermind the construction of the acclaimed Bauhaus buildings of 1925-26 and to design his own house in a complex of faculty housing. The Gropiuses' house in Dessau would presage their Lincoln house in its simplicity, careful planning, and large areas of fenestration that admitted natural light and connected the house with its natural surroundings. Gropius resigned as director of the Bauhaus in 1928 in hopes that his departure would quell political controversy surrounding the school. He entered private architectural practice in Berlin and immersed himself for the first time in urban planning and large scale housing design, but many of his projects remained unbuilt.

In 1934, Gropius and his wife, finding the German government increasingly inhospitable, moved to England, where Gropius entered partnership with Maxwell Fry. In 1937, Dean Joseph Hudnut of the School of Architecture and President James Conant of Harvard University persuaded Gropius to come to Harvard, revitalize the Graduate School of Design, implement his teaching methods shaped by the Bauhaus years, and free the school from the Beaux-Arts methods and philosophy that had dominated it previously.

Gropius, his wife and daughter, now Ati Gropius Johansen, rented a house in Lincoln, Massachusetts shortly after their arrival and began to explore the traditional architecture of New England of which their rental house was an example. They were enchanted with Lincoln and eager to build a house of their own there. Financial considerations would have made it impossible for them to build had not Helen Osborne Storrow, the wealthy and civic minded widow of James Storrow, a prominent Boston banker, offered to provide the site and pay for the construction of their house. A mutual acquaintance, architect, Henry Shepley of the Boston firm of Coolidge, Shepley, Bulfinch and Abbott approached Mrs. Storrow about the idea. She readily agreed because, as Ise Gropius remembered:

> One of her principles was that a newly arrived immigrant should always be given a chance to show what he could do best. If it was good, it would take root, if it wasn't it would disappear. But it had to be tried out.[22]

The conditions were that the Gropiuses would pay 6% of the total construction cost of the house a year as rent and would have an opportunity to purchase the property in the future. In fact, they did buy the

---

[21] Ibid., 17. For further description of the principles that guided the Bauhaus, see Walter Gropius, Ise Gropius and Herbert Bayer, *Bauhaus 1919-1928* (New York: Museum of Modern Art, 1938), 6.

[22] Ise Gropius, History of the Gropius House (SPNEA, 1977), 2.

house in 1945 after Mrs. Storrow's death. Rental costs provided and incentive to keep overall costs down and the structure was built for about $20,000.[23] Mrs. Storrow would later provide the same conditions for the four families that settled on Woods End Road just west of the Gropius property between 1938 and 1939.

The design of the Gropius House was the result of intense study and planning by Walter Gropius, his wife, Ise and even their twelve-year-old daughter, Ati. According to Ati Gropius Johansen, "I think it was being discussed at every meal. I mean, the endless discussion about . . . orientation. . . . Whether the windows should be here, and the east and the sun. . . and all that."[24]
In keeping with their established philosophical approach, the Gropiuses studied local architecture, wanting to respect indigenous methods and materials. They acknowledged that New England wood frame buildings won their admiration and were a source of inspiration in the design of their house. Gropius wrote to Maxwell Fry in 1937, "the landscape around Cambridge and Boston is fine and attractive and surprisingly unspoiled. The old white-painted colonial houses, unpretentious and genuine in plan and appearance, won my affection."[25] They found such buildings had much in common with Modern architecture. The Gropius house is also clearly inspired by the principles of the Modern Movement in architecture that Gropius was instrumental in defining. These principles were identified and described for American audiences in 1932 by Henry Russell Hitchcock, Jr., and Philip Johnson in the catalog for the exhibit on the "International Style" at the Museum of Modern Art in New York, a name originally suggested by Alfred Barr of the museum. The aesthetic principles of the International Style, they said, were:

> A sense of volume as opposed to solidity, regularity as opposed to symmetry, and detail achieved through the intrinsic elegance of materials, technical perfection, and fine proportions as opposed to applied ornament.[26]

Many since, including Walter Gropius and Hitchcock, have repudiated the style name, though it is still broadly used. Gropius said in 1943:

> I want to rip off at least one of the misleading labels that I and others have been decorated with. There is no such thing as an "International Style" unless you want to speak of certain universal technical achievements of our period which belong to the intellectual equipment of every civilized nation, or unless you want to speak of those pale examples of what I call "applied archaeology," which you find among the public buildings from Moscow to Madrid to Washington. Steel or concrete skeletons, ribbon windows, slabs cantilevered or wings hovering on stilts are but impersonal contemporary means--the raw stuff, so to speak—of which regionally different manifestations are created.[27]

[23] Ati Gropius Johansen, Recorded interview, March 26, 1995.

[24] Ati Gropius Johansen, Recorded interview, March 26, 1995.

[25] Walter Gropius, Letter to E. Maxwell Fry, Cambridge, Mass., April 8, 1937, as quoted in Reginald Isaacs, *Walter Gropius: an Illustrated Biography of the Creator of the Bauhaus* (Boston: Bulfinch Press, 1991), 232.

[26] Henry Russell Hitchcock, Jr., and Philip Johnson, *The International Style*, 1932, 13.

[27] Walter Gropius, *Scope of Total Architecture* (New York: Harper and Bros. Publishers, 1955), xxi.

As early as 1931, Walter Gropius had articulated his vision for the modern house in an American architectural journal. This vision encompasses the philosophical approach that guided his teaching at the Bauhaus and later at Harvard and found ultimate expression in his Lincoln house:

> According to the new view about a dwelling to come up to present day requirements, the dwelling house should no longer resemble something like a fortress. . . . Instead it should be of light construction, full of bright daylight and sunshine, alterable, time-saving, economical and useful in the last degree to its occupants whose functions it is intended to serve. . . .
>
> The ground plan of a dwelling house is a geometrical projection of its spatial idea--the organizing plan for moving within the house. The elevation, facade, is the result of that plan and not the starting point of the house design. Hence no artificial symmetry, but a free functional arrangement of the succession of rooms, short, time-saving passages of communication, moving space for the children, clear separation between the living, sleeping, and the housekeeping parts of the house, and finally proper utilization of the ground and especially the sunny aspect. The bedrooms need morning-sun (facing east), the living rooms should have southern or western light, and the north side is left to storerooms, kitchens staircases and bathrooms.[28]

The subtle influence of regional architecture on the design of the Gropius House reflected Gropius's respect for indigenous, tried and true practices:

> I tried to solve the problem in much the same way as early builders of the region had faced it when, with the best technical means at their disposal, they built unostentatious, clearly defined buildings that were able to withstand the rigors of the climate and that expressed the social attitude of their inhabitants.[29]

This was not to say that the house was nothing more than a rational solution to the program. Gropius recognized that spiritual and psychological needs must be met by architecture. These were achieved:

> Through proportion upon which the "beautiful" effect depends. Proportion is a matter of the realm of the spirit: construction and materials are its bearers, with the aid of which it reveals the genius of its creator. It is determined by the particular function of a given house, and through it the latter is imbued with the "tension" a spiritual life of its own, as it were, beyond the utility value of the house.[30]

Later evaluations of Gropius suggest that he kept his emotional reaction to aesthetic form in check in order to better serve the greater needs of the Modernist vision. However, one has only to look at his

[28]Walter Gropius, "The Small House of Today," *Architectural Forum* 54 (1931), 269; 274.

[29] Walter Gropius, *Scope of Total Architecture* (New York: Harper and Bros. Publishers, 1955), xxii, as quoted in Peter Gittleman, "The Gropius House: Conception, Construction and Commentary," (Master's thesis, Boston University, 1996), 10.

[30]Walter Gropius, "The Small House of Today," *Architectural Forum* 54 (1931), 271.

house to understand that he responded to the aesthetic appeal of even utilitarian objects. For example, in writing to the Briggs Manufacturing Company in 1957, he said:

> Before the war, I used in my own new house in Lincoln, Massachusetts, a new form of toilets which you had just brought out . . . . They were of an entirely rounded out, soft form of toilet, in fact the best form of toilet I have ever seen.[31]

Soon after he arrived at Harvard, Gropius negotiated to bring Marcel Breuer to the Harvard faculty. Breuer, a talented designer of furniture as well as architecture born in Hungary, was trained at the Bauhaus. He left Germany for England in 1933. By the fall of 1937, Gropius and Breuer had formed an architectural partnership. Breuer was the first of many refugees and intellectuals from Europe whom the Gropiuses would help to resettle in the United States, promoting them for jobs, offering emotional support or even on occasion a temporary place to stay.

By November 1937 plans of the Gropius House were prepared, which list the firm of Gropius and Breuer as architects. Shortly thereafter, Mrs. Storrow funded construction of a house for Breuer on adjacent Woods End Road. There has always been speculation as to the extent to which Breuer was involved in the design of the Gropius House. According to Joachim Driller, German scholar, the initial plans were prepared by a young draftsman while Breuer was away in England in the winter of 1937-1938. The plans were close to the structure as built, but lacked the brise-soleil. Driller believes that Breuer suggested the sun-blocking roof overhang, which was a feature that the architect had employed previously in his buildings.[32] Another scholar, Leslie Cormier, suggests that Breuer, particularly interested in the interplay of light and shade, was responsible for the shadow-creating roof joists over the upstairs porch.[33] In any case, it is clear that Gropius and Breuer wanted to use their respective houses to promote their architectural partnership. They would, therefore, have been likely to make suggestions for improvements to each other's designs, which might or might not have been accepted..

The contractor for the Gropius House was Casper J. Jenney. Jenney, reminiscing in later years described the experience of working with Gropius and Gropius's wish to involve his students at Harvard in the project as part of the hands-on experience that he considered essential in training and that he had first put into practice at the Bauhaus:

> We found everything we needed for the house in stock [catalogs]. His ideas were most unusual. Although he used stock items, he used them in ways different from anything I had done before . . . . Many afternoons we sat for a couple of hours on a sawhorse talking over the house changes as I did not always agree with his ideas. Many times he was right and I was wrong. Almost every afternoon several boys from Harvard came out

[31] Walter Gropius, letter to Briggs Manufacturing Company, Warren, Michigan, February 7, 1957 (Gropius Collection, SPNEA Library and Archives).

[32] Jaochim Driller, "Bauhaus Architecture New England Style? Remarks on the Gropius House in Lincoln, Mass," p.2, as quoted in Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary," (Master's thesis, Boston University, 1996), 33.

[33] Leslie Humm Cormier, "The Woods End Colony: an Architects' Refuge in America," (Master's thesis, Brown University, 1983), 26.

> to Lincoln to look at the progress of the house. Dr. Gropius spent much time with them, giving his reasons for using the materials that were inexpensive without cutting down on quality. We both thought it would be a good idea at Harvard to require pupils to have at least two years experience in practical building before they designed houses and buildings. I agreed to take on at least three pupils each summer from Harvard and he agreed to give them credit for their work.[34]

Throughout Gropius's tenure at Harvard until his retirement in 1952, students continued to experience the Gropius house. At least two student gatherings were held at the house every year. Ise Gropius always said that their objective was for people to "see a modern house in operation."[35]

Landscape

The landscape at the Gropius property has not until recently received the scholarly attention that has been devoted to the house. Recently scholars have examined the landscape in the context of other designed landscapes of the 1930s and the subsequent refining of the Modernist landscape architecture, and have found that the landscape is a potent statement of the key principles of modern landscape design.[36] While Walter Gropius is not associated with landscape design to the extent that he is with the architecture of the modern movement, he nevertheless did articulate early on a philosophy of landscape design that is now recognized as embodying the design ideals of Modernist movement in landscape architecture. Writing in 1933 in an article entitled, "The House of New Lines," Gropius said:

> Of similar importance to the harmonic formulation of the building structure itself is the correct integration of the home into the landscape into the garden. The garden is simultaneously an extended living space on the outside. The arrangement of the plant environment, the diversion of green masses, the trees and shrubs in their relationship to the house and to its living functions require just as careful treatment as the grouping of the building mass itself. The interspersion of tree and plant growth between the building forms, which opens and closes the view, guarantees appropriate contrast, relaxes and enlivens the scheme, mediates between building and person, and creates tension and scale; for architecture does not exhaust itself in the fulfillment of its goals unless we observe as the purpose of a higher order the psychic needs according to harmonic space, according to the mass of the parts, which make the space truly living.[37]

Here is how one landscape historian analyzes the components of the Gropius landscape as a reflection of modernist philosophy:

---

[34]Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 5.

[35]Ise Gropius, "Walter Gropius: His New World Home," Film, 1970.

[36]Eric Kramer, "Modernist in a New England Landscape," December 17, 1997, Typescript, SPNEA Library and Archives.

[37]Walter Gropius, "The House of New Lines," a published article dated 1933 but without further attribution in the Busch-Reisinger Gropius Archive, as quoted in Eric Kramer, "Modernist in a New England Landscape," December 17, 1997, p. 7, Typescript, SPNEA Library and Archives.

> What we call the "garden" of the Gropius House, the highly cultivated space just adjacent to the house, then is essentially a carefully arranged series of diverse spaces and experiences at once defined *and* interconnected by permeable boundaries—colonnades of trees, screens of rose trellises and subtle changes of grade—that build a series of dissolving gradients between indoor and out. The house does not end at its thermal boundary. Instead it dissolved subtly into the space around it. Neither does the garden end at the exterior walls. It clings to the architectural elements and penetrates its spaces—the screened porch sits recessed into the mass of the building, the roof terrace dominates the second floor and large panes of glass bring the constantly shifting light and shade of the landscape into the living quarters. These outdoor rooms resonate strongly with the spacial arrangement of the interiors of the house. . . . Outside, the open plan of the house rather literally extended into the garden as rooms are formed and synthesized into a rationally and practically ordered sequence of spaces and experiences. At the same time the garden serves to build connections outside itself linking spaces reshaped for the needs of residential life to those slowly created over the long history of the larger agricultural landscape.[38]

Gropius's ideas for the landscape surrounding the Gropius House resonate with the larger issues of spatial planning and urban design with which he and his colleagues were grappling during his years at Harvard. The many people who visited or read about the Gropius House in the early years must have absorbed and been influenced by the landscape's design.

As soon as the house was completed, coverage of its unique design in newspapers and magazines was widespread, something that the Gropiuses supported in order to promote the Gropius/Breuer architectural practice and spread the Modernist philosophy that they espoused. Though not the first Modern house in America, it was, in many ways, the most influential due in part to this publicity. Ati Gropius Johansen remembers a constant stream of visitors.[39] Gropius and Breuer began to receive commissions for the design of Modern houses. When Gropius's and Breuer's partnership was dissolved in 1941 and he joined the Architects Collaborative in 1945, the firm would design more houses, including two neighborhoods in Lexington, Massachusetts: Six Moon Hill, where most of the TAC partners lived, and Five Fields. Deeply involved in teaching until 1952 and in the TAC architectural practice until his death in 1969, Gropius became the grand old man of the Modern Movement, who could take pride in the extent of his influence. Over 250 of Gropius's former students held professorships in schools around the world.[40] Many others held important positions as architects and planners. Gropius continued to attend social functions and to inspire friends and associates. He received significant recognition for his role in advancing Modern Architecture. He received an honorary Doctor of Art from Harvard University in 1953 and was awarded the "Grand Prix d'Architecture" of the Matarazzo Foundation of San Paulo, Brazil as the "architect whose work may be considered to have played a highly important role in the development of contemporary architecture."

[38] Eric Kramer, "Walter Gropius: Modernist in a New England Landscape," December 17, 1997, pp. 5-6, Typescript, SPNEA Library and Archives.

[39] Ati Gropius Johansen, Recorded interview, March 26, 1995.

[40] Hans M. Wingler, *Bauhaus Archive, Berlin*, p. 118, as quoted in Peter Gittleman, "The Gropius House: Conception, Construction, and Commentary," (Master's thesis, Boston University, 1996), 59.

In 1983, a group of architects, former colleagues, students and others gathered to reevaluate his career in the light of the growing disenchantment with the Modern Movement. Gropius's vision and integrity as a teacher were praised, while his own buildings and those he spawned through his students were seen as often not living up to their initial promise.[41] I. M. Pei, however, offered this evaluation of Gropius's architecture:

> I would say that his architecture in America is best represented by his domestic buildings. . . . And I think his own house is the best of the lot, because it's him, it's so much him and it's probably one of the best examples of experimenting with latching on new ideas and modern ideas on to a vernacular which already existed for some time in America and yet the house, the . . . openness of the house, the . . . manipulation of space and so on and the detailing in the house are all very, very first rate. I think that the house is now a landmark, and rightly so.[42]

[41]Stephen Games, "Crystal Visions," A documentary of the work of the architect, Walter Gropius (British Broadcasting Company, 1983). Transcript, SPNEA Library and Archives.

[42]I. M. Pei, as quoted in Stephen Games, "Crystal Visions," A documentary of the work of the architect, Walter Gropius (British Broadcasting Company, 1983). Transcript, SPNEA Library and Archives.

9. MAJOR BIBLIOGRAPHICAL REFERENCES

Unpublished Materials

Architectural Drawings of the Gropius House. Revised March 29, 1938. Busch-Reisinger Museum, Harvard University.

Cormier, Leslie Humm. "The Woods End Colony: An Architects' Refuge in America." Master's thesis, Brown University, 1983.

Games, Stephen. "Crystal Visions," A documentary of the work of the architect, Walter Gropius," British Broadcasting Corporation, 1983. Transcript, SPNEA Library and Archives.

Gittleman, Peter. "The Gropius House: Conception, Construction and Commentary." Master's thesis, Boston University, 1996.

Gropius Archive. Busch-Reisinger Museum, Harvard University.

Gropius Archive. Houghton Library, Harvard College.

Gropius Manuscript Collection. SPNEA Library and Archives.

Kramer, Eric. "Walter Gropius: Modernist in a New England Landscape." December 17, 1997. Typescript, SPNEA Library and Archives.

Redmond, Elizabeth. "Walter Gropius House, Lincoln, Massachusetts, Furnishing Plan," 1988. Typescript, SPNEA Library and Archives.

Published Sources

Anthony, Beulah Brown. "The Massachusetts Home of Dr. and Mrs. Walter Gropius." *American Home* (July 1939): 21, 54-57.

Campbell, Robert. "Utopia Revisited." *Boston Globe* (April 7, 1994): Home section.

Fitch, James Marsden. *Walter Gropius*. New York: George Braziller, 1960.

Ford, James and Katherine Morrow Ford. *The Modern House in America, 1930-1960.* New York: Architectural Book Publishing Company, 1940.

Giedion, Sigfried. *Space, Time and Architecture.* Cambridge: Harvard University Press, Fifth Edition, Revised and Enlarged, 1982.

__________. *Walter Gropius.* New York: 1954. Reprint. New York: Dover Publications, Inc., 1992.

Gropius, Ise. *History of the Gropius House*. Boston: SPNEA, 1977.

Gropius, Walter. *The New Architecture and the Bauhaus.* Translated by P. Morton Shand. London: Faber and Faber, 1935.

__________. *The Scope of Total Architecture.* New York: Harper and Bros. Publishers, 1955.

__________. "The Small House of To-Day." *Architectural Forum* 54 (March 1931): 266-278.

Gropius, Walter and Ise Gropius and Herbert Bayer. *Bauhaus* 1919-1928. New York: Museum of Modern Art, 1938.

__________. "Time Mellows This Modern House." *House and Garden* (January 1949): 72-77.

Hitchcock, Henry Russell Jr. and Philip Johnson. *The International Style.* New York: W. W. Norton & Co., 1932.

Isaacs, Reginald. *Gropius: An Illustrated Biography of the Creator of the Bauhaus.* Berlin: Gebr. Mann Verlag Gmbh & Co. KG, 1991.

Johansen, Ati Gropius. Recorded interviews with Peter Gittleman. Lincoln, Massachusetts, April 21, 1989; March 13-16, 1991; March 26, 1995; October 27, 1995. Audio tapes and transcriptions in the SPNEA Library and Archives.

Nerdinger, Winfried. *Walter Gropius.* Berlin: Bauhaus-Archive and Cambridge: Harvard University Art Museums, 1985.

Society for the Preservation of New England Antiquities. "Gropius House." *SPNEA Annual Report 1987.*

Tzonis, Alexander, ed. *The Walter Gropius Archive.* New York, London, Cambridge, Massachusetts: Garland Publishing, Inc. and Harvard University Art Museums, 1990.

Whitford, Frank. *Bauhaus.* London: Thames and Hudson, 1984.

11. FORM PREPARED BY

Name/Title: Anne Grady, Research Historian
Address: SPNEA
141 Cambridge Street
Boston, MA 02114

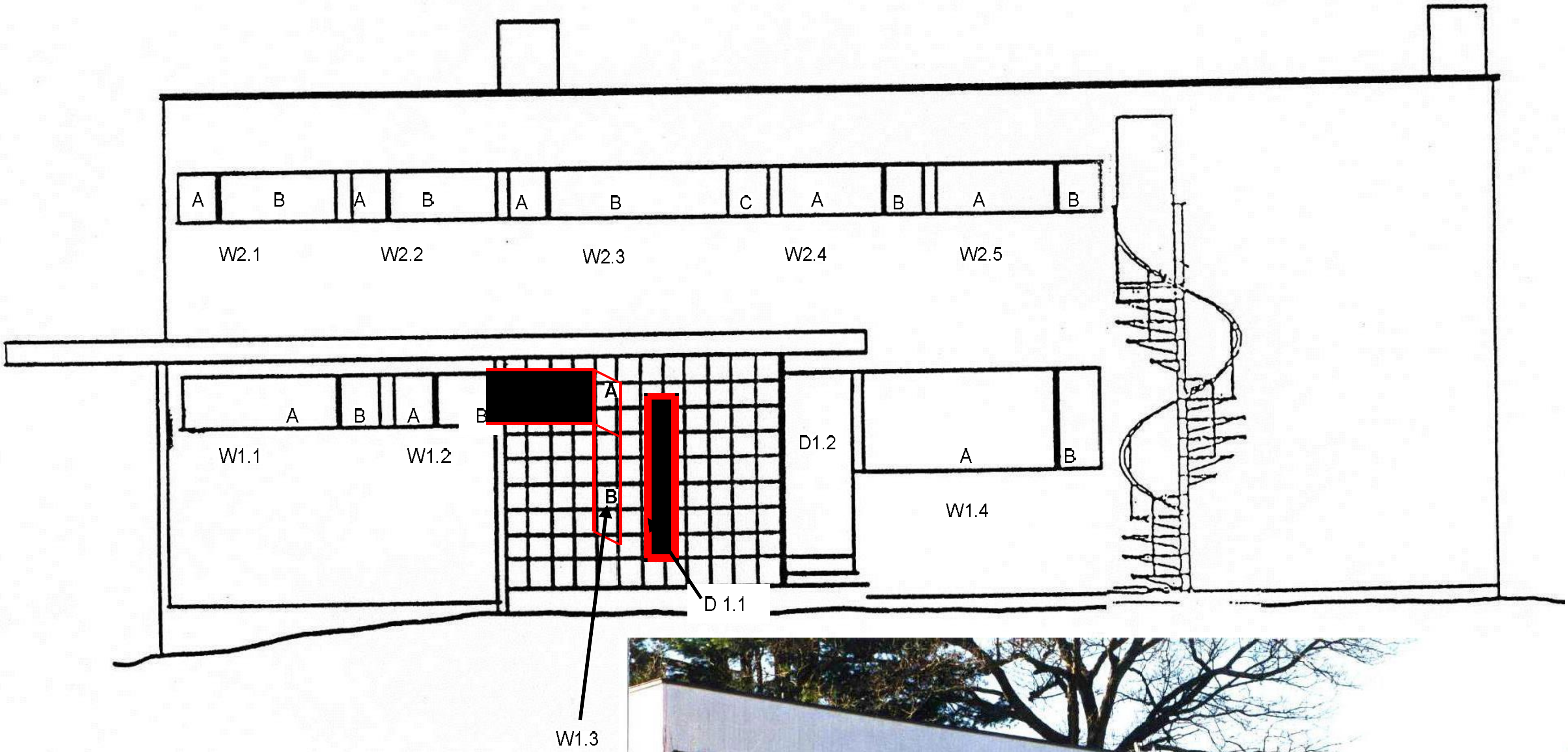
Telephone: (617) 227-3957, ext. 273
Date: January 13, 2000

Edited by: Carolyn Pitts
National Historic Landmark Survey
National Park Service
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

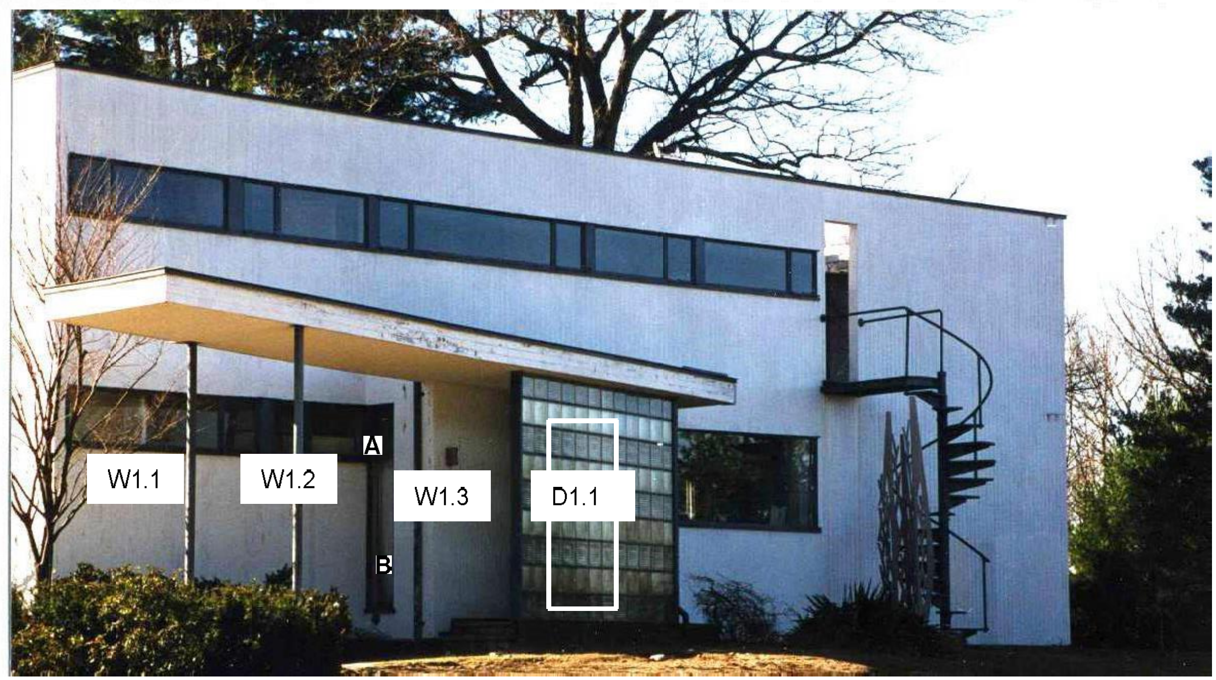
Telephone: (215) 597-8875

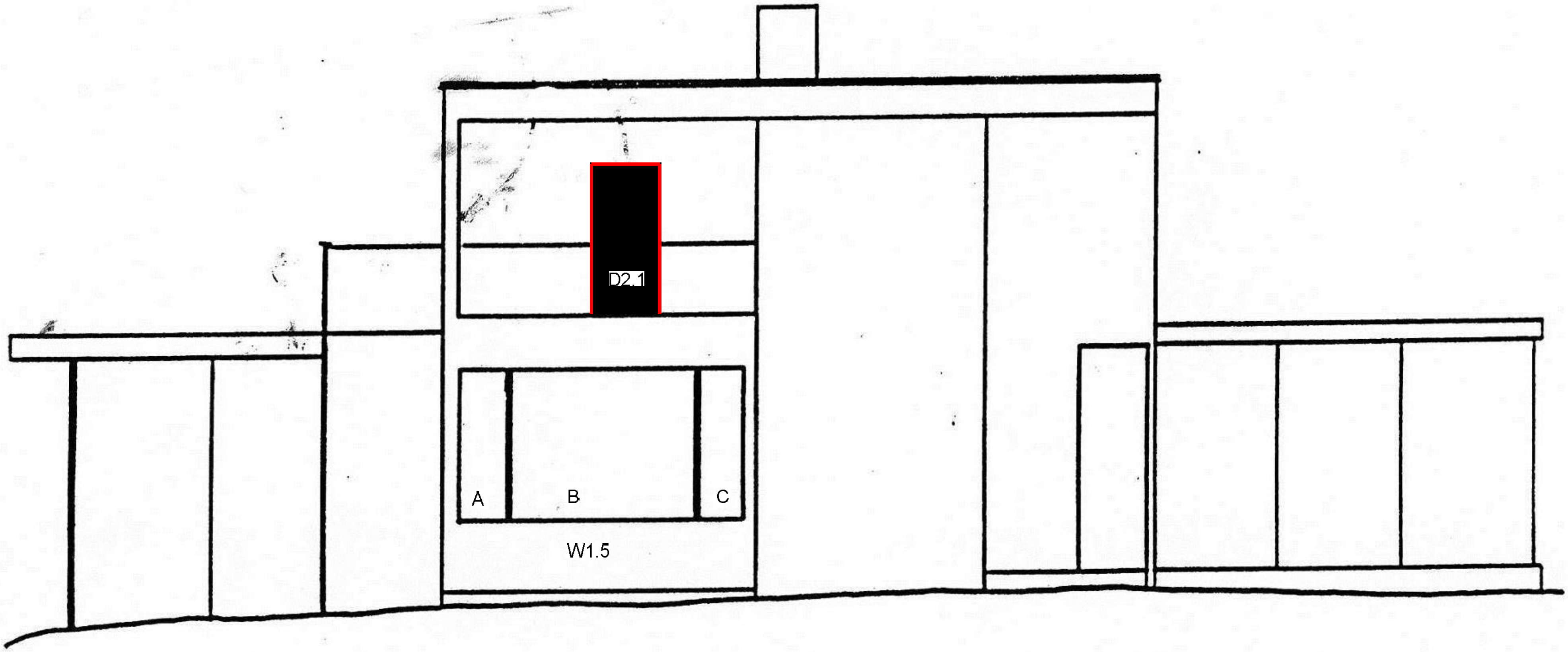
Additional Resources 05

Gropius House Window and Door Schedules
Historic New England, 2009



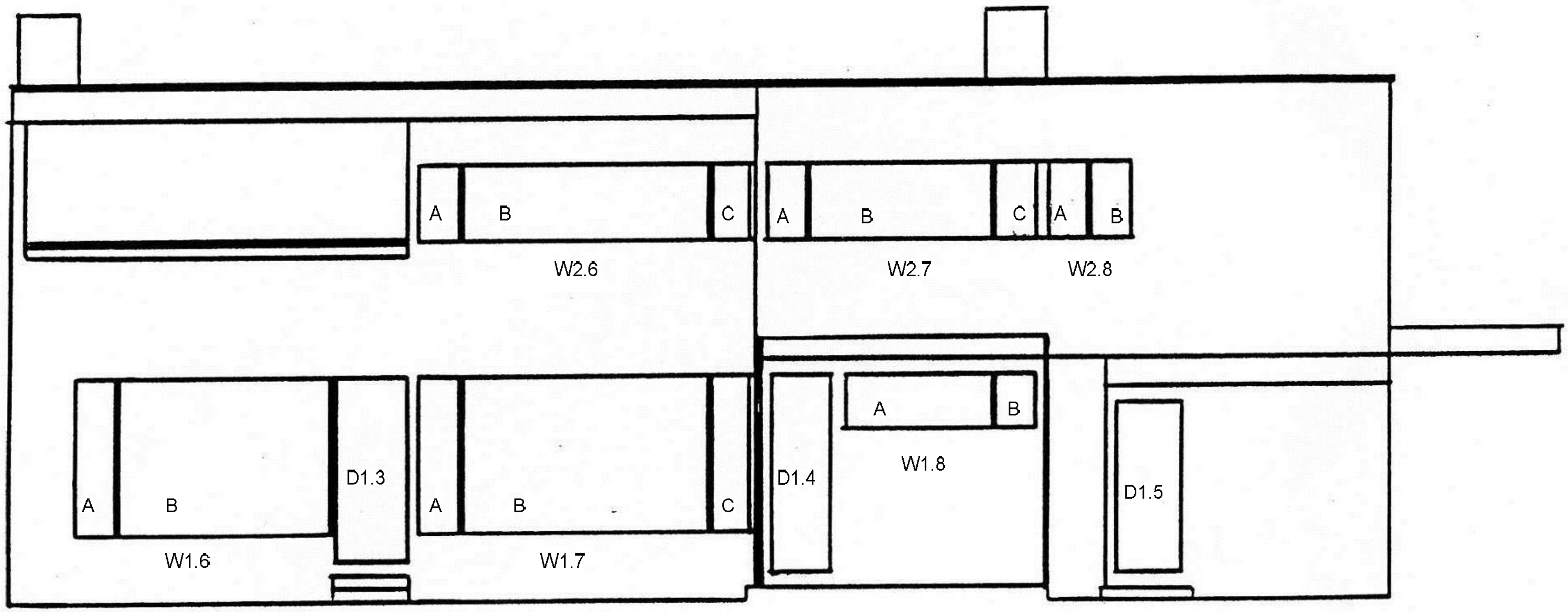
NORTH ELEVATION



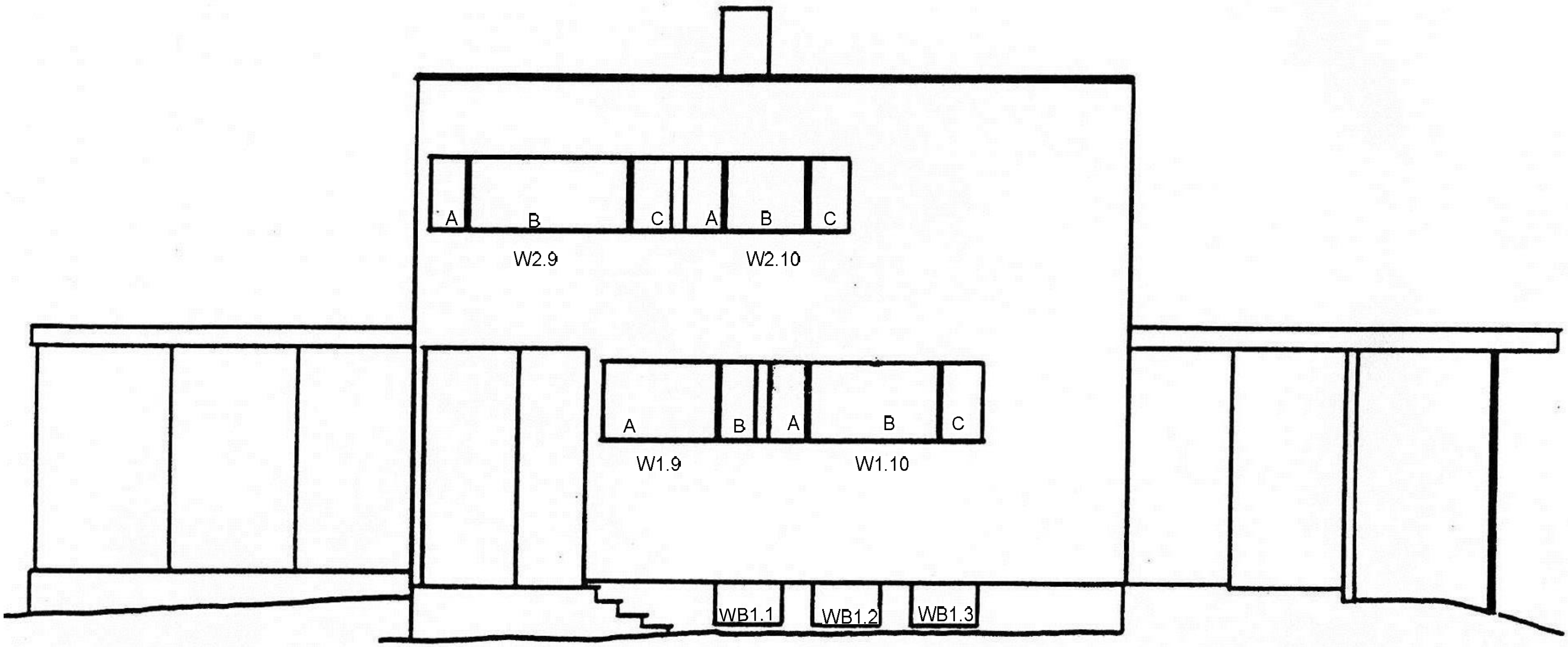


WEST ELEVATION

GROPIUS HOUSE
LINCOLN, MA.



SOUTH ELEVATION



EAST ELEVATION

Additional Resources 06

Gropius House Site Conditions Assessment
Historic New England, 2009

Historic New England
The Society for the Preservation of New England Antiquities

SITE ASSESSMENT

GROPIUS HOUSE

68 Baker Bridge Road
Lincoln, Massachusetts
Baseline Assessment: September 2009

TABLE OF CONTENTS

GROPIUS HOUSE

ROOF SYSTEM

The building includes four separate flat, built-up gravel/asphalt roof sections. The main roof is pitched towards a drain that directs water through piping that runs through the interior of the building and then to an unknown location. It is possible that this is routed to a dry well or that pipes run out through the landscape.

There are three other built-up gravel flat roofs at the building:

- Front entry walkway
- Screened in porch on the south elevation
- Under the wood decking of the second floor porch

In addition to these standard roof forms, there is an extension of the main museum roof in the form of a brise soleil. This roof system is in two parts, both located on the western elevation. One section runs over the second floor porch at the northwest corner and currently serves as both a support mechanism for a large vine and a brise soleil. The other brise soleil is located along the southern edge of this second floor deck area and overhangs the house itself, providing shading to the rooms below.

The flat roofs are showing some signs of wear or deterioration although there are no active leaks. During the winter, significant snow accumulation is shoveled off of the roof in order to minimize load. This practice may promote roof deterioration as the gravel and tar could be scraped and damaged during the removal process. Vegetation growth was observed which should be removed as an annual maintenance activity. This growth will help to hold water on the roof which can ultimately lead to water damage under the gravel surface. Due to the number of trees and brush in the vicinity of the museum, debris can build up on the roof. The porch trellis roof serves as a home to a large grape vine. This creates significant mold growth issues and likely contributes to the paint failure in this location.

Main body of roof with center chimney, vent stack (right) and roof drain (left)

Roof over front entry walk way

Brise soleil / trellis over 2nd floor roof deck

Roof over south elevation screen porch

Decking of roof porch;
Built-up asphalt and gravel roof underneath

AMENDMENTS

May 2014

- One broken deck board was replaced. While all the boards are full length redwood, no such lengths were readily available for this repair. As such, the broken board was cut to the nearest joist and a piece of western red cedar was patched into the location.

June 2014

- The condition of the roof system under the decking of the second floor porch is unknown. The deck system itself is comprised of full length (~20') redwood boards, 3-1/2" x 5/8". The boards are supported off the underlying roof by nominal 2"x4" sleepers spaced 18" to 20" on center. The thin boards and the wide span of support contributes to a fairly springy surface. While originally designed for Gropius' daughter to entertain friends, this decking system is failing under current uses. Tour groups of a certain size have resulted in unfortunate breaks of the boards. While the underlying roof allows for only 1-1/2" drop, the bouncy-ness of the system has led some guides and visitors to believe that the system is structurally unsound.

CHIMNEYS

The building includes two brick chimneys. One is located on the southwest corner of the building and provides release for a fireplace located in the living room on the first floor. The exterior of the brick has been painted a blue green color above the roof line. Below the roof line, the brick wall is painted gray (Benjamin Moore 1624, Wescott Navy).

The second chimney is located on the main roof of the building and vents the heating system located in the basement. The flue passes through the pantry on the first floor and the guest bedroom on the second floor. The chimney includes a cricket to direct water around the unit and into the drain on the other side. The exterior of this chimney has also been painted a blue green color above the roof line.

The chimneys (masonry and coatings) appear to be in good condition and no leaks were reported at this time.

Both chimneys include a metal cap (presumably copper), their flues are open to daylight so falling water does freely enter the chimney, but no adverse effects have been noted in the living room fireplace.

Active chimney in center of building

Inactive chimney on west elevation

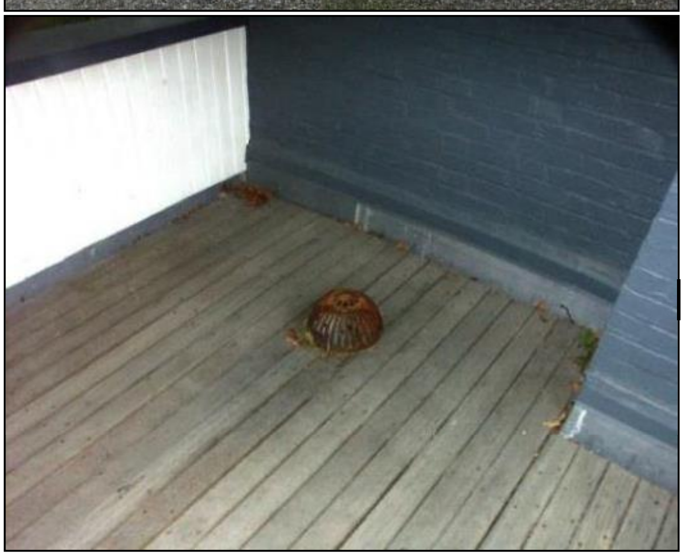
Gutter System

Water drainage from the roofs is accomplished in three different ways. The main roof and the second floor porch roof drain into two interior pipes that drain through the building. These drains are likely to terminate into a dry well in some unknown location. The interior paths of the drains are a bit unclear and should be further investigated to fully document. The portions visible in the basement are cast iron. Both drains have covers to divert debris.

The south porch roof drains from two scuppers located on the southern-most edge. There seems to be a missing scupper on the east side of the south porch roof. A metal water deflector is located at the base of the porch potentially to catch the water from a scupper above. However, there is no evidence of a scupper presently, though historic photos show one located there. A significant amount of water seems to pool at this location.

The entrance or portico roof drains into two metal downspouts on either side of the western edge. One of these downspouts is tucked into a clay pipe while the other daylights to the base of the foundation. Assessment of these systems during a heavy rain may shed light on efficacy and indicate if there are maintenance issues to address. There are no visible water issues on the face of the building and no known water leaks or basement flooding issues that suggest there are current problems.

Main body of roof drain and biogrowth suggesting route of water



Drain on second floor porch deck


Downspouts of front entry porch draining to underground clay tile pipes

Scupper on south elevation of screen porch

Water deflector on east elevation of screen porch

CLADDING

The exterior cladding is primarily vertical siding – either redwood or western red cedar (documentation is inconsistent on the species). The condition of the cladding is good.

Historically the building has suffered from painting issues with the cladding. Paint analysis in 1995 determined that a paint layer dating to approximately 1960 contained polyvinyl alcohol. This is a water soluble polymer apparently used widely in adhesives, paints, sealants, coatings, textiles, plastics, etc. It is unknown why this material was used. Perhaps it was thought that as a plastic emulsion it would result in a longer lasting paint job. However, the 1995 analysis noted that the hydroscopic properties actually seem to work by pulling water into the surface, a condition known to negatively impact paint adhesion.

The 1995 analysis also determined that Retardol – a penetrating fungicide – was applied in 1960. This substance resulted in a sticky, unstable coating on top of the synthetic emulsion paint layer. Analysis further indicated that the Retardol actually penetrated through four or five layers of paint and into the substrate which added to the underlying moisture and thus likely contributed to the paint failure.

The "solution" to the paint adhesion problem was the removal of all paint layers prior to a new paint campaign. Currently, the paint adhesion is good, however the siding suffers from a very visible black mildew layer on all elevations. It is likely that at this point the mildew spores or so embedded in the wood that this surface mildew – once removed through topical washing treatments – will continue to resurface.

At the second floor porch the south-facing wall was painted pink to reduce a bright reflection. This wall is also heavily mildewed although the paint adhesion is in good condition.

Vertical board siding on east elevation

Excessive mildew build up on north elevation

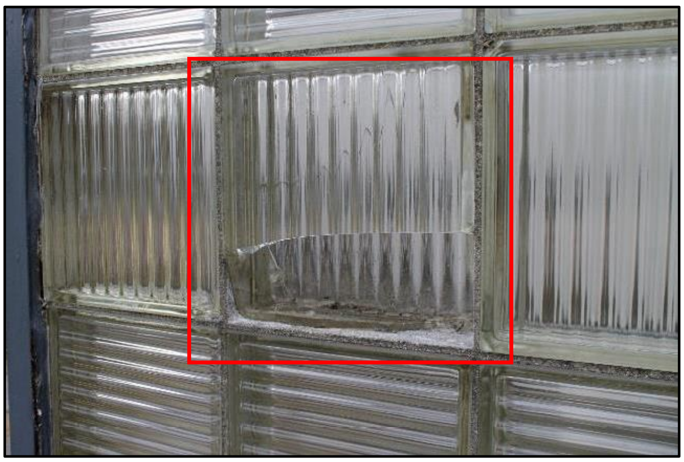
The west wall is dominated by a painted brick wall that incorporates a fireplace and its associated flue as well as a large plate glass window. The paint on the brick wall is in good condition. It is possible that this condition is helped by the fact that the chimney is inactive.

Brick and glass west elevation

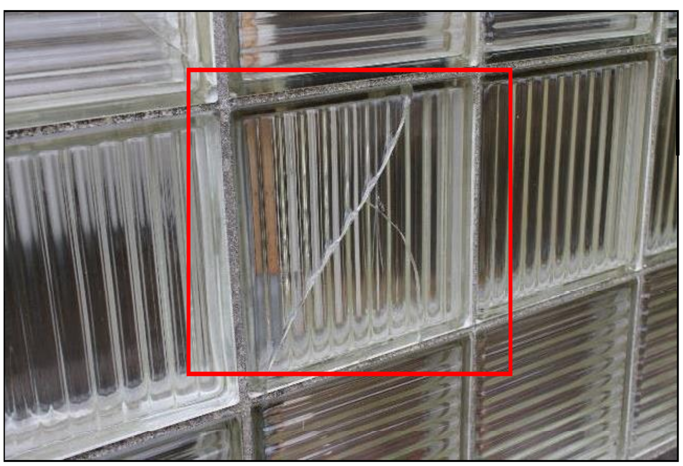
Brick fireplace wall on west elevation

One wall of the north (front) entry is nominal 12" x 12" glass block. This wall is largely in good condition although one block has broken apart and several are cracked. The glass block is not intended to be structural, but it is possible that other support elements have not held up over time, shifting some structural load to the glass block. It is possible that this has led to some of the cracking. It is equally possible that debris from mowers or trimmers in the landscape could have also cracked the blocks. Once cracked, water can enter the hollow glass blocks. Freeze / thaw cycles may then contribute to additional fracturing of the piece. Internal documents make note of the cracked block going back at least 10 years. No repair action is currently scheduled as conditions have not worsened over the past 5 years. The mortar is in good condition.

Glass block wall on north elevation at front entry



Fracture with loss of glass



Typical intact fracture of glass block

AMENDMENTS

June 2014

- The exterior cladding was washed in the spring of 2014 with a dilute solution of Jomax House Cleaner. Areas of failed paint were repainted with Benjamin Moore Aura, Exterior Acrylic Latex Paint, matching the previously documented colors. These activities resulted in a clean crisp appearance rather than a muddy gray.

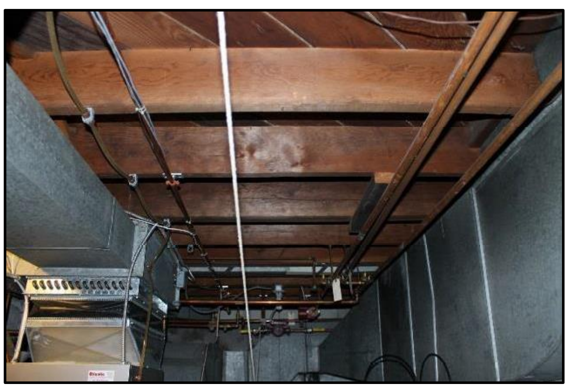
February 2015

- The second story west elevation wall (at the roof deck) was observed to have regenerated its mildew grey condition. This wall was washed in 2014, not repainted. Other elevations will be evaluated as snow conditions provide for access later in the spring.

FRAMING

The house is typical 20th century stick construction with nominal 2" framing stock. This construction is only visible in the basement and in a damaged area of the first floor ceiling. The sub-floor also visible in these areas is diagonally laid along the floor joists.

The various elements outside of the main block of the building are supported by relatively narrow (approximately 4" diameter) steel columns. One column on the southeast elevation exhibits significant surface rusting. It is unclear why this one column exhibits the condition. It is also unknown if this rusting has compromised the overall structural capacity of the column.



Nominal 2" framing stock as visible in the basement

Nominal 2" framing stock as in the first floor ceiling due to a radiator leak

Column supports on south elevation

Rusted column on southeast corner

WINDOWS

The window frames at the house are comprised of steel with brass hardware and wood sills and are painted a dark grey. Most windows are large expanses of single, pane, plate glass—generally fixed with smaller casements adjacent. In the 1990s, ultra-violet film was applied to the interior of the windows for collection preservation. There are a few instances of specialty prism glass for windows requiring a little more privacy. There are several cracks in the specialty glass throughout the building. An extensive window survey should be performed.

In the late 1990s an extensive restoration took place on the windows. Documents indicate that the cladding was rotted at the window lintels and the sash were severely rusted. Many of the sash were removed and repaired or replaced. Presently, it appears that the glazing putty and paint used were either applied incorrectly or were incompatible resulting in a wrinkling affect. The two products did not dry at the same rate. Although the result is unsightly, the glazing and paint appear to be fair condition.

Example of broken specialty glass

Typical glazing conditions


Windows on the east and north elevations

AMENDMENTS

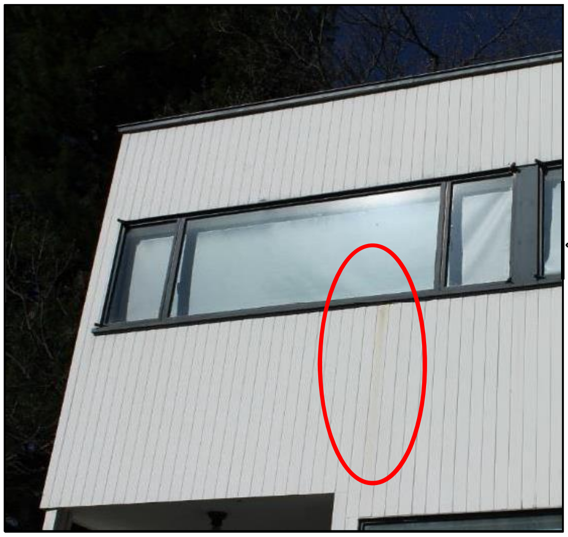
<u>November 2013</u>

- Several areas of glazing are seen to be failing, especially along the bottom edge of the windows.

<u>June 2014</u>

- Areas of glazing failure were treated by removing loose and failing glazing, priming the any metal sash frame exposed and applying new glazing putty (Sarco DualGlaze). Once firm to the touch, the new putty was painted with Wescott Navy to blend in with the existing paint scheme.


Typical glazing failure issues on east elevation - 2013

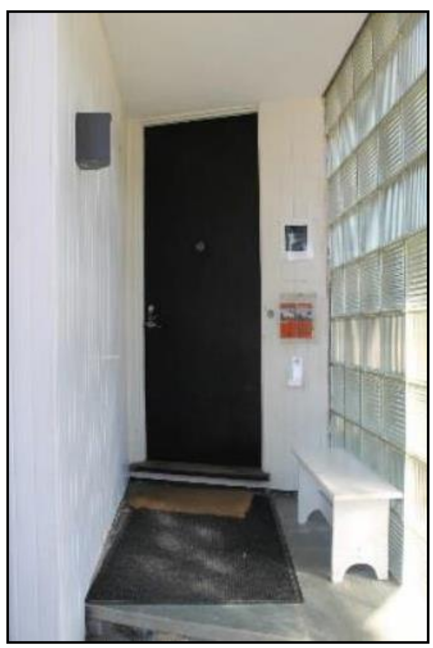


Rust staining evident on east elevation due to glazing failure and underlying rust development - 2013

DOORS / ENTRIES

The museum includes five entrances. The main entrance is located on the northeast corner of the building. It is a single wood door painted black and includes rubber weather stripping. The entrance is accessed from the gravel driveway and up three bluestone steps. Due to the angle of the door and wall, the lock is difficult to access and there are several marks on the door. This angled orientation also causes stress on the key and the lock mechanism. Keys must be replaced routinely as they are bent or broken. The lock mechanism – an industrial full mortise lock with eccentric latch and bolt mechanisms – suffers from worn out springs. This is a concern as a matching replacement lock has not been located and repairs to the mechanism tend to be short lived.

Front entry



Angled door configuration of front entry

There are three rear doors (one off of the kitchen that leads to the driveway, one off the pantry that leads to the south porch, and one off the living room to another patio under the brise soleil). Two of the doors are solid wood painted dark gray (Benjamin Moore Wescott Navy) while the third—off of the living room—is metal and glass.

Rear entry steps

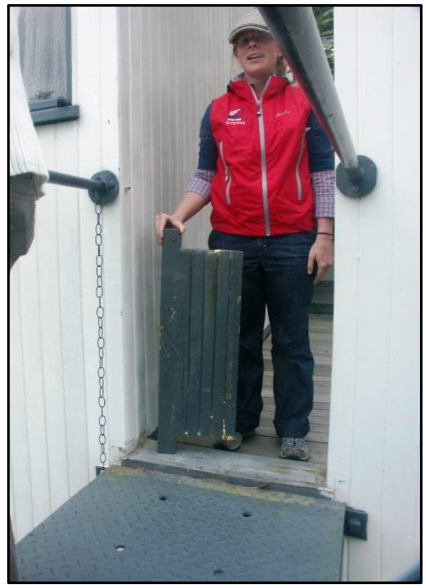
Rear entry steps – general conditions

The staff office is accessed through the rear door that opens into the main kitchen. This door is located off of the driveway and up four bluestone steps set on a fieldstone foundation. Some of the mortar has spalled off the risers, which could be a potential hazard. The steps do not include hand railings.

The fifth entrance is located off of the second floor porch to the west bedroom, which is accessed from a metal spiral staircase on the north elevation. The stairs are in good condition but are chained off to avoid use by the public as the railing is not code compliant. The door is wood and glass and is painted dark gray (Benjamin Moore Wescott Navy) and includes interlocking weatherstripping. This door tends to bind with seasonal movement, especially during very wet summers. It also includes flaking paint at the base.

The threshold at the top of the spiral staircase is very loose and can be picked up with little effort. The railings have large openings, which, even though the stairs are chained off, can be easily accessed due to the noncompliant railings. Although these stairs are not accessed by the public, the threshold should be at secured.

Spiral staircase



Loose threshold

There is a consistent complaint about the door hardware in the museum. Many knobs are loose and doors can be difficult to close and lock during humid days. The hardware is small and lightweight, so there is a higher potential for damage. The three rear doors include lightweight screens with metal hinges. On two screens, the bottom hinges have ripped off and are now inoperable. The general public open the screens on a regular basis, which causes the screen to move off their tracks and bang against the house on windy days.

Although not an entrance into the building, there is one more screen door located at the south elevation screened in porch.

The door works properly but includes a significant step up, which is lessened with a small wood platform that acts as a step. This platform is not set in any way and could be a potential hazard on site.

AMENDMENTS

May 2012

- Threshold for spiral staircase repaired and reinstalled securely.

April 2013

- The condition of the steps accessing the rear kitchen entrance is very poor. The mortar was repaired in a conservative fashion using lime based mortar and monitored for durability.

April 2014

- The condition of the steps accessing the rear kitchen entrance is again very poor. The bluestone landing required mortar repair in the spring of 2013. The use of salted sand throughout the winter has destroyed not only the repairs, but the mortar in the lower steps as well. With a 1938 build, the original mortar was very likely Portland cement based, especially given the foot traffic that these steps would be enduring. The steps were completely rebuilt in the late 1990s – likely using a Portland based mortar. Repairs in 2014 utilized a Portland mortar and these repairs will be monitored for durability.

<u>March 2015</u>

- Despite a harsh winter, it appears that the mortar on the landing is holding up well. Some of the nosing mortar is failing and this will be inspected once conditions moderate.

INTERIOR

The interior of living room, dining room, and study were finished with a white, textured, acoustic plaster from California Stucco Company. The plaster is covered with a thin layer of white paint and has grayed over time due to the oil heat and cigarette/ cigar smoke from the Gropius period.

The floors in the museum include cork in the entrance hall, stairs, and second floor hall, which were replaced in 1988. Carpeting covers the rest of the rooms with the exception of the kitchen and pantry that include black rubber flooring. The second floor white carpeting was replaced in the 1990s with a thicker pile that has resulted in some difficulty opening a number of doors in the building.

The dressing room and master bedroom are separated by a large window wall that was apparently included to create heating zones in the house.

Mainly, the walls and trim are painted white—though numerous shades of white have been used in the past.

In general, the interior finishes are in good condition.

Dining Room view showing ceiling discoloration and lighting fixture

Thick pile carpet in dressing room

Wear patterns on cork flooring

FOUNDATION

The foundation of the house is a combination of fieldstone and brick. It includes a full basement with whitewashed walls and a concrete floor as well as a crawlspace under the living room, dining room, office areas. The basement is not known to flood. The foundation appears to be in good condition.

Most of the site drainage problems are along the driveway near the Visitor's Center/ Garage.

ELECTRICAL & LIGHTING

No electrical or lighting issues are currently known.

Both the south elevation and the north entrance include outdoor lighting that is mainly used during events.

The electric meter is located in the northeast corner of the basement. The meter number is 97004525. There is a fuse box at the top of the basement stairs and a circuit breaker box in the basement (northeast corner). The fuses affect most of the outlets and lighting for the museum (that is, original residence). The circuit breakers control more modern services associated with HVAC and office operations. There is a single dump switch in the master bedroom that can operate all the lights in the house. A GenTran outlet is located at the service entrance and wired to key circuits. A generator is not on site, but could be provided from a neighboring regional site.

There is no lightning protection on the building although there is surge protection installed on the circuit panel at the service entrance.

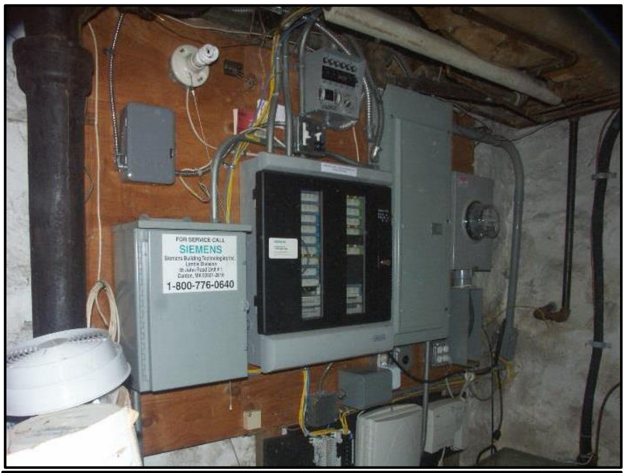
There appears to be a water leak coming from the exterior conduit and dripping into the basement. Currently there is a bucket catching the water and being drained once a week.

The lighting in the museum mainly consists of incandescent bulbs in ceiling and wall sconce fixtures. There are also floor and table lamps as part of the collection. Much of the lighting in bathrooms and closets are single, half chrome bulbs.

Most of the lighting appears to be in good condition with the exception of the dining room ceiling light. The fixture is a stage light that focuses a beam directly onto the dining room table. It is situated within the ceiling/floor interstitial space and creates tremendous heat and the potential for fire. It may be possible to find a replacement bulb that will generate the same effect at a lower wattage.

Exterior lights are controlled by a timer which can be adjusted as needed to accommodate evening events and the seasonal change in daylight. However, there is no lighting along the driveway between the house and the visitor's center. Given this darkness and the sometimes eroded condition of the driveway, this situation presents a potential hazard to visitors and staff.

There is an electrical outlet on the south wall of the house within the screen porch area and one on the west wall of the 2nd floor open deck area. There is also a coaxial outlet in the ceiling area of the 2nd floor deck. It is unclear what this setup is but photographs suggest that it might have been used for environmental monitoring of some sort.



Electric panel, meter, and service entrance (northeast corner of basement)

Earlier service entrance and site disconnects located at bottom of basement stairs

Active fuse box located at top of basement stairs

PLUMBING

The building includes two exterior spigots (on south elevation and east elevation). Both spigots are operational, do not have any leaks and are drained seasonally. There is an exterior shower on the west elevation that is no longer operable.

Exterior shower – no longer functional

A small water heater, operated by a timer, is located in the basement near the main electrical panel. Water is supplied by the Town of Lincoln. The museum includes a septic tank with a drain clean out located in the parking area near the house. The Visitor's Center/ Garage only has a portable toilet, which is not connected to the plumbing.

The plumbing in the museum is shut off in all areas except the bathroom located off of the Studio/Office, which is used only by the staff, and a basement sink, which is used for catering purposes during events. The sink in the staff bathroom drips.

There is no irrigation system.

HVAC

The HVAC system is located in the basement of the museum and provides two heating services (central forced air and perimeter hydronic) based on a gas fired boiler. Perimeter loops consist of baseboard fin tube radiation behind custom enclosures; full radiators are located in each bathroom. The air handler / air conditioning component was replaced in 2008 with a two part system by Carrier. The air system circulates dry, cool air and the water system circulates warm water to heat the building.

Gas fired boiler

Carrier air handler

AMENDMENTS

May 2010

- A radiator located in the dressing room developed a leak which damaged the ceiling of the servant's quarters (now staff office). It is understood that at some point, antifreeze had been introduced to the system; this antifreeze is thought to have caused some corrosion leading to leaks. The radiator was taken off line and no longer provides heat to the dressing room space. Other radiators have been taken off line previously, but the central air core is sufficient to keep the building adequately heated through the winter.

July 2013

- Snakes crawled into the air conditioning unit and shorted out the control board. The control board was replaced, but it is unclear how to prevent future snake incidents.

INSULATION

The basement is lined with eelgrass insulation at the ceiling. There are several areas where the insulation has come unsecured and is loose or has fallen from the ceiling altogether. Several of the pipes located in the basement near the electrical panels have been insulated.

There does not appear to be an access panel to the attic, therefore it is unclear whether the attic is insulated (or if the building contains any attic space).

Views of basement insulation

MISCELLANEOUS ISSUES

Mainly, pests at the site include spiders, evening moths, web case moths, mosquitoes, snakes and ants as well as an occasional mouse. At present, these seem to be in control, however, the ripped screens at the south porch have made the mosquitoes problematic during evening events.

As stated within the "cladding" section of this assessment, mold/mildew problems on the cladding continue to persist.

On the interior, there seems to be one closet on the second floor that continues to have a mildew/mold problem. It is located in the west bedroom.

VISITOR CENTER / GARAGE

ROOF SYSTEM

The roof to the Visitor's Center/Garage is flat with a tar and gravel surface that is slanted slightly east to allow for water run-off. Due to the number of trees and brush in the vicinity of the garage, there is significant debris on the roof.

Unfortunately, due to the cold climate of New England, ice dams frequently form on flat roof systems, which allow water to pool. The interior of the building has a number of water stains on the ceiling indicating water penetration at the roof probably due to ice dams and vegetation build-up.

Water stains in ceiling of visitor center

Exterior roof line damage – northeast corner

At the northwest corner of the building there is damage to the roof flashing, which may have been done by a large vehicle.

AMENDMENTS

January 2013

- Roof inspection revealed that the seam between the asphalt rough and the copper border was not sealed, allowing for water penetration. The copper border was replaced, soldered, and well sealed to the roof system.

April 2014

- Observing no further staining a year after the repair, the ceiling stains in the gift shop were treated with Zinsser B*I*N to make them less visible, pending full repainting of the ceiling.

CHIMNEYS

There are no chimneys on the building.

GUTTER SYSTEM

The building does not have a gutter and downspout system but includes two scuppers at the rear of the building. They appear in good condition, but the ceiling in the building is showing water staining indicating that water is not draining properly from the roof.

CLADDING

The building is sided with redwood cladding laid vertically—except at the garage door overhang—and painted white. Generally, the cladding is in good condition, with the exception of the east elevation that shows damage probably done by a wood pecker. This could mean that the cladding is infested with insects.

FRAMING

The garage is simply constructed with 2x4 wood studs and diagonal bracing on a concrete slab and fieldstone foundation. There seems to be only a thin layer of felt paper and then the exterior layer of cladding. The visitor's center portion was built within the framing of the garage around 1997. This included additional framing, insulation, drywall, and a dropped ceiling to create a usable interior space that could be reversibly removed, returning the garage to its original state.

The framing appears to be in good condition.

WINDOWS

The building includes six window openings. Two are located on the exterior garage doors, two are new window openings from the 1997 visitor's center renovation, and two are located on either side of the building on the north and south elevations.

The garage door windows are typical divided panels of individual fixed glass.

Window arrangement on front elevation

Window arrangement on north elevation

The 1997 windows are constructed of steel with tempered glass and include two sliding sash at either end for ventilation.

The side elevation window openings are metal, single pane plate glass sash with a wood sill. The row of sash includes a center hopper unit.

In general, the window openings are in good condition. The side elevation openings could use some surface glazing and repainting. One of the panes on the north elevation appears to have been hit with a rock and needs replacement.

ENTRIES

The building, which now houses the Visitor's Center, was a two-car garage and still includes the two garage doors. The interior has been retrofitted to include a modern, usable space with a secondary entrance. The garage doors are locked with Medco locks as well as the main center entrance. This door is a standard glass door with a lever handle painted white.

Visitor center entry located behind garage door.

AMENDMENTS

<u>*March 2015*</u>

- Handle and lockset replaced due to failure. Handle is same style, but heavier grade quality.

INTERIOR

The interior of the small Visitor's Center/ Garage is minimalistic in design and color. The walls are drywall and painted white and the floor is black linoleum. The ceiling is slightly suspended with metal ceiling straps to accommodate the garage doors in an open position as well as provide a space for additional electrical wiring.

The interior is in good condition with the exception of the water staining at the ceiling.

FOUNDATION

The foundation is a flat slab concrete pad. It appears to be in good condition.

ELECTRICAL & LIGHTING

The building is on the same service as the house. There are no fuse boxes or circuit breakers located in the garage. The building does not include lightning protection. There is an outdoor lighting fixture on the garage door overhang that is operated by a switch. The fixture uses three fluorescent bulbs.

Interior lighting is accomplished with simple ceiling track lighting with incandescent bulbs. The main building and Visitor's Center/ Garage have recently been wired for a new point of sale system. The staff did not desire any additional lighting or outlets.

PLUMBING

The building does not include any plumbing. A public portable toilet is located on the south side of the building. The portable toilet is cleaned out regularly.

HVAC

The building does not include an HVAC system. Four windows open for ventilation and two small wall mounted electric baseboard heaters provide heat during the winter.

INSULATION

The 1997 renovation of the Visitor's Center/ Garage included wall and ceiling fiberglass insulation.

SITE LANDSCAPE

SITE DRAINAGE

Located on the top of a plateau, site drainage around the house is generally not an issue. However, as the driveway entrance and the garage/visitor's center are located at the bottom of a hill water does pool in this area. This creates a fairly muddy mess for visitors during rainy periods and dangerous icy conditions during the winter. As the site is open year round, this is an ongoing issue. Heavy rains washing down the driveway are known to carve gulleys into the driveway's surface. The site manager feels that the driveway warrants a refreshing of its gravel surface as erosion and plowing have degraded the surface significantly over the past few years.

During the summer of 2009, the town of Lincoln repaved Baker's Bridge Road. However, there is an approximately 3' gap between the asphalt and the stone wall. This is an area used daily by the mailman and has quickly eroded and is causing additional rutting problems at the driveway entrance.

SITE CIRCULATION

The Visitor's Center/ Garage is located near the main entrance off of Baker Bridge Road. The area in front of the building is pea-stone gravel and is intended for parking but does not include any parking signs or parking lines to indicate where and how the general public should park. It can only accommodate around 6 or 7 cars at one time, which makes events at the museum difficult.

The museum building is accessed from the Visitor's Center/ Garage by a pea stone gravel driveway. The entrance is located up three blue stone steps.

There are no spaces that are specifically designated as handicapped. There is no handicap accessibility for the site other than at the visitor's center.

Due to the lack of signage, the general public tends to miss the Visitor's Center/ Garage as the area for tickets, parking, and information and continues up the driveway to the museum entrance.

Parking is minimal with the ability to hold no more than 10 cars. Since the tours themselves are limited to 10 this probably is acceptable although staff is sometimes known to park at Wood's End Road to free up space for visitors. Accessing this remote parking location is very inconvenient and can be very unsafe at different times of the year.

The paths and walkways around the house are a combination of gravel and bluestone. In some cases the bluestone has heaved and shifted and has the potential to be a trip hazard.

The building garden beds and lawn spaces are protected with a small metal perimeter, which could also be a tripping hazard.

The site includes a metal spiral staircase leading to the second floor porch, which is blocked off from the public. The second floor porch includes a noncompliant metal railing and could potentially be a hazard.

Shifting paving stones

Metal landscape border

2nd story porch deck

SITE SIGNAGE

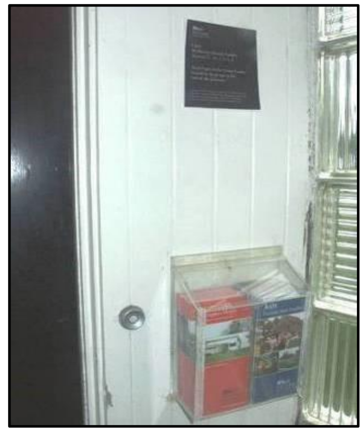
The main Historic New England sign to the site is located at the entrance near the Visitor's Center/ Garage. A National Historic Landmark sign is set on a free-standing post and is located near the front museum entrance. Additional signage for the museum building is done with a small black and white laminated sign velcroed to the exterior wall near the front door. It outlines the hours of operation and the name of the organization.

Site signage is limited on site, which causes confusion to the public visitors. The parking spaces are not designated and visitors are often unaware that the garage is also the visitor's center.

There are signs on the highway (95/128) that note the Gropius House but there are no signs from the highway to the actual site which could be frustrating to potential visitors.

The typical site sign at the driveway entrance can be somewhat obscured in the summer due to the tree canopy but this is an unavoidable situation. Most importantly, though is the fact that the site hosts evening programs and since the main sign is not lit in any way the property entrance is not noticeable.

Standard Street Entrance Sign


Standard Museum Entry Sign

WALLS / GATES / FENCES

The site includes two trellis walls on the west and east elevations of the house. The one on the east side appears to be slightly out of plumb, but seems stable. Retaining walls include bluestone caps that are loose and could be a potential trip hazard. The site also includes stone walls, one of which was damaged by a snow plow (at the staff parking area) during the winter 2008 and should be repaired. Stone walls along the perimeter of the site also appear to be deteriorating.

There is a low retaining wall along the south and west elevations of the house. This wall is comprised of mortared rubblestone with a slate or bluestone cap. In many instances the cap pieces are loose. As the caps are in line with the grade as one walks around the house, there is a natural tendency to walk on these walls. The loose caps present a potential hazard for visitors and a long term loss for the integrity of the walls. In their current state there is growing structural deterioration of the wall with mortar cracks throughout likely due to frost heaving.

The property itself is bound by a low dry stack rubblestone wall that is falling apart in some places and overgrown in others. The area of most concern from the site manager's perspective is directly at the entrance to the driveway.

Trellis on western elevation

Stone capped walls (above)

Wall damage at top of driveway

Typical landscape walls

Stone wall at property entrance

AMENDMENTS

<u>*October 2009*</u>

- Olde Mohawk Masonry repaired the stone wall damaged by the snowplow in the winter of '08-'09, resecured the bluestone caps, and rebuilt one retaining wall on the south east side of the property.

LANDSCAPE FEATURES

There is a Japanese style garden on the south side of the house. This is fairly simple affair that appears appropriately maintained.

The house is surrounded by a field with an apple orchard. Many of the orchard trees are enclosed by a steel cage that attempts to discourage deer from feasting. These cages are rusted and contribute to a somewhat unkempt appearance. Many of the cages have been removed in the past 2 years. The remaining cages remain in anticipation of reuse as needed to support replacement trees. The orchard field is left overgrown for interpretative reasons. Closer to the house, the lawns are mowed and well kept.

There is a garden sculpture on the north side of the house. This was installed around 1950 by Gropius and the sculptor (Richard Filipowski).

Japanese Garden

North elevation of house with orchard

Filipowski Sculpture

BUILDING VEGETATION

Building vegetation is common at the museum. There are several large overhanging trees, a grape vine at the second floor porch, and a trumpet vine that grows right next to the building.

The shading from the overhanging trees is allowing plant material to thrive on the flat roof. The trumpet vine trunk is growing very close to the base of the cladding. The shade and moisture from this vine has started to deteriorate the paint.

Recent tree work removed several of the large tree branches that were shading the second floor porch.

There are two significant trees overhanging the house. There is a large oak tree at the southwest corner and a Zelkova that overhangs the front entry portico on the northeast corner. The proximity of these pieces to the house warrant close attention to ongoing maintenance.

Trumpet vine on south elevation

Trumpet vine base

Zelcova at house entrance

Shading trees on west elevation

GARDEN STRUCTURES

There is a trellis on the west elevation that supports a grape vine. This vine is trained up onto the trellis that is integral to the 2nd floor porch deck. This trellis appears to be in good condition although its constant contact with the grape vine warrants constant vigilance to routine maintenance. The posts and bottom rail of the trellis were replaced in 2005.

There is a trellis on the east elevation that has been pushed out of plumb. It is thought that this condition relates to the knocked over stone wall (winter 2008-2009) adjacent to the trellis although these may be two unrelated events as the distance from the damaged wall to the start of the trellis is a few feet – and the wall between the two is relatively unharmed. It is more likely that the footings for the trellis may be shifting, thus pulling the trellis out of plumb.

Trellis at western elevation

Trellis at eastern elevation

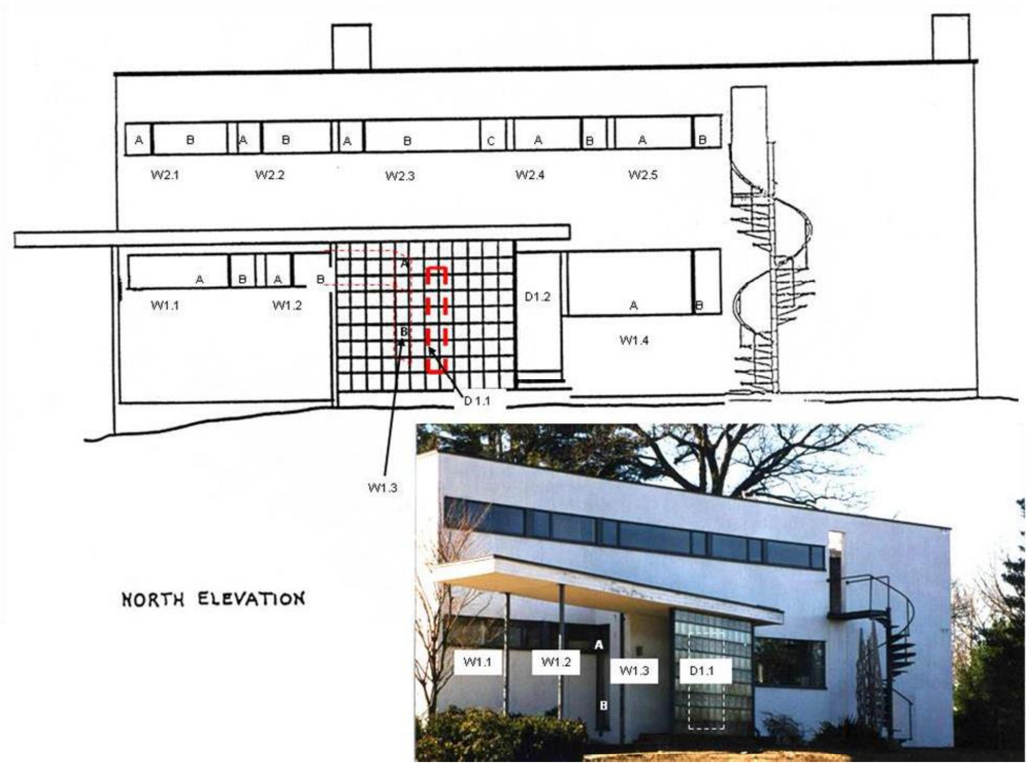
MISCELLANEOUS ISSUES

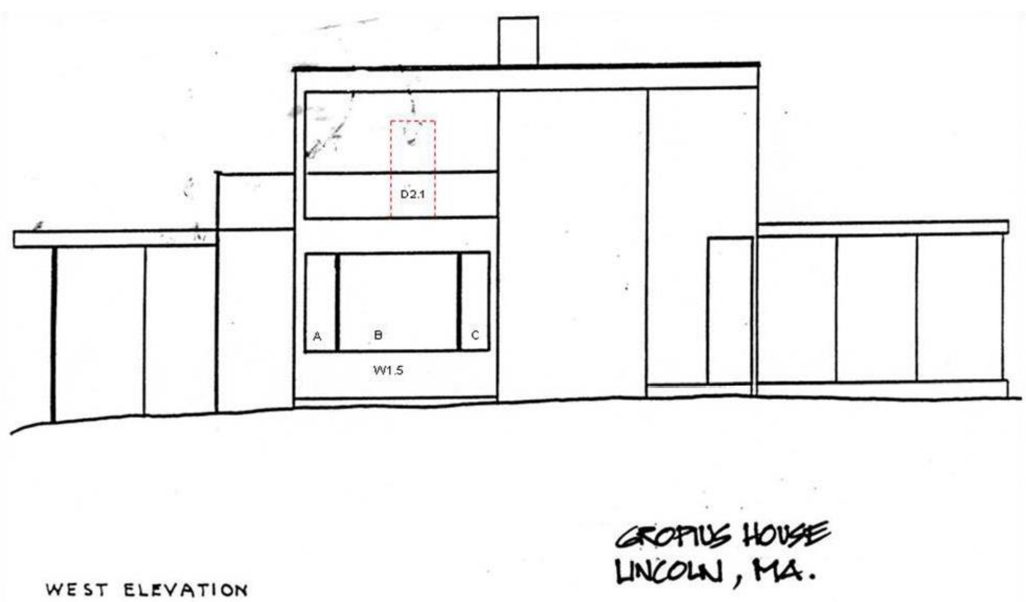
The site is located in a wooded area; there are always threats of different types of wildlife.

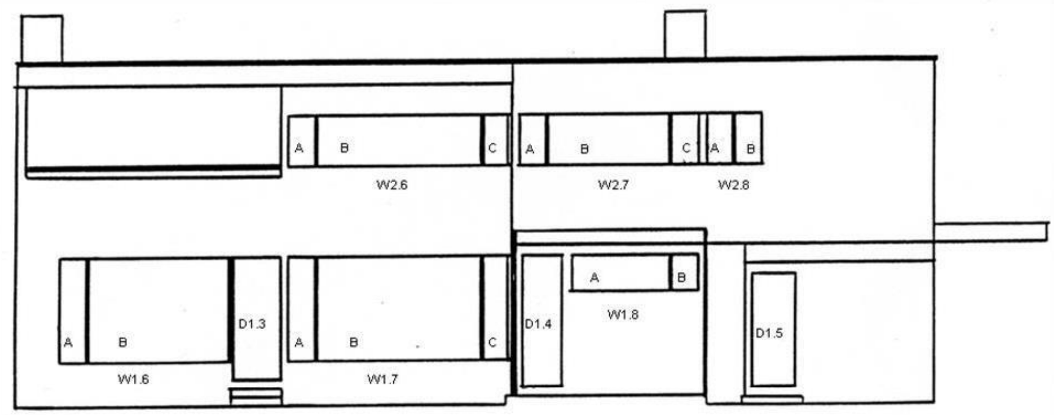
Due to the hosting of evening programs and the generally deteriorated condition of the driveway the need for landscape lighting between the house and visitors center is important for the safe travel of the visitors.

APPENDICES

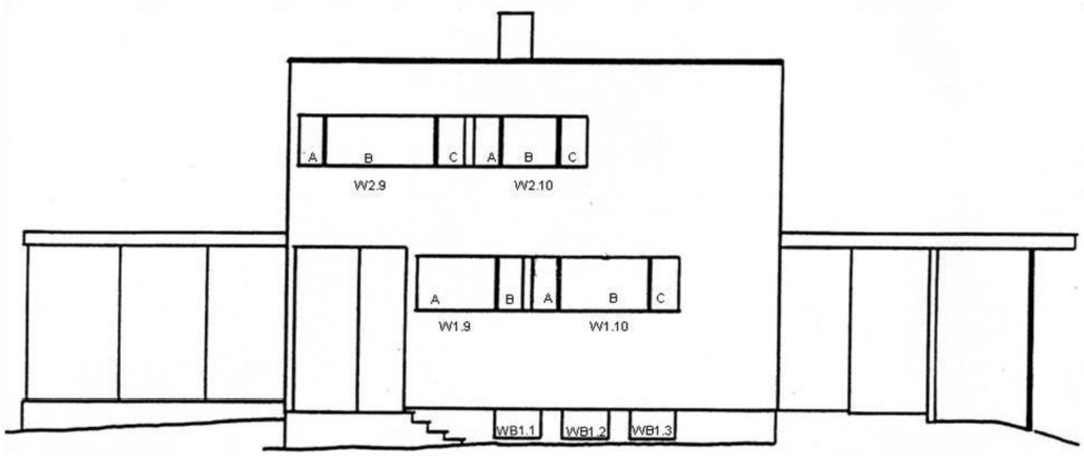
APPENDIX A – DOOR AND WINDOW SCHEDULES







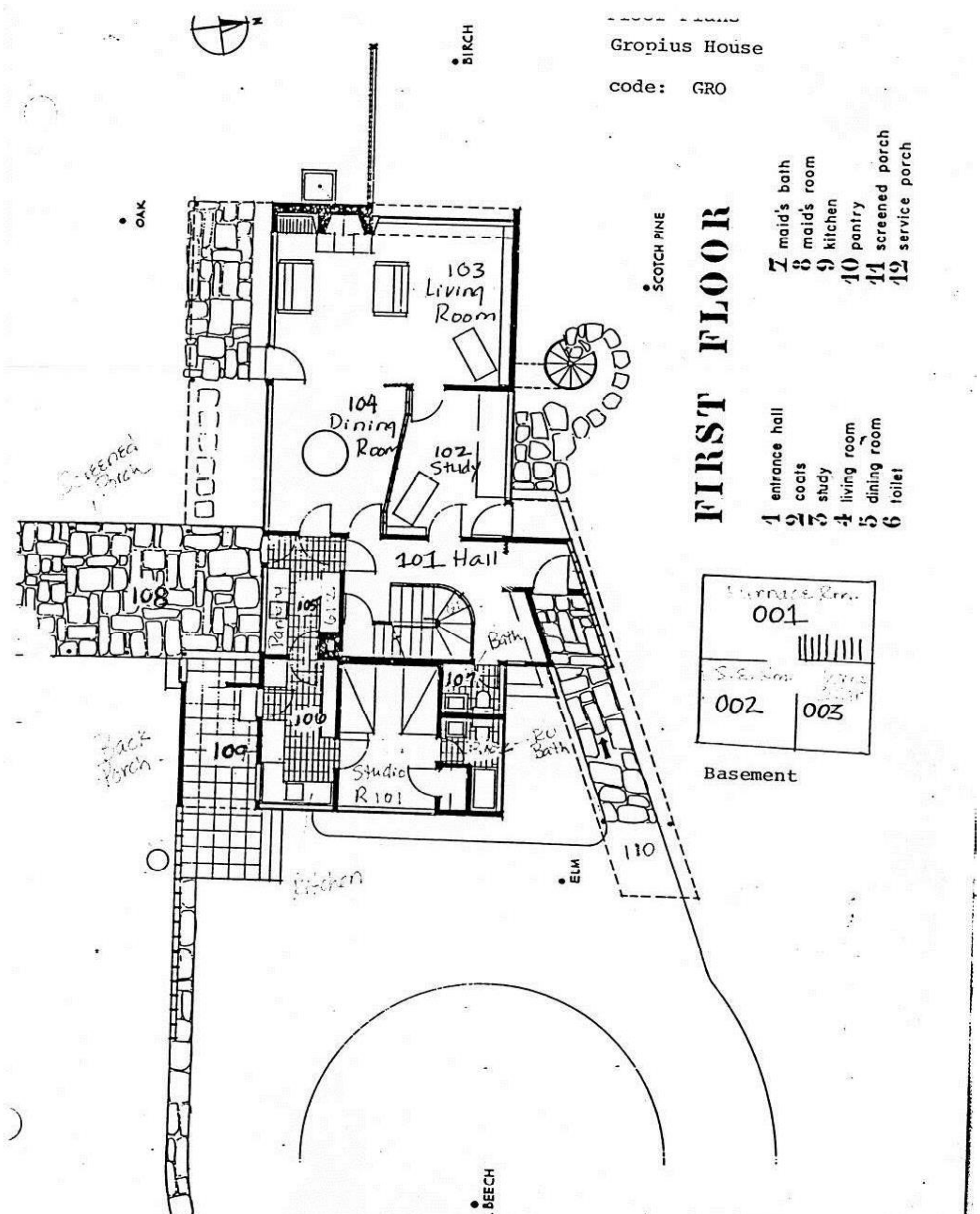
SOUTH ELEVATION



EAST ELEVATION

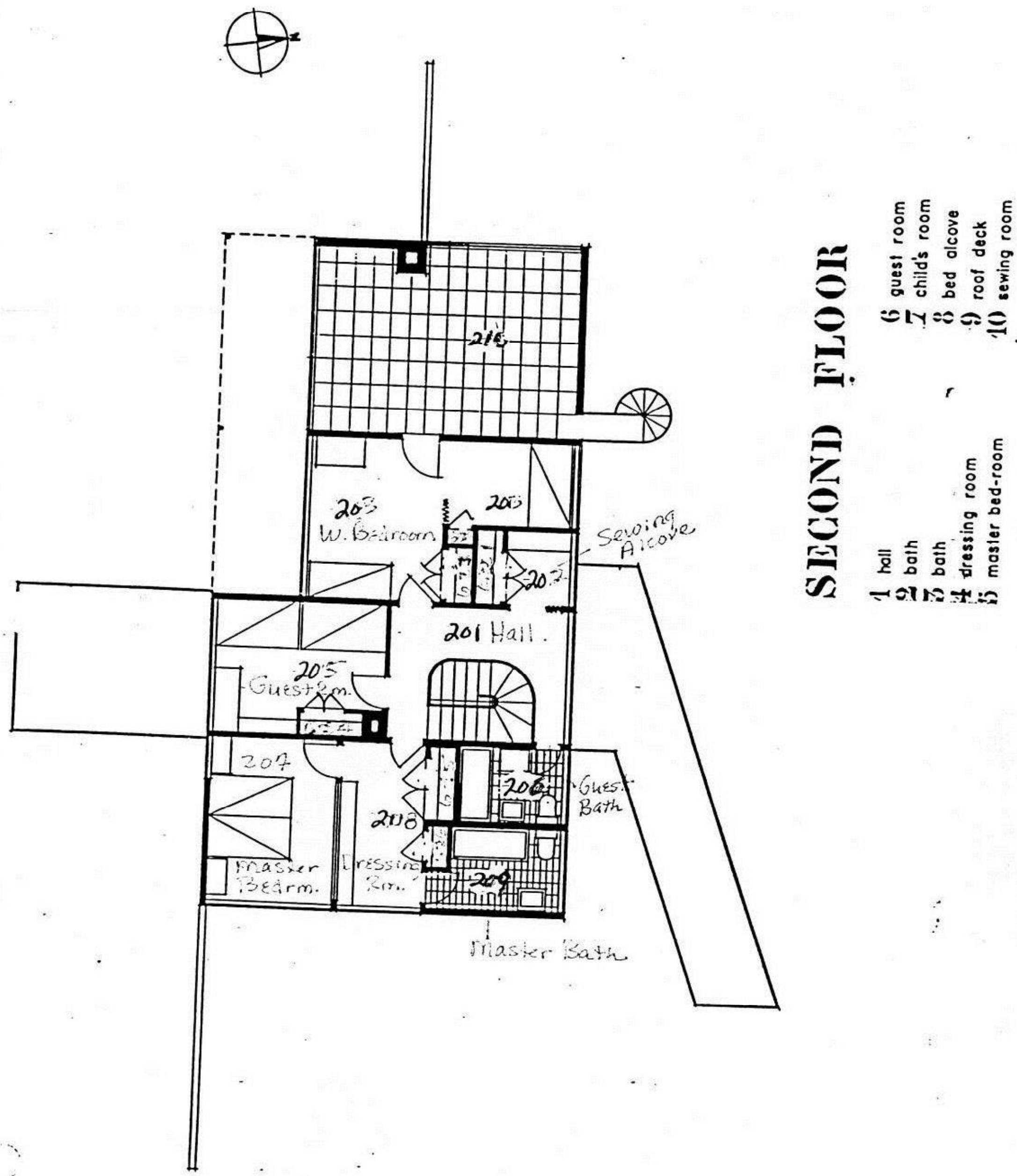
APPENDIX B – FLOOR PLANS

FIRST FLOOR

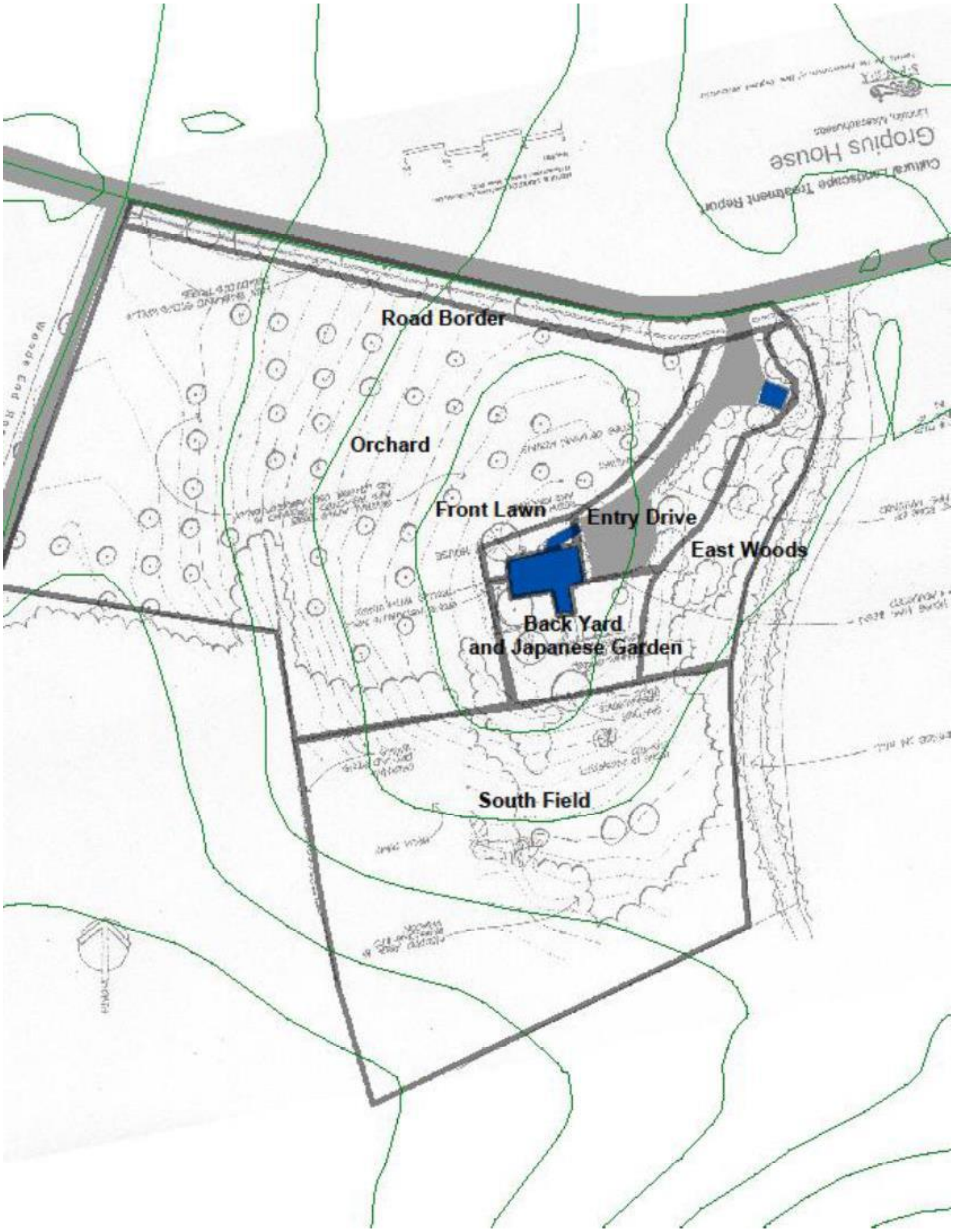


Source: Ise Gropius, History of the Gropius House (1977)

SECOND FLOOR



APPENDIX C – SITE PLAN



Additional Resources 07

Gropius House Tree and Woody Shrub Inventory and Assessment
Tree Specialists and Historic New England, 2009

Tree Specialists, Inc.
Conservation | Preservation | Restoration

140 Washington Street
Holliston, Massachusetts 01746
T 508.429.8733 F 508.429.7991
www.treespecialists.com

2009 Tree Assessment and Inventory project

Summary of field notes for the Gropius House in Lincoln M.A. ï site visit on March 13, 2009:

Many of the most prominent trees around the house have obviously been worked on in the past, and are in decent shape. Still, their proximity to the historic structure does elevate the importance of ongoing maintenance:

There are several trees in close proximity to the house that need to pruned back for increase air and light flow to the structure. The **Zelkova** (#1) by the covered entryway should be pruned back, or, consider removal if it is not historically appropriate. The large **Red oak** (#3 at the rear corner) is obviously right on top of the building. The tree looks to be in good shape structurally, but the proximity of the canopy to the roof and siding will trap moisture, and may be problematic over time. A lightning protection system in this tree would protect the tree, as well as the house and the adjacent **mature pine** (#3). The pine should be periodically crown reduced to decrease snow loading, and to reduce shading on adjacent understory plantings. The **smaller pine** (#2) by the front lawn should be periodically crown reduced, or removed. It would not be advisable to allow another large pine to develop so close to the structure.

The orchard is in need of pruning and some structural bracing on a couple of the trees. The tendency of apple trees to become hollow and their heavy, dense growth habit can combine to cause structural failures. Pruning doesnõt need to be fussy, but should be done with some regularity. The numerous large **Red cedars** that are growing around the property are the alternate host for a common foliar disease on apples called *Cedar-apple rust*. While it is impossible to completely control the disease, reducing the number and proximity of cedars to the orchard can reduce the severity.

Bordering the orchard on the street side are a number of younger volunteer trees. If allowed to develop they will seriously change the visual character of the property. The town is proposing to remove many of the **declining maples** that are growing outside the wall along the street, which will also change the visual character of the property. This perimeter of the property may warrant further discussion and planning, though the issue is not necessarily ñhigh priorityò.

There is some high priority work to be done on some large pines (#õs 19-21) around the garage/visitors center. Pines are a weak wooded species that tend to shed limbs and break apart in storms. Their proximity to the structure increases the need for proactive management.

Site Name			Gropius	Objective Abbreviation		Pruning Type			Priority- 1,2,3	
Date			3/13/2009	M- Maintenance		CC- Crown Clean			Condition- Good,Fair,Poor	
				R- Removal		CR - Crown Reduce			Safety Issue-Yes,No	
				SR- Storm Repair		SB- Structural Bracing			Notes-Historically Significant- Hist	
						CRA- Crown Raise		Part of a Landscape Design Feature- Feature		
						CT- Crown Thin				
ID #	Zone #	DBH	Common Name	Objective	Pruning Type	Safety Issue	Priority	Condition	Notes	2016 Historical Notes
1	ED	19"	Zelkova	M	CC,CRA	NO	1	Good	Clearance off house	Replacement of historic elm tree. DO NOT REPLACE. The original was one of five trees Gropius planted before construction.
2	FL	21"	White Pine	M	CC,CR,CT	NO	2	Good		Replacement of a historic tree. The original was one of five trees Gropius planted before construction
3	BY	32"	Red Oak	M	CC,CR,CT	NO	2	Good	Lightning protect?	Historic Tree planted by Gropius before construction.
4	BY	47"	White Pine	M	CC,CR,CT	NO	CR1. 2	Good	CR limbs off juniper. Inspect SB	Historic Tree planted by Gropius before construction.
5	BY	39"	Red Oak	M	CC,CR	NO	3	Good		Historic Tree planted by Gropius before construction.
6	BY	5"	Crab Apple	M	CC	NO	3	Good		Historic Tree planted by Gropius.
7	BY	12"	Dogwood	M	CC	NO	3	Good		Historic Tree planted by Gropius.
8	BY	15"	Euonymus	M	CC	NO	3	Good	Research origin	Historic Tree planted by Gropius.
9	BY	5"	Juniper SP.	R ?					Dead, Replant?	Provenance not known at this time.
10	BY	N/A	Cedar Stump						Stump, Replant?	Historic Tree should be replace.
11	EW	10"-15"	Red Cedar						13 trees research? Clean out invs.	
12	ED	N/A	Juniper	M	CC,CR				Shrub border	Historic Gropius plantings.
13	EW	N/A	Mixed woods						SugM,Ash,Wpne remove all but sm	

14	EW	31"	White Ash	M	CR	NO	2	Fair		Provenance not known at this time.
15	EW	31"	White Pine	M	CC,SB	NO	2	Fair	Co dominant stem	Provenance not known at this time.
16	EW	24"	White Pine	M	CC,SB	NO	2	Fair		Provenance not known at this time.
17	ED	26"26"	Hemlock	M	CC,CR,SB	NO	2	Good	2 stems, old monitor for adelgid	Historic Gropius plantings.
18	EW	26"	Hemlock	M	CC	NO	2	Good	CC low dead, monitor for adelgid	Historic Gropius plantings.
19	EW	34"	White Pine	M	CC,CR,SB?	NO	2	Good	SB inspection, rmve saplings around	Historic Gropius plantings.
20	EW	26"	White Pine	M	CC,SB	NO	2	Good		Provenance not known at this time.
21	EW	36"	White Pine	M	CC,CR,SB	Yes	1		3 way cable-split, over garage	Historic Gropius plantings.
22	ED	6"	Crab Apple						Shaded out	Historic Gropius plantings.
23	EW	N/A	Sugar Maple saplings						Clean out	
24	ED	14"14"	Sycamore Maple					Fair	Volunteers?	Provenance not known at this time.
25	RB	46"	White Ash					Fair		
26	RB	36"	Sycamore Maple					Poor	Town Tree	
27	RB	29"	Sugar Maple					Fair	Town Tree	
28	RB	24"	Sycamore Maple					Poor	Town Tree	
29	RB	27"	Sugar Maple					Fair	Town Tree	
30	RB	31"	Sugar Maple					Poor	Town Tree	
31	RB	21"	Sugar Maple	R				Poor	Town Tree	

32	RB	25"	Sugar Maple	R				Poor	Town Tree	
33	RB	20"	Red Maple					Fair	Town Tree	
34	RB	8"	Red Maple					Fair	Town Tree	
35	RB	16"	Red Maple					Fair	Town Tree	
36	RB	4"	White Ash					Fair	Town Tree	
37	RB	20"	Red Maple					Poor	Town Tree	
38	RB	41"	Red Oak					Poor	Town Tree	
39	O	4"	Cherry	R					Scale	
40	O	6"	Black Oak							
41	O	35"	Black Oak	M	CC	No	3	Fair	Causing wall damage	
42	O	5"	Red Maple							
43	O	10"	Red Maple							
44	O	10"	Red Maple							
45	O	10"	Sugar Maple							
46	O	22"	Pin Oak	M	CRA			Good	Low Branches	
47	O	22"	Red Oak	M	CRA					
48	O	19"	Red Oak	M	CRA					
49	O	7"	Red Oak							

50	O	8"	Red Oak								
51	O	8"	Red Oak								
52	O		White Ash								
53	O		White Ash								
54	O		White Ash								
55	O	17"	Apple	M	SB				F/P	Old	
56	O	24"	Apple	M	CC,SB					Old	
57	O	21"	Apple	M	CC					Old	
58	O	24"	Apple	M	CC					Old	
59	O	18"	Apple	M	CC					Old	
60	O	12"	Apple	M	CC					Old	
61	O	19"	Apple	M	CC					Old	
62	O	17"	Apple	M	CC					Old	
63	O	19"	Apple	M	CC					Old	
64	O	16"	Apple	M	CC					Old	
65	O	30"	White Pine	M	CC,CT,CR	NO		2	Good	SB,Remove brush around	
66	O	25"	White Pine	M	CC	NO		2	Good		
67	O	16"	Red Cedar	M	CR					Remove?	

68	O	14"	Red Cedar	M	CR				Removed.	
69	O	12"	Red Cedar	M	CR				Remove?	Historic Gropius plantings.
70	O	12"	Flowering Dogwood						Monitor for anthracnose	Historic Gropius plantings.
71	SF	12"	Flowering Dogwood						Stump, Replant?	Historic Gropius plantings.
72	SF	56"	White Pine	M	CC,SB		SB1		CC rough, 3way cable, ant frass	Historic Gropius plantings.
73	SF	50"	White Pine	M	CC,SB		3		CC rough	Historic Gropius plantings.
74	SF	N/A	Mixed woods						Clear invasive and saplings, mow	
75	O	N/A	Mixed woods						Selective removal down to wall	
76	O	N/A	Apples, new						(Root collar excavation fill with sand,	
									Mulch around with composted wood	
									chip. Remove cages as needed.	
									Monitor for orchard diseases)	

Gropius Tree Inventory
March 13, 2009

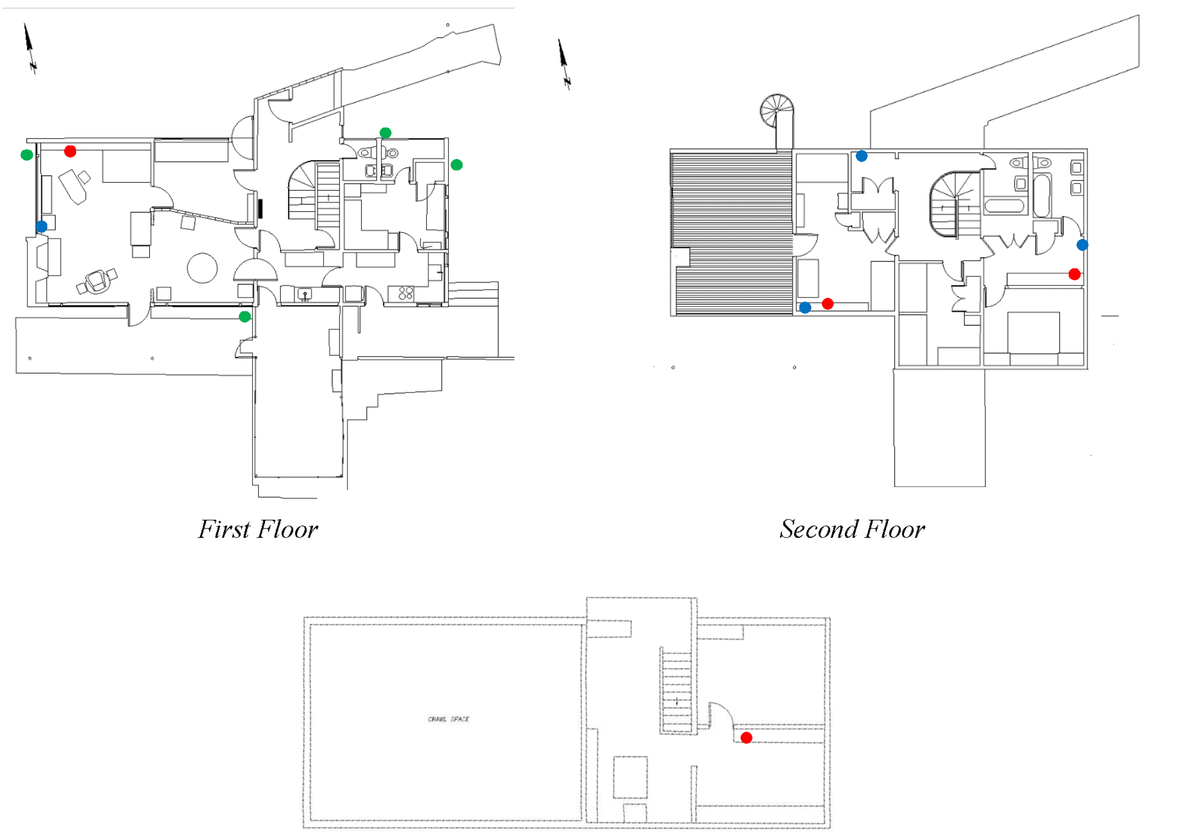
Additional Resources 08

Gropius House Environmental Monitoring and Assessment Report
Historic New England, 2016

<u>Gropius House - Environmental System Review</u>

Historic New England has a standing program of monitoring temperature and relative humidity in all museum buildings in the collection. This program, dating back to the late 1990s, was redesigned and redeployed in 2009 and through semi-annual data analysis, the organization has been able to tweak building systems in order to maintain a general balance of relative humidity between 40% and 60%. The organization has determined that this range provides a manageable balance between the ongoing management of organic objects in the collection, the building components and the inhabitants ï visitors and staff.

At Gropius House data loggers from Onset (Bourne, MA) have been deployed in four locations since 2009. These collection points are located in the basement, the living room, the dressing room, and the living room chamber or ñAtiôs Roomò. *(Figure 1)*



First Floor

Second Floor

Basement

Figure 1: Onset Data Logger Locations

- *U12-011 data loggers*
- *U100-23 data loggers*
- *U23-001 data loggers*

Since Gropius House is open for visitation year round and provides office space for one site manager year round, the winter heating plan results in the relative humidity profile dipping below 30%. Rather than add artificial humidity to the space, Historic New England will be looking at moderating temperature in the house. As is typical with most below grade basements, the relative humidity in the summer in the basement is elevated. This is somewhat exacerbated by the large crawlspace with unfinished floor. *(Figure 2)*

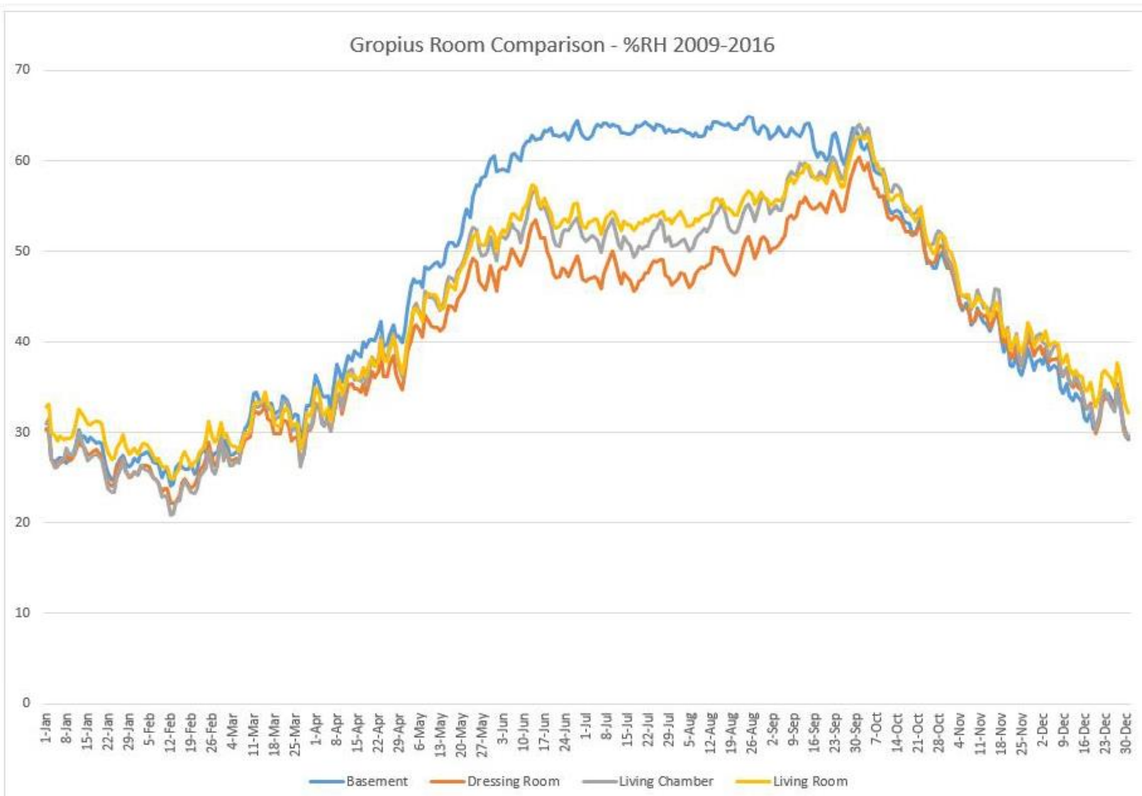


Figure 2: Relative Humidity Trends by Room

In 2016 additional data loggers were deployed in ñwall cavitiesò and affixed to each exterior elevation. This deployment was done in an attempt to understand temperature and humidity changes in these spaces. *(Figure 1)*

While the idea of placing sensors in wall cavities was interesting, the actual implementation was challenging. For this deployment Onsetôs U100-023 data logger with an external temperature and humidity sensing probe was used. In order avoid unnecessary penetration of existing walls, the probes were inserted into the radiator cavities at each elevation. Over time, most of the perimeter radiators have been taken off line due to leaks. Thus, a probe in this space is the closest option to a probe in the exterior wall space.

Three of the four locations were within a few feet of the existing room data logger. This proximity allows for an approximate comparison of conditions in the room and in the ñwall cavityò. The only location on the north elevation did not correspond to an existing room sensor and the radiator in this space remained active. Thus its data is considered an outlier at this time. In the other three locations, the relative humidity data in the ñwall cavityò and the room were remarkably similar. This might suggest that interior and interstitial relative humidity conditions are not likely to impact the mold growth exhibited on the exterior cladding. *(Figures 3-5)*

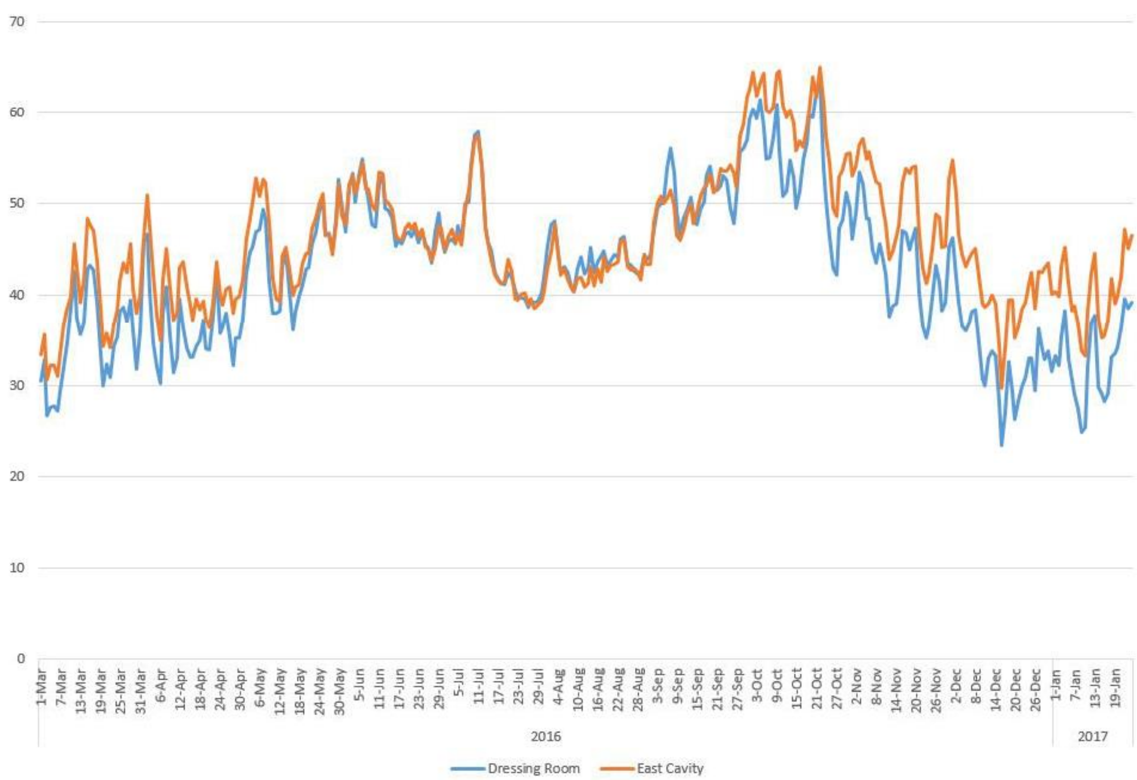


Figure 3: Relative Humidity Comparison – Dressing Room / East Cavity

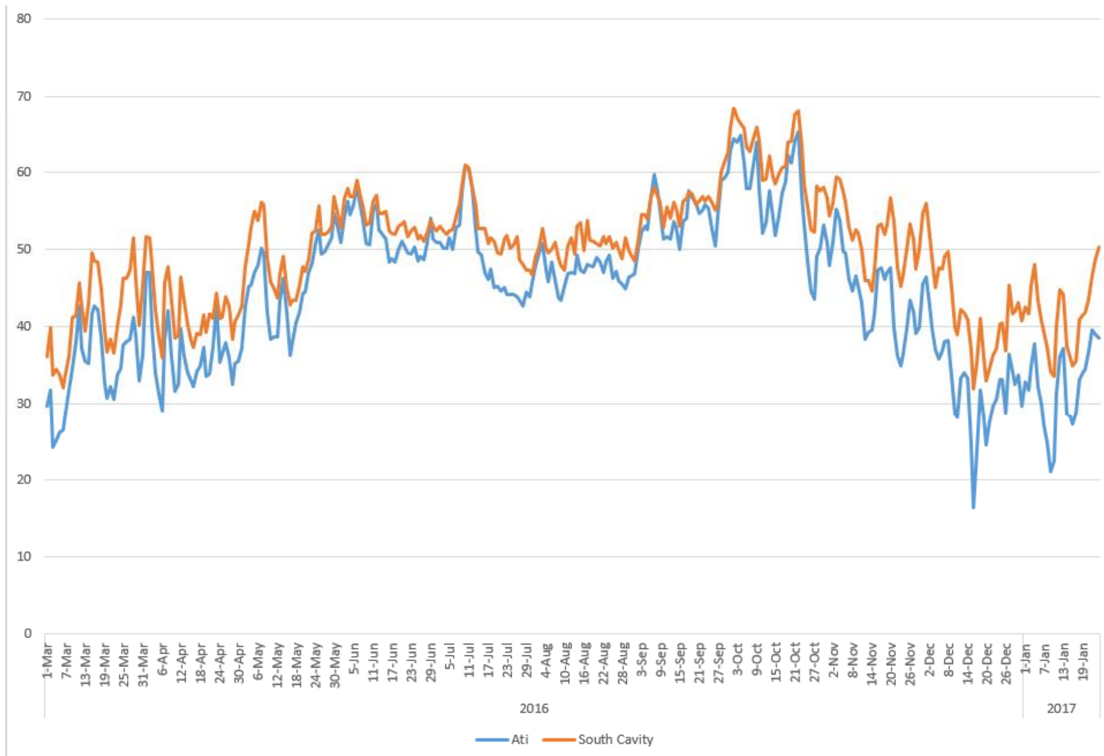


Figure 4: Relative Humidity Comparison – Ati's Room / South Cavity

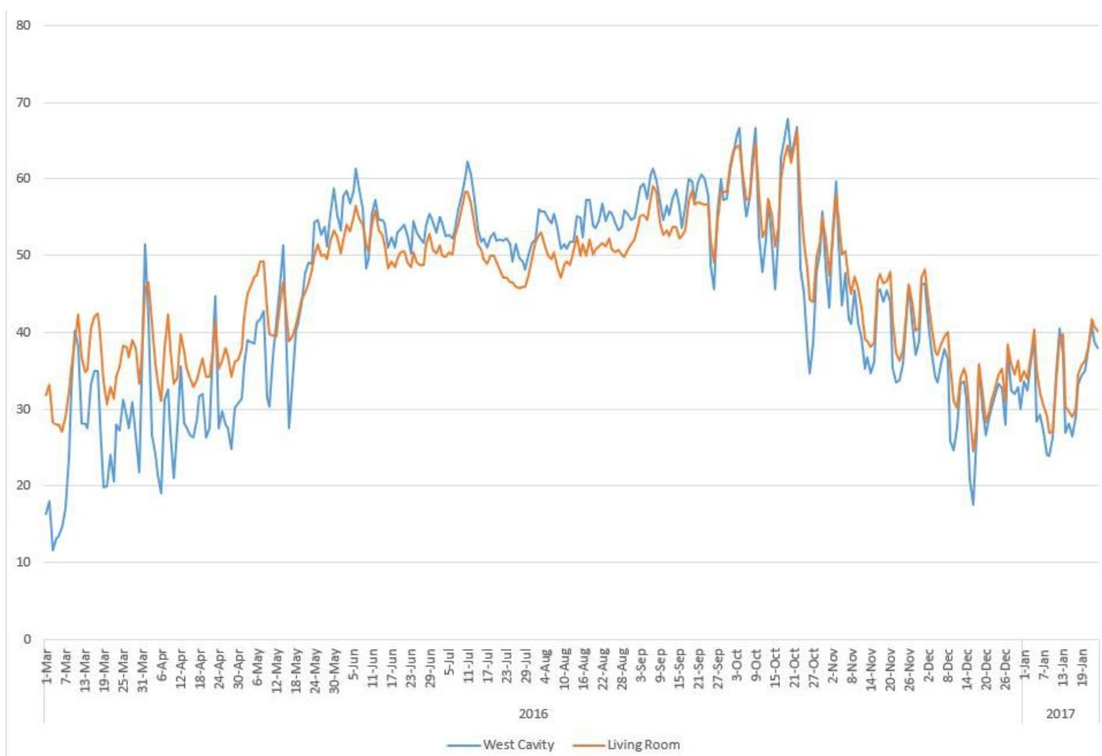


Figure 5: Relative Humidity Comparison – Living Room / West Cavity

With respect to the data collection on the exterior elevations, Onsetœs U23-001 weatherproof temperature and relative humidity data logger. The relative humidity data was remarkably similar across all four elevations. The overall trend of relative humidity on the exterior ranged from approximately 65 to 80%. This would be a suitably hospitable environment for mold growth on the exterior cladding. *(Figure 6)*

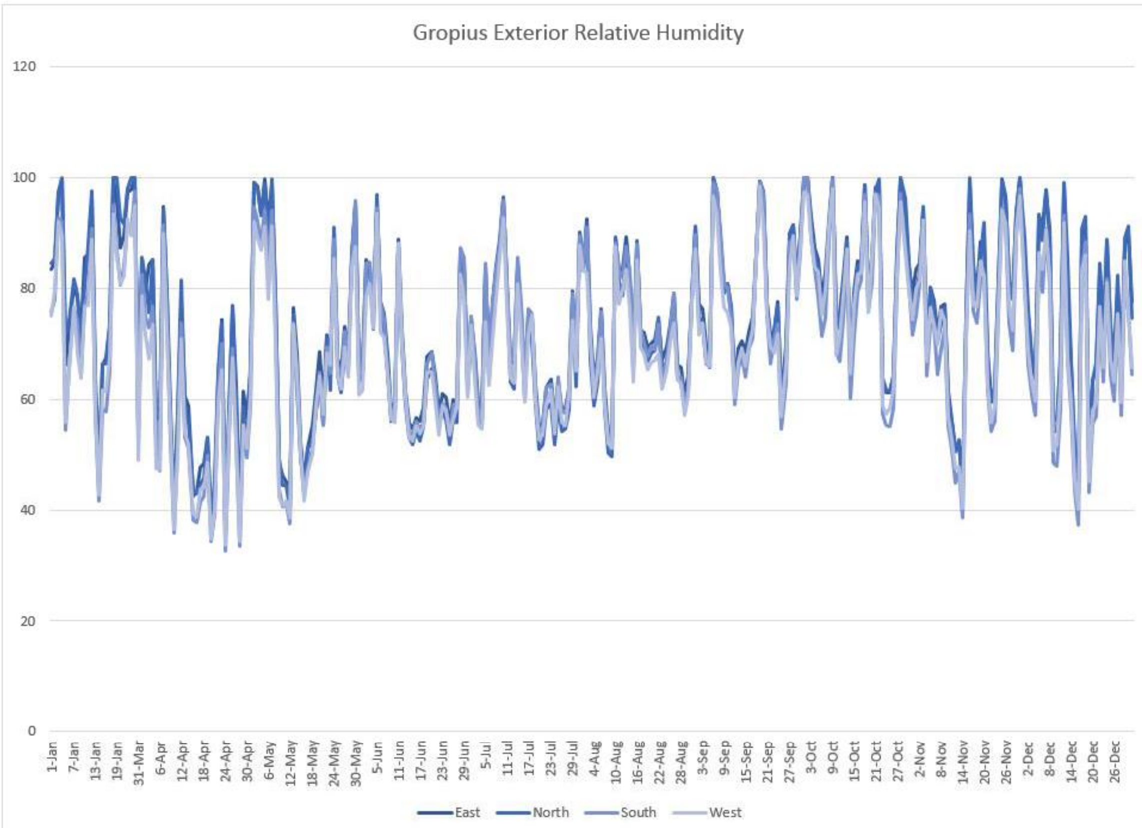


Figure 6: Exterior Humidity Trends by Elevation

Additional Resources 09

Conservation Report for Glass Block, Acoustic Plaster and Exterior Siding
Jablonski Building Conservation, 2016

CONSERVATION PLAN:
ARCHITECTURAL GLASS AND ACCOUSTICAL PLASTER

GROPIUS HOUSE
LINCOLN, MA

Prepared for:
Historic New England
Lyman Estate
185 Lyman St.
Waltham, MA 02452

Prepared by:
Jablonski Building Conservation, Inc.
40 West 27th Street, Suite 1201
New York, NY 10001

October 5, 2016

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Jablonski Building Conservation, Inc. (JBC) was retained to assess the condition of and develop a treatment plan for the exterior architectural glass and to conduct cleaning tests on the acoustical plaster at the Gropius House in Lincoln, Massachusetts.

Architectural Glass: Materials Identification

Three decorative types of glass were identified at the Gropius House, including glass block and two types of flat, architectural pattern glass. A review of historical manufacturers' product literature allowed for positive identification of the glazing materials. Fluted glass used on the north elevation is "Louvrex" manufactured by the Libbey-Owens-Ford Glass Company of Toledo, Ohio. Ribbed glass used on the south elevation is most likely another Libbey-Owens-Ford product called simply, "ribbed". Glass block used on the north elevation matches the description of a product identified as "Insulux" pattern number 407, manufactured by the Owens-Illinois Glass Company of Muncie, Indiana.

Architectural Glass: Assessment & Treatment

A survey and assessment of exterior architectural glass at the Gropius House was performed to determine its current condition. This work encompassed materials present on the north, east, and south exterior elevations of the building, including pattern flat glass and glass block. Conditions were noted on elevation drawings (see Appendix A). JBC investigated the cause of deterioration occurring at the exterior glass block wall. This entailed a structural assessment (Appendix B), performed in consultation with a structural engineer, and analysis of the mortar used in the block wall assembly (Appendix C).

The survey of pattern glass ("Louvrex" and "ribbed") found breakage on all three elevations where the material is present. The majority of these breaks are typical, linear stress-related cracks most likely due to corrosion of the steel window sashes. Cracks in the glass block units are due to corrosion of the steel channel which frames the vertical ends of the wall.

There are several treatment options for deteriorated pattern glass and glass block. While repair is preferred, replacement, either with similar modern materials or salvaged historic materials, will likely be necessary.

Acoustical Plaster: Materials Analysis

The acoustical plaster present on the walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways is identified as a product called "stucoustic", manufactured by the California Stucco Products Company. The material is a two-coat lime-based plaster containing cellulose, pumice, and crushed marble. Evidence suggests that the plaster's texture was achieved through a spray-applied dash finish that was "knocked down" using a broad float or similar tool. No asbestos and no evidence of air-entraining admixtures were detected. The plaster does contain sulfates, nitrates, and possibly chloride salts. No evidence of an original surface coating was found.

Acoustical Plaster: Cleaning Tests and Treatment

JBC tested the effectiveness of nine latex-based poultice-type cleaners in removing soling and stains present on the acoustical plaster. Some of these products left the substrate slightly discolored. Tests employing gentle abrasive means were ineffective. Additional tests explored the viability of coating the plaster using limewash to mask soiling and stains. This treatment provided the best results.

INTRODUCTION

The services of Jablonski Building Conservation, Inc. (JBC) were retained by Historic New England (HNE) to assess the condition of and develop a treatment plan for the exterior architectural glass and to conduct cleaning tests on the acoustical plaster at the Gropius House in Lincoln, Massachusetts. Conservators Mary Jablonski and Edward G. FitzGerald from JBC visited the site October 28-30, 2015, to perform an assessment of the existing conditions and execute the cleaning tests. They were joined by structural engineer Elizabeth Acly with Cirrus Structural Engineering. HNE was represented by Colleen Chapin, Senior Preservation Manager. Second and third site visits were conducted April 19-20 and May 31-June 1, 2016, to perform additional testing on the plaster. Results and recommendations are presented below.

I. HISTORY AND DESCRIPTION OF MATERIALS

In the design of his home, Walter Gropius primarily made use of standard materials available through architectural trade catalogs. These materials were selected for reasons of economy, but also because Gropius wanted to demonstrate that readily available industrial products could be used to create elegant modern design solutions.[1] The use of readily available products is evidenced in the glazing and acoustical plaster materials selected for the house.

A. Pattern Glass

Two types of architectural pattern glass were used in the window openings of the Gropius House. Pattern glass is present in steel-framed windows on the north, east, and south elevations of the house. The monolithic (single-thickness) panes are set in a traditional (i.e. oil and whiting) glazing compound.

On the north elevation, fenestration is arranged in a horizontal band composed of fixed panes of textured, bevel-fluted[2] glass alternating with casement sash, allowing light into the half-bathroom located off of the front entry hall and into the maid's bathroom. The 1-inch wide fluted pattern is arranged horizontally, accentuating the linear band-like form of the windows. Fluted glass is also used in an adjacent window on the east elevation on the east wall of the coat closet ell located off of the front entry hall. This window consists of a fixed vertical sash with an upper, operable casement sash. The fluting pattern of the glass runs vertically in this application, matching the vertical orientation of the window. Narrow windows glazed with view-obscuring pattern glass were likely chosen in these locations to provide privacy while still allowing diffuse light into interior spaces.

On the south elevation, beneath the screened-in porch, ribbed glass is present in a window consisting of a large horizontal fixed sash and a smaller adjacent casement sash, allowing diffuse light into the pantry. As with the fluted glass on the north elevation, the ribbed pattern of this south window is oriented horizontally. Each rib measures 1/8-inches wide and the glass thickness measures 3/16-inches. The glass surface has been given a frosted finish texture (on the interior, ribbed side), making the glass opaque.

After Historic New England assumed responsibility for the property in the 1980s, some of the metal window sashes at the Gropius House were removed and restored, one elevation at a time, over several years.[3] While treatment reports from this work mention damage to the clear, flat glass in the living room window on the south elevation, no report

[1] Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 7.
[2] The fluted pattern is beveled or facetted in profile rather than having the rounded concavities typically associated with the word *fluted.* The fluted side of the glass (i.e. opposite the flat side) has a mottled surface texture similar to hammered glass.
[3] For a description of window deterioration and installation detail issues, see Jeanmarie Dani, "The Walter Gropius Residence, Lincoln, Massachusetts: Construction History and Restoration Issues," (MS thesis, Columbia University: 1995), 49-50.

of damage to or treatment of any of the pattern glass has been found.[4] Discussions with site staff suggest that only the sashes containing flat glass were removed and that those containing pattern glass were left and treated in situ.[5]

B. Glass Block

Glass block is used to enclose the west end of a flat roofed marquee at the main entrance on the north elevation of the Gropius House. This glass block wall continues into the front entry ell, fenestrating the interior entry hall. The individual blocks were cast with a fluted pattern that runs parallel on both faces and, on the front entry wall, they were laid with this pattern alternating in direction (flutes running horizontal or vertical) with each course. The wall serves not only to shield the entry from weather (and prying eyes) and illuminate the interior, it contributes to the design aesthetic of the house, imparting a sense of volume without the solidity conveyed by traditional masonry and providing detail through the intrinsic elegance of materials rather than applied ornament. The same glass block is also used to form a partition wall between the study and the dining room, echoing the exterior wall and allowing light to penetrate the north-south axis of the house.

Two memos written in 1996 report deterioration in the condition of the exterior glass block wall on the north elevation. Apparently cracks in certain blocks, which had been present for some time before the memos were written, were progressively worsening. In one memo, the author surmises that water that had filled the inner cavity of a block during the summer months had frozen in the winter, causing more cracks to appear.[6] In the other memo, a diagram shows the location of the cracks affecting four separate blocks.[7]

C. Acoustical Plaster

The walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways are all covered with a textured sound-absorbing plaster made by the California Stucco Products Company.[8] The same company also supplied the stucco used on the ceilings of the back porch, entry canopy and the roof deck.[9] According to Ise Gropius, the material was spray-applied directly over a rough coat of plaster and the installation was supervised by "the chemist-owner of the

---

[4] Bruce Blanchard, "Work Completion Report," Sept. 18, 2000 (HNE Collection).
[5] FitzGerald discussion with Colleen Chapin, Senior Preservation Manager, Historic New England, April 20, 2016.
[6] Peter [*unknown*], memorandum to Linda [Willett] re. Gropius House glass block, Feb. 1, 1996 (HNE Collection).
[7] Annabel Hanson, memorandum to Linda Willett re. damage to glass block wall, July 17, 1996 (HNE Collection).
[8] Gropius, *History of the Gropius House*, 11-12.
[9] Walter Gropius, letter to California Stucco Products of New England, Inc., July 11, 1955 (HNE Collection).

producing plant."[10] In her 1997 materials evaluation for the house, Susan Buck determined that the plaster appears to have been coated with a thin layer of white paint on top of which she noted a layer of soiling.[11] Evidently, this soiling had been noted before. A list entitled "House Repairs" dated November 23, 1945, includes, "Have ceilings and wall of living room and study washed."[12]

By the 1980s, the plaster had apparently developed a "shabby" appearance due to soiling.[13] The house was originally heated by an oil-fired system and, in the living room, the Gropius family made use of the wood-burning fireplace—both of which generated soot that may have contributed to the discolored appearance of the plaster. Members of the Gropius family also smoked indoors.

After Historic New England assumed responsibility for the property, several attempts to improve the appearance of the acoustical plaster were made.[14] At the time, HNE staff were cautious that any cleaning system to be used would not bleach pigments in the plaster and would not require an excessive amount of water which might damage the porous material.[15] Records indicate that the following cleaning products or processes were tested or used including a steam cleaning process using a vacuum pick-up, a PROSOCO product called "Sure-Klean T534 Concentrated Alkaline Cleaning Compound", a product called "Acoustic-Clean" containing chlorine bleach, and a product called "Ceil Clean Ceiling Solution and Activator".[16]The extent and results of the tests and/or any full-scale cleaning treatments is unknown for all of the aforementioned except Ceil Clean.

Ceil Clean was used to treat the acoustical plaster in 1986.[17] This proprietary product included a solution containing a caustic detergent, chelating agent, solvent, and surfactant, and an "activator" consisting of an inorganic water-soluble oxidizing agent (likely ammonium persulfate).[18] The first component of this was designed to dissolve and redistribute soiling to create an even appearance while the second component, the

---

[10] Gropius, *History of the Gropius House*, 11-12.
[11] Susan L. Buck, "A Material Evaluation of the Gropius House: Planning to Preserve a Modern Masterpiece," *APT Bulletin* 28, no. 4 (1997): 29-35. Note that this is not the full report and only makes brief mention of a suspected coating on the plaster: "There appears to be only one, thin, white paint layer on the acoustic plaster in the living room and dining room; it is not possible to determine whether this is the original paint." (p. 33) JBC did not receive a copy of Buck's full report. For a complete materials analysis of the plaster, including more discussion regarding the presence of a coating, see Section IV.
[12] Document entitled "House Repairs," November 23, 1945 (HNE Collection).
[13] "Gropius House Completion Report," [1987] (HNE Collection).
[14] In addition to cleaning, HNE treatments included "replacement of defective areas of the specialty acoustical and gypsum plaster work". Document entitled "Development Project Completion Report Submitted to the Massachusetts Historical Commission June 1986," 2 (HNE Collection).
[15] Ibid.
[16] Ibid. [unsigned], memorandum to Rob re. Gropius, Sept. 15, 1987(HNE Collection). Andy Ladygo, memorandum to Peggy re. Rob's meeting with Siliono, Dec. 23, 1987 (HNE Collection).
[17] P.O. to New England Ceiling Masters, Needham, MA, May 24, 1986 (HNE Collection).
[18] "Ceil Clean Ceiling Solution and Activator," material safety data sheet [1980] (HNE Collection). Note patent number listed under "formula" on MSDS. Jeffrey J. King, "Inorganic Persulfate Cleaning Solution for Acoustic Materials," U.A. Patent 4,377,489, filed March 16, 1981, issued March 22, 1983.

activator, was intended to bleach away residual staining. Ceil Clean was designed to be spray-applied and left to dry in place, not to physically remove soiling.

The Ceil Clean treatment proved somewhat successful. However, water stains, leeching lime/cement, and the most severe soiling were not removed by this process.[19] Follow-up cleaning tests were performed using bleach solutions and abrasives with no improvement in results.

In 2002, HNE made another attempt to improve the appearance of the plaster.[20] This effort appears to have focused on orange-colored stain present on the plaster above the window in the dining room. Swab applications of alcohol and a solution of alcohol and water were ineffective. Ammonia and an ammonia and water solution proved effective in lifting some of the staining onto the swab. However, these also seemed to make the color of the stain appear more vibrant. Watercolors were dotted over the stain in order to reduce its visual appearance and further treatment tests using poultices, detergents, and a wider range of solvents were recommended.

[19] "Gropius House Completion Report."
[20] L. Murdoch, *untitled* [plaster cleaning report] July 2002 (HNE Collection).

II. ARCHITECTURAL GLASS: MATERIALS IDENTIFICATION

Historical research was conducted to identify the manufacturer(s) of historic architectural glass at the Gropius House. The scope of this research is limited to the architectural pattern glass and glass block present on the exterior. The purpose of this research is to document character-defining materials and generate information to aid in sourcing appropriate replacement materials.

A. Methodology

To aid in materials identification, descriptive attributes of the pattern flat glass and glass block were recorded during a field survey. Information provided by HNE related to the history of the house was also reviewed. Identification of glass materials was carried out through research of historical manufacturers' product literature dating to the period of design and construction.

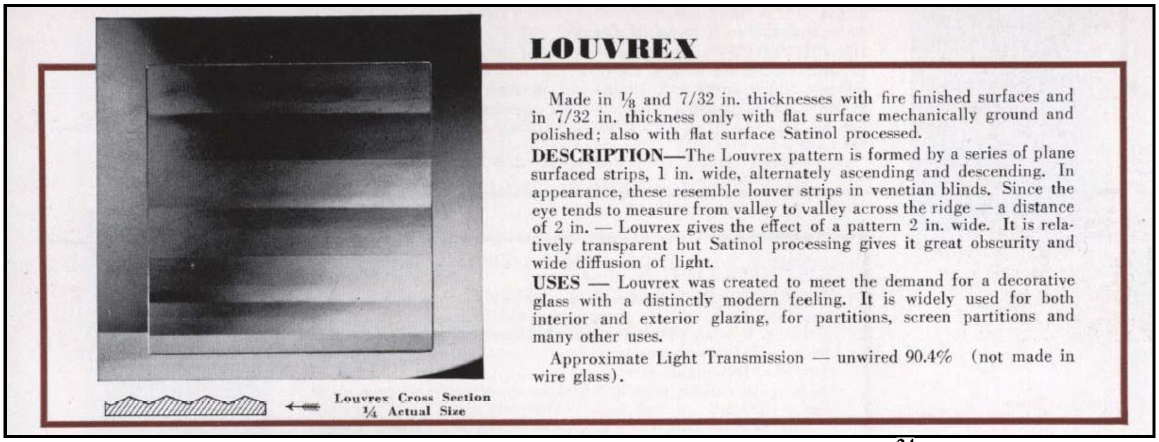
B. Materials Identification

Three decorative types of glass were identified at the Gropius House, including glass block and two types of flat, patterned architectural glass. A review of historical manufacturers' product literature allowed for positive identification of the glazing materials.

1. Pattern Glass

Bevel-fluted glass used on the north elevation matches the description of a product identified as "Louvrex," manufactured by the Libbey-Owens-Ford Glass Company of Toledo, Ohio (Figure 1).[21] The product first appeared in the company's 1938 catalog where it was described as "a new figured glass especially developed for use in modern architecture."[22] In addition to the pattern, the mottled surface texture of the glass matches the description of a finishing process known as "Satinol" that was a standard option available on Louvrex and other pattern glass models manufactured by a Libbey-Owens-Ford subsidiary, the Blue Ridge Glass Corporation, located in Kingsport, Tennessee. While early construction specifications suggest that Gropius intended to use other glazing products in the sashes where Louvrex was installed, they also show that he was familiar with the products of Libbey-Owens-Ford and its Blue Ridge subsidiary.[23] The disparity between the specifications and as-built conditions coupled with the fact that Louvrex did not appear in the manufacturer's literature until 1938, the very year that the house was under construction, suggest that Gropius either made a late change to a cutting-edge material or that the glass was replaced at a later time. However, every other indication suggests that the glass is original to the house.

[21] "Libbey-Owens-Ford Glass" in *Sweet's Catalog File* 1938, Sec. 17-25 (New York: F.W. Dodge Corp., 1938), 18/3.
[22] Ibid.
[23] Walter Gropius and Marcel Breuer Associated Architects, "Specification of Labor and Materials for the Residence of Mrs. James J. Storrow, Lincoln, Massachusetts" (HNE Collection), Sect. 14: Glazing, 48.



LOUVREX

Made in 1/8 and 7/32 in. thicknesses with fire finished surfaces and in 7/32 in. thickness only with flat surface mechanically ground and polished; also with flat surface Satinol processed.

DESCRIPTION—The Louvrex pattern is formed by a series of plane surfaced strips, 1 in. wide, alternately ascending and descending. In appearance, these resemble louver strips in venetian blinds. Since the eye tends to measure from valley to valley across the ridge — a distance of 2 in. — Louvrex gives the effect of a pattern 2 in. wide. It is relatively transparent but Satinol processing gives it great obscurity and wide diffusion of light.

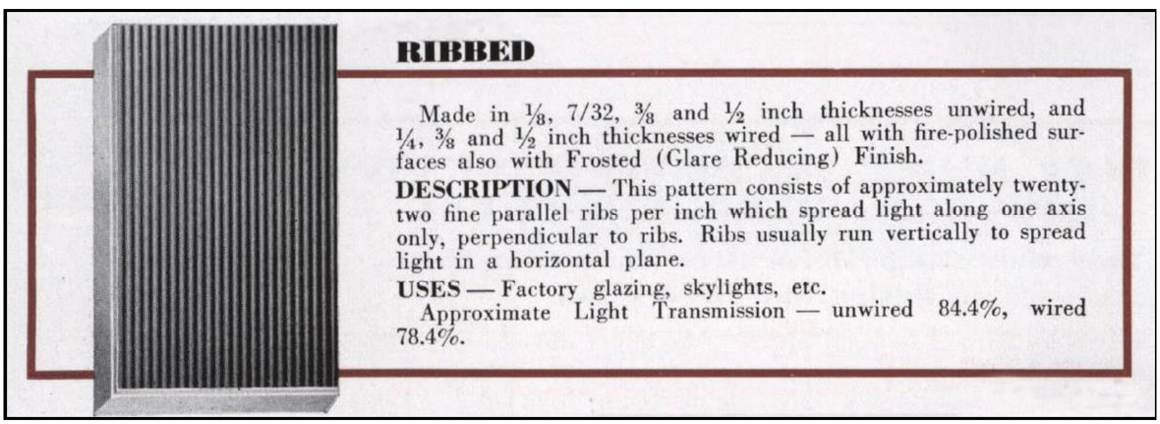
USES — Louvrex was created to meet the demand for a decorative glass with a distinctly modern feeling. It is widely used for both interior and exterior glazing, for partitions, screen partitions and many other uses.

Approximate Light Transmission — unwired 90.4% (not made in wire glass).

Louvrex Cross Section 1/4 Actual Size

Figure 1. "Louvrex" fluted glass from 1941 Libbey-Owens-Ford trade catalog.[24]

Ribbed glass used on the south elevation's pantry window also matches the description of a Libbey-Owens-Ford product called simply, "Ribbed" (Figure 2).[25] This product was available as early as 1933.[26] The glass has been manufactured with a frosted or etched finish texture which was available as a standard option from the manufacturer. Early construction specifications indicate that Gropius originally intended to use another ribbed glass called "Skytex" in his design.[27] Both Skytex and Ribbed glass were manufactured by Libbey-Owens-Ford's Blue Ridge subsidiary, however, Skytex had a much coarser appearance with eight ribs per inch versus Ribbed which had twenty-two.[28] Interestingly, the manufacturer's product literature recommended these particular types of glass be used in industrial applications including factory glazing and skylights, an aesthetic that was very much in keeping with Gropius' design philosophy.



RIBBED

Made in 1/8, 7/32, 3/8 and 1/2 inch thicknesses unwired, and 1/4, 3/8 and 1/2 inch thicknesses wired — all with fire-polished surfaces also with Frosted (Glare Reducing) Finish.

DESCRIPTION — This pattern consists of approximately twenty-two fine parallel ribs per inch which spread light along one axis only, perpendicular to ribs. Ribs usually run vertically to spread light in a horizontal plane.

USES — Factory glazing, skylights, etc.

Approximate Light Transmission — unwired 84.4%, wired 78.4%.

Figure 2. Ribbed glass from 1941 Libbey-Owens-Ford trade catalog.

---

[24] *Libbey Owens Ford Quality Flat Glass Products* (Toledo, OH: Libbey Owens Ford Glass Company, 1941), 1, available online at https://archive.org/details/1941CatalogLibbeyOwensFordQualityFlatGlassProducts (accessed 11/10/2015).
[25] Ibid.
[26] *Flat glass: Flat drawn window glass, polished plate glass, safety glass, figured and wire glass* (Toledo, OH: Libbey Owens Ford Glass Company, 1933), available online at https://archive.org/details/SweetsArchitecturalCatalog1933Vol.C00011 (accessed 11/10/2015).
[27] Gropius and Breuer Architects, "Specification of Labor and Materials" (HNE Collection), Sect. 14: Glazing, 48.
[28] *Libbey Owens Ford Quality Flat Glass Products*, 13.

Both types of pattern glass found at the Gropius House were produced using the roll method of forming glass sheets. In this process, molten glass is passed through a pair of metal forming rolls, one of which is embossed with a pattern that is imprinted on the glass as the sheet is formed. The resulting sheet is smooth on one side and patterned on the other.

2. Glass Block

Glass block used on the north elevation matches the description of a product identified as "Insulux" pattern number 407, manufactured by the Owens-Illinois Glass Company of Muncie, Indiana.[29] This was later verified through original construction documents provided by HNE.[30] First introduced in 1935, the Owens-Illinois Insulux blocks used at the Gropius House were some of the earliest glass blocks produced on a commercial scale in the United States and represented the "cutting edge" in building materials of the time period.[31] Characteristic features of this glass block include its size (11-3/4 x 11-3/4 x 3-7/8 inches), ridges located on the side of the block and, particularly, the number (11) and parallel configuration of the molded flutes on two faces of the block (Figure 3 and Figure 4). These features help distinguish this glass block from other similar products manufactured during the same time period, such as the Pittsburgh-Corning Corporation's "Argus" pattern block introduced in 1938.

Hollow glass blocks are manufactured as two separate halves that are pressed together while the glass is still molten, and annealed. Patterns, such as the fluting found in the blocks at the Gropius House, are molded into the inner face of each of the halves before they are joined. During the process, air is evacuated from the inner cavity to create a partial vacuum that improves insulating performance and prevents condensation from forming inside the block.[32] Once annealed, the edges of the blocks are coated in a material that improves their bond with mortar. The blocks are then set in a Portland cement mortar, with expansion joints at jambs and heads and metal joint reinforcement in horizontal mortar joints crossing larger spans (Figure 5).

---

[29] *Owens-Illinois Insulux Glass Blocks* (Muncie, IN: Owens-Illinois Glass Company, 1942), 10.

[30] Gropius and Breuer Architects, "Specification of Labor and Materials" (HNE Collection), Sect. 3: Masonry, 15.

[31] Elizabeth Fagan, "Building Walls of Light: The Development of Glass Block and Its Influence on American Architecture in the 1930s" (Master's thesis, Columbia University, 2015).

[32] Early glass blocks were also manufactured as separate halves. However, the two halves were joined using a metallic seal that was susceptible to failure.

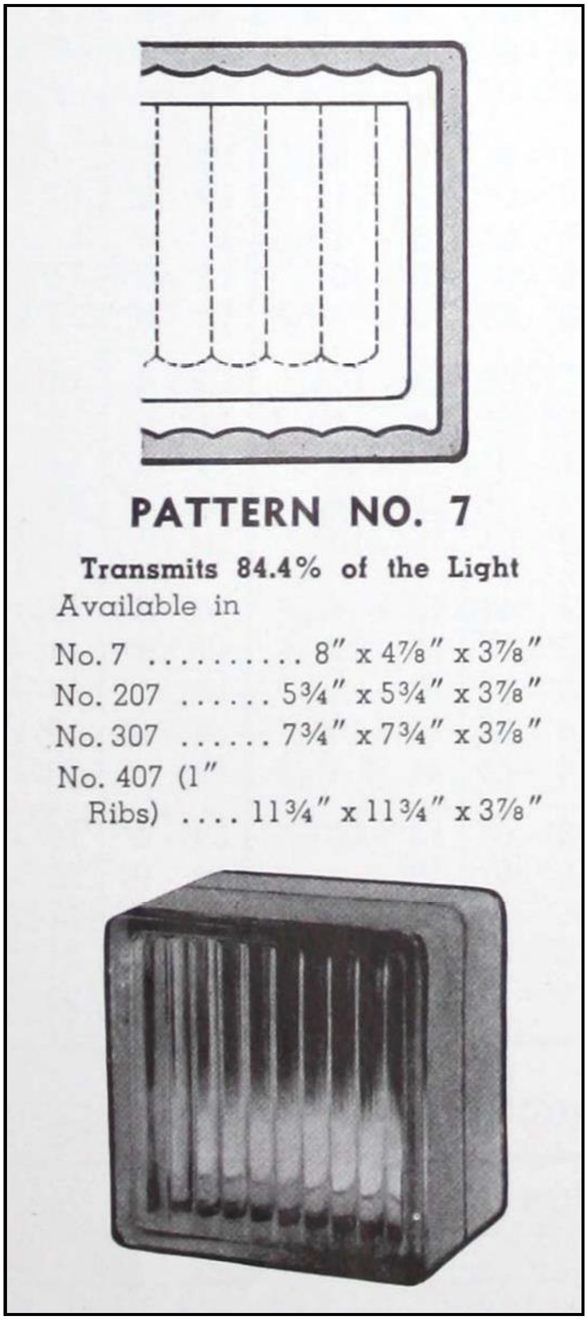


Figure 3. Insulux pattern no. 7 details from 1942 Owens-Illinois trade catalog.

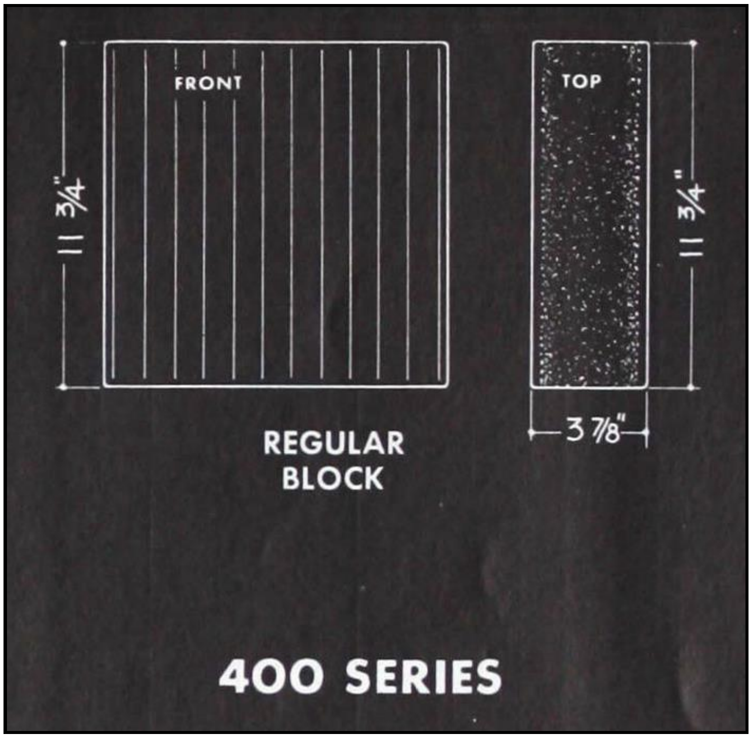


Figure 4. 400 Series Insulux block dimensions from 1942 Owens-Illinois trade catalog.

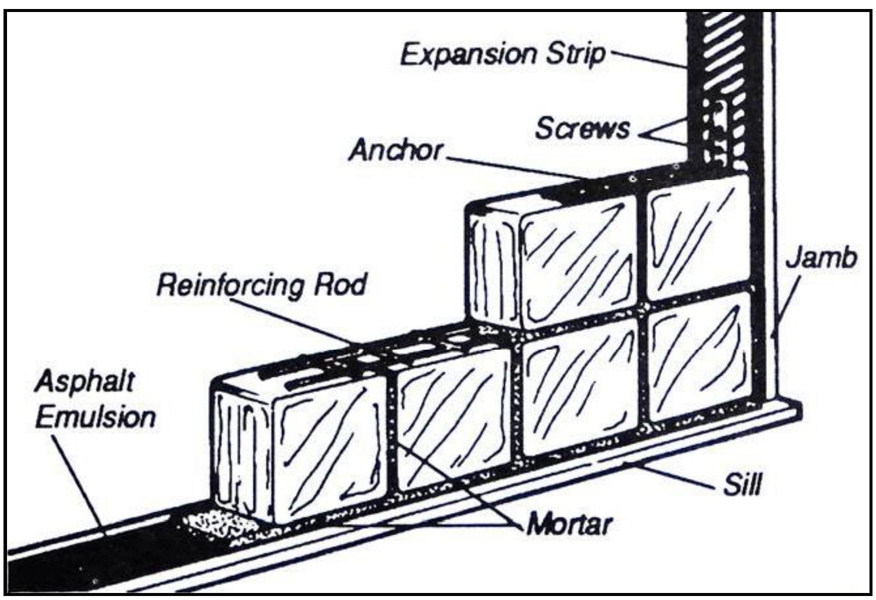


Figure 5. Typical glass block wall construction details showing positioning of metal joint reinforcement rod. (Credit: Eagle-i Inspections, Inc.)

III. ARCHITECTURAL GLASS: ASSESSMENT & TREATMENT

A survey and assessment of exterior architectural glass at the Gropius House was performed to determine its current condition. This work encompassed the pattern flat glass and glass block present on the north, east, and south exterior elevations of the building. Non-pattern exterior plate glass and glass present in interior partitions are not addressed.

A. Methodology

Prior to JBC's site visit, reports and other records of prior assessments and treatments supplied by the client were reviewed. Comprehensive documentation and field survey of the exterior architectural glass was executed visually from the ground and by ladder. Conditions were noted on elevation drawings (see Appendix A). Windows are referred to by numbers taken from drawings supplied by HNE relating to window restoration work conducted in the 1980s and 90s. Individual glass block units in the entryway wall were assigned alpha-numeric identifiers according to their position in the wall (see Appendix A for identification schema). Descriptive attributes of the pattern flat glass and glass block were recorded to aid in materials identification and to assist in sourcing replacement materials.

In addition to assessing and documenting the condition of glass at the Gropius House, JBC was asked to investigate the cause of deterioration occurring at the glass block wall. This work entailed a structural assessment (Appendix B), performed in consultation with a structural engineer, and analysis of the mortar used in the block wall assembly (Appendix C).

Following assessment of conditions, JBC undertook an extensive search in an attempt to locate "in-kind" replacement materials for deteriorated glass. Findings from this exercise are presented in the Treatment Recommendations below.

B. Condition Assessment

Condition drawings showing the location and nature of damage to the architectural glass are contained in Appendix A.

1. Pattern Glass

The survey of pattern glass found breakage on all three elevations. The majority of these breaks are typical, linear stress-related cracks most likely due to corrosion of the metal sashes. Stress cracks are most common in annealed or heat-strengthened glass, like that used at the Gropius House. Stress cracks typically emanate from the edge of a pane and traverse the flat plane of the glass until terminating at another edge or crack, thereby releasing the tension that initiated the cracking.

Deteriorated conditions observed at each window are presented below.

Window 102 (South Elevation)
Glazing in the fixed (westernmost) sash of this window exhibits severe cracking. Multiple cracks traverse the ribbed glass. A hole in the lower portion of the glass that was likely caused by an impact has been covered over by a clear film (probably packing tape). In addition to impact-related damage, the extent of the cracking suggests that stress on the glazing may have caused or contributed to further cracking. Glazing in the adjacent, operable sash is intact and in good condition.

Figure 6. Stress/impact related damage in fixed-pane of Window 102.

Window 109 (East Elevation)
Glazing in the lower sash of this window exhibits extensive stress cracking. Several cracks culminate in an area of “oyster” shaped, conchoidal surface loss occurring along the bottom edge of the pane. Glazing in the small upper sash is intact and in good condition.

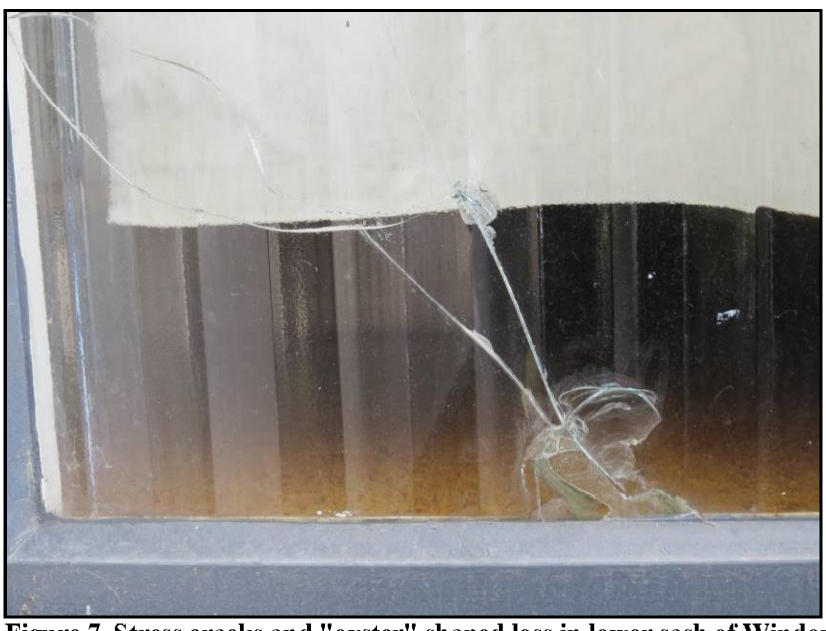


Figure 7. Stress cracks and "oyster" shaped loss in lower sash of Window 109.

Window 110 (North Elevation)
Glazing in the fixed (westernmost) sash of this window exhibits a single stress crack in the upper east corner. Glazing in the smaller adjacent operable sash is intact and in good condition.

Figure 8. A single stress crack seen in Window 110.

Window 111 (North Elevation)
Glazing in the fixed (easternmost) sash of this window exhibits a single, vertical stress crack. Glazing in the adjacent, operable sash is intact and in good condition.

Figure 9. A single stress crack seen in Window 111.

2. Glass Block

Cracks and spalls were observed in 14 glass block units on both the north and south sides of the entryway wall (see Appendix A). The most significant damage is concentrated in the second and third courses of the wall. The glass has largely remained tight and intact adjacent to the cracks in all but one location on the north side where substantial loss has occurred.-Deteriorated conditions are noted below. All other blocks not mentioned here are in good condition.

Blocks D2, G11, H3, H11, and J11 all exhibit a minor spall in one corner edge on their north (exterior) -facing side (Figure 10). Similar damage was observed on the south (interior) -facing side of Blocks E2, E3, and F2. In some blocks, these spalls are slightly displaced. Cracking is present on the north side of Block G1 and on both sides of Blocks G7, H2, H5, H7, and H8 (Figure 11). The most severe damage was observed in Block H2, which exhibits extensive cracking and is missing a large section on its north side (Figure 12).

Figure 10. Typical corner spalls in glass block units.

Figure 11. Typical cracks in glass block units.

Figure 12. Block H2 exhibiting extensive cracks, losses, and exposed corroding metal joint reinforcement.

A review of documentation of cracks in the block wall prepared in 1996 indicates that the condition of the blocks has progressively deteriorated over time, with cracks increasing in size and propagating in number (see Figure 13 and Figure 14). This indicates that the deterioration is active and will continue to worsen if not corrected.

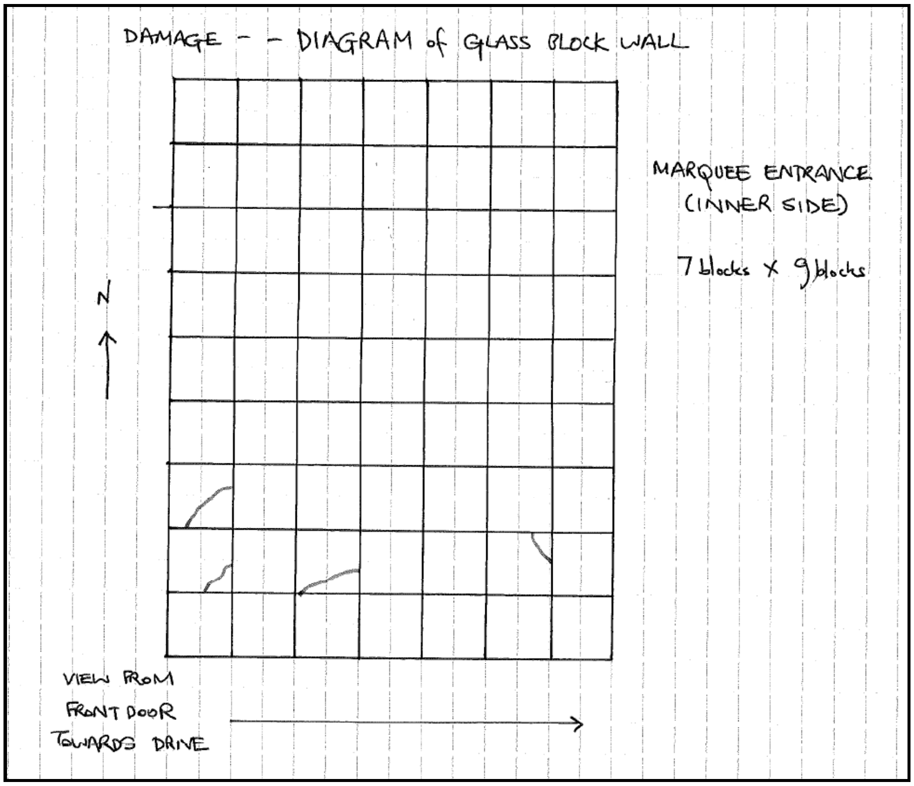


Figure 13. Diagram of cracks in the glass block wall (looking north) from 1996 memo (HNE Collection).

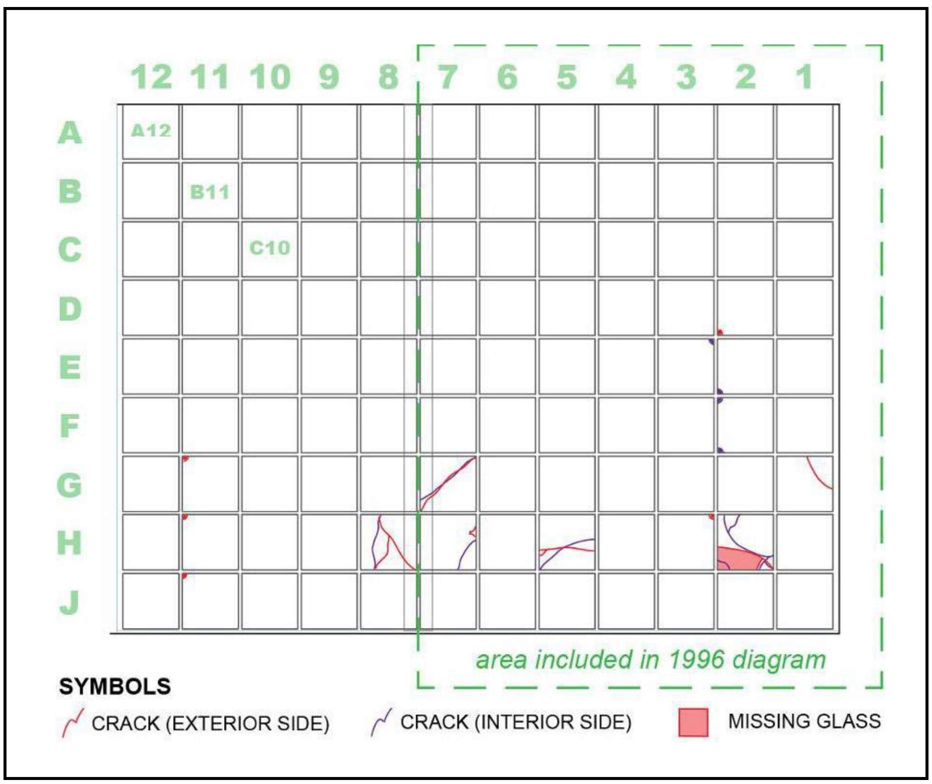


Figure 14. Current condition of glass block wall (interior elevation looking north), with location of 1996 condition diagram noted.

Cracks in the glass block units are likely caused by shear stress created by corrosion of the steel channel which frames the vertical ends of the wall (see Engineer's Report in Appendix B). The generally horizontal direction of the cracks forms a pattern consistent with a local horizontal shear stress. Stress-related cracks are exacerbated as moisture intrudes into the crack and expands in freezing conditions. As a crack grows in size, it will allow moisture to further infiltrate and fill the inner cavity of a block where freezing temperatures place further stress on the already compromised material (see Figure 23).

Figure 15. The lower portion of a Block H2 (second course from bottom, 2nd block from left) has broken away as a result of stress cracking exaccerbated by freezing moisture. Note the displacement of the metal channel (left of glass block) caused by corrosion.

Analysis of the glass block pointing mortar indicates that it is a Type N mortar (see Petrographic Analysis in Appendix C), a moderately hard mortar type consistent with the block manufacturer's installation recommendations (both historically and today).[33] Since both the glass and mortar are both brittle materials, expansion joints are crucial details to accommodate movement and relieve localized stress forces. The only designed accommodation to relieve stress in the wall is the cork padding added where the ends of the block wall abut the steel channel.

Steel reinforcement bar in the block wall mortar joints exhibits corrosion where deterioration of the block has exposed the steel to air and moisture. Corrosion of embedded steel in cementitious materials is, in most cases, prevented by the inherent alkalinity of the cement. The high pH of the cement permits the formation of only a thin

[33] *Owens-Illinois,* 12.

oxide layer on the steel which prevents metal atoms from dissolving. This passive film does not actually stop corrosion; it reduces the corrosion rate to an insignificant level. When this film is breached, the passive protection stops and oxidation accelerates.

The steel reinforcement in the block wall appears to be in stable condition (with exceptions as noted). However, if deterioration of this material were permitted to occur unchecked, rust jacking combined with minimal accommodation for expansion would likely lead to widespread cracking and spalling in the glass blocks. Care should be taken to maintain the integrity of the mortar joints to prevent corrosion of the reinforcing bar.

For further discussion of deterioration of the block wall, see the engineer's report contained in Appendix B.

C. Treatment Recommendations

Best practices in historic preservation advocate the retention and repair of original materials. For 20th century built heritage, conventional wisdom must be reconsidered in the context of the Modernist aesthetic and designer's intent. In modern buildings, the material itself often serves as ornament, with designers carefully choosing their material palette to express the true nature of the materials and structural systems employed. Deterioration of materials in this context conflicts with modern design principles that favor clean, unbroken lines. Even when the option to repair historic fabric is available, the most appropriate solution may be to preserve Modernism's ideals rather than material originality.

The philosophical challenges of preserving Modernism are apparent in decisions regarding the treatment of the exterior glass at Gropius House. In this case, one could argue that preserving the designer's intent necessitates replacement of deteriorated materials. However, in-kind replacement materials are very difficult to source (see Materials Sourcing above). From a pragmatic perspective, the glass must be treated to protect the structure from the elements and prevent damage to adjacent materials. Yet, cracked and spalled exterior pattern glass is not easily repaired and repairs would have an unknown service life.

Taking the challenges into consideration, JBC has outlined treatment options for each of the three types of glass below.

1. Pattern Glass

Attempts should be made to repair and retain the historic glass *in situ*. However, repairs are unlikely to produce the desired aesthetic results and may not adequately address corrosion of the sashes which is causing the damage. Replacement, which will unfortunately result in the loss of historic materials (especially if full elevations are replaced for consistency), is likely necessary to improve aesthetics and address the cause of deterioration.

Treatment A – Repair

There are two conceivable options for repair: repair in-place or repair off-site.

Option 1 – Repair In-place

Attempt repair in-place with epoxy injected into cracks and used to fill voids.[34]

This option has the advantage of being the least invasive and has the lowest initial cost. However, it also has several disadvantages: it does not address the corrosion of the steel sashes that contributes to the glass deterioration; it does not allow access to broken edges which should be thoroughly cleaned before being rejoined; it will be difficult to form the epoxy to the fluted or ribbed profile of the glass; the repair will likely be visible.

Option 2 – Repair Off-site

Remove glass from steel sashes, rejoin glass and replace in sashes. Treat corrosion in sashes by removing paint and rust back to bare metal before priming and coating with a corrosion inhibiting coating system.

This option has advantages over Option 1 in that it will permit access to the glazing channel to treat corrosion occurring in the sashes. Broken glass edges are also accessible for cleaning and rejoining. Unfortunately, repairs will likely remain visible and more breaks may occur while the glass is being removed.

Treatment B – Replacement

Remove broken glass from sashes and retain a sample for archival purposes. Treat corrosion in sashes by removing paint and rust back to bare metal before priming and coating with a corrosion inhibiting coating system. Two options for replacement exist:

Option 1 – Replace with Matching Material

Replace original glass with identical modern or salvaged material. Identical modern materials are not available. However, a very close match for the ribbed glass is available in Bendheim's JBCO-162, "ribbed" product (Figure 16).[35] The pattern and thickness dimensions of this product are nearly identical to the original. However, it is not available with an etched finish (as found on the original) from the manufacturer. This can be reproduced with acid etching or sandblasting, services available at some glass shops. The color of the glass may vary slightly from the original, but the effect can be mitigated if the glass in the adjacent, operable sash is also replaced.

[34] Recommended Products: Cracks may be injection-filled with HXTAL NYL-1, a low viscosity epoxy adhesive. Larger chips, spalls, etc., may be filled with a high viscosity epoxy resin such as Delta Kit, Inc.'s Plate Glass Repair Resin (Delta Kit also stocks injection equipment, polishing paste, and other supplies).

[35] JBCO-162, "ribbed" glass is manufactured by and available from Bendheim Ltd., 61 Willett St. Passaic, NJ 07055, (800) 606-7621, http://www.bendheim.com/

Figure 16. Sample of Bendheim's JBCO-162, "ribbed" glass compared to original glass in Window 102 (south elevation).

After an extensive search, no close-matching modern replacement (mass-produced or custom) for the Louvrex glass on the north elevation was found. See Option 2 below.

Option 2 – Replace with Similar Material

Replace deteriorated glass with a material that approximates the character defining features of the original. This option applies especially to the Louvrex glass. If no salvage material can be procured, replacement may proceed using a fluted glass that has a different profile but maintains the effect of the original. One such material is the 1-inch "fluted" glass manufactured by Gray Glass.[36] While this glass lacks the same pattern width, profile shape, and textured surface, it conveys a linear character that is similar to the original Louvrex. Note that, in order to maintain continuity of appearance, undamaged glass in adjacent sashes would have to be replaced.

[36] Manufactured by and available from Gray Glass Company, 217-44 98th Avenue, Queens Village, NY 11429, (718) 217-2943, http://www.grayglass.net/

Figure 17. Samples of replacement glass compared to original Louvrex glass in Window 109 (east elevation). Samples (left to right): AGC "Flutes" Clear Pattern, AGC "Textured Flutex", Gray Glass "1-inch Fluted", Bendheim's JBCO-35.

Figure 18. Samples of replacement glass compared to original Louvrex glass in Window 110 (north elevation). Samples (left to right): AGC "Flutes" Clear Pattern, AGC "Textured Flutex", Gray Glass "1-inch Fluted", Bendheim's JBCO-35.

2. Glass Block

The assembly details of the glass block wall should be address in conjunction with treatment prescribed for the glass block units to address the cause of deterioration. The steel channel at the wall ends should be removed and replaced with a non-corroding metal of similar or matching dimensions. Caulking should be replaced with a butyl-rubber expansion joint seal. Where exposed, corroded metal reinforcement in the glass block wall mortar joints should be wire brushed to remove loose corrosion product, followed by treatment with a rust converter to stabilize the metal.[37] The joint reinforcement should then be coated with a two coats of a zinc oxide rust-inhibiting enamel primer.[38] Two treatments and several options for preserving the glass block units are available:

Treatment A – Repair

Repair cracks and small chips, spalls, or voids in-place using epoxy.[39] Note that this treatment will cannot be used to correct large material losses as found in Block H2. This treatment option has a number of other disadvantages: epoxy repairs in glass typically require access to both sides of the surface being treated and it is not possible to access the interior of the block units without removing them from the wall and cutting them in half; it will not be possible to clean the broken edges of the blocks to ensure they are properly rejoined; repair in-place will not provide access and opportunity to treat corrosion on rebar.

Treatment B – Replacement

Replacement will likely be required for glass blocks that have been compromised by cracks or material losses. These include Blocks G1, G7, H2, H5, H7, and H8 (6 units total). Blocks exhibiting minor corner spalls (e.g. Block D2) may remain as-is (this type of damage is unlikely to spread if left untreated). Unfortunately, the particular model of Insulux block used at the Gropius House is rare. In order to match and not detract from the appearance of the existing block, salvage or new old stock replacements are necessary. This is particularly important because the replacements will be placed adjacent to original materials and any variation in color or pattern will be easily distinguishable. An extensive search of salvage suppliers and other sources was largely unsuccessful.[40] However, salvaged Owens-Illinois blocks of a very similar pattern (no. 402 or 416) with fluting oriented in opposite directions on either face have been donated to HNE and were also located by JBC on the online auction site eBay.

[37] Recommended Product: Rust-oleum Stops Rust Rust Reformer (see Appendix E for product information).

[38] Recommended Product: Rust-oleum 7400 System Heavy Duty Rust Inhibitive Primer (see Appendix E for product information). Note: While epoxies area a popular coating for rebar and other metallic reinforcement, they should not be used unless all surfaces can be coated to form a continuous barrier.

[39] See Footnote 34 for products.

[40] One potential supplier reported occasionally having the correct salvaged blocks in stock: Glass Blocks Unlimited, P.O. Box 206, 225 Helman Ln, Cotati, CA 94931, (800) 992-9938

Leaving blocks with cracks and substantial losses as-found is not recommended. These blocks will likely continue to deteriorate and, over time, may compromise the steel reinforcing bar located within the mortar joints, leading to rust jacking and more widespread deterioration.

Individual blocks may be replaced by first cutting the mortar joints using an angle grinder fitted with a masonry blade. Care should be taken to avoid damage to adjacent blocks in good condition and, if possible, cutting into embedded metal reinforcement. Once the joints have been cut, remaining mortar may be removed using a hammer and masonry chisel (power tools are not recommended for this work as they may damage adjacent blocks). The damaged block and all debris should be removed from the opening. Sound mortar (i.e. mortar that is well attached) may be left in-place if removal may cause damage to adjacent blocks. Metal reinforcement, where present, should be treated as described above. Replacement block should be installed using a Type N mortar that matches the original in appearance and joint profile.

Option 1 – Replace with In-kind or Similar Material
Replace either with identical block (preferred) if available or, replace with similar, unmodified block (no. 402 or 416).

Option 2 – Customized Replacement
Custom fabricate replacements by cutting blocks with similar but perpendicular flutes (i.e. Insulux no. 402 or 416) in half and rejoin them, with the flutes oriented correctly, using an adhesive. Blocks of a similar vintage to those found at Gropius House but, with the fluting pattern crossed, are more readily available as salvage or new-old stock than the parallel-fluted block. Conversations with glass block experts at Glass Blocks Unlimited in Cotati, California, indicate that this may be a viable method. While they were unaware of anyone else reconfiguring a block in this manner, they regularly cut blocks using a tile saw and reassemble the pieces using a silicone adhesive to form mitered corners. This option is somewhat experimental and the durability of the silicone adhesive in such an assembly is unknown. However, the option offers the distinct advantage of closely matching the color and appearance of the original material.

Blocks should be cut using a tile saw or, preferably, a water jet. The halves should be thoroughly cleaned and dried in an oven before being assembled with a high-quality exterior grade clear RTV (room temperature vulcanization) silicone or non-yellowing epoxy (such as HXTAL NYL-1). Both adhesive sealants have good adhesion to glass and resist deterioration in alkaline environments (e.g. cementitious mortar). Allow sealant to fully cure as per manufacturer recommendations before installing block.

Option 3 – Custom Manufactured Replacement
Custom manufacture new block to match the originals. The number of blocks needed to conduct repairs is insufficient to meet manufacturers' minimum quantities (in the thousands) for custom remanufacturing. However, Owens-Corning, the modern day successor to Owens-Illinois, occasionally remanufactures limited quantities of old designs like that found at Gropius House once a sufficient number of orders has

accumulated to justify the cost. This process may take several years, will be expensive and, although the block would be made by its original manufacturer, the color of the glass will be different than that of the original.

IV. ACCOUSTICAL PLASTER: MATERIALS ANALYSIS

The acoustical plaster present on the interior of Gropius House exhibits soiling most likely as a result of tobacco and wood smoke, water leaks, and general atmospheric pollution. JBC was asked to develop recommendations for the treatment of the white-colored acoustical plaster located in the dining room, living room, and study. Pink-colored acoustical plaster located in the first and second floor hallways was not included. In order to facilitate this work and to better understand the constituent components of the plaster, JBC conducted a materials analysis.

A. Methodology

Two samples of acoustical plaster were removed by JBC conservators, one from behind an HVAC grill located on the north wall of the living room and one from an area already damaged by deterioration located directly above the exterior doorway to the study.

A clean, unsoiled surface of the plaster was matched to a color standard of the Munsell Color System and a commercial paint color system (Benjamin Moore, Pittsburgh Paints, Sherwin-Williams) under natural light.

The plaster matrix and fibers extracted from this matrix were examined by JBC visually and aided by stereo and polarized light microscopes. A portion of the samples was subjected to chemical spot tests used to help determine the material's composition. Plaster samples were also sent to external laboratories for petrographic analysis and secondary, certified confirmation of JBC's finding that the material does not contain asbestos. Copies of the external laboratories' petrographic and asbestos analysis reports are contained in Appendix D. A review of historical literature, patents, and recent research related to composition of acoustical plaster was also conducted.

B. Description

The walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways are all covered with a textured sound-absorbing plaster made and installed by the California Stucco Products Company. Research of historical manufacturer's product literature shows that the material was called "Stucoustic" (see Figure 21, p. 30).[41]

C. Findings

The acoustical plaster is a soft and moderately friable material with a textured surface created by the presence of large (approximately 2mm in diameter), aspherical air voids (Figure 19). In cross-section, the material exhibits two coats, a darker colored scratch coat and a lighter finish coat that measures approximately 2mm thick (Figure 20). The finish coat is considerably more porous than the scratch coat, having a sponge-like

[41] *Sweet's Catalog File* 1936, Sec. 10-14 (New York: F.W. Dodge Corp., 1936), 13/27, available online at https://archive.org/details/Sweets1936final_201507 (accessed 2/11/2016).

texture. Based on microscopic analysis, the plaster has a lime-based binder with aggregate composed of a medium-grained pumice and minor crushed marble constituent. Fibers present in the finish coat were extracted from the matrix and have been identified as cellulose. No asbestos was found. No evidence of foaming or air-entraining agents was detected. However, chemical analysis is required to positively detect and identify any admixtures. Chemical spot tests confirm the presence of iron and water-soluble salts (sulfates and nitrates), but do not indicate the quantities present. Petrographic analysis confirms the presence of sulfates and also identifies secondary deposits of a mineral optically consistent with chloride salts.

Figure 19. Close-up of plaster in living room showing typical surface texture.

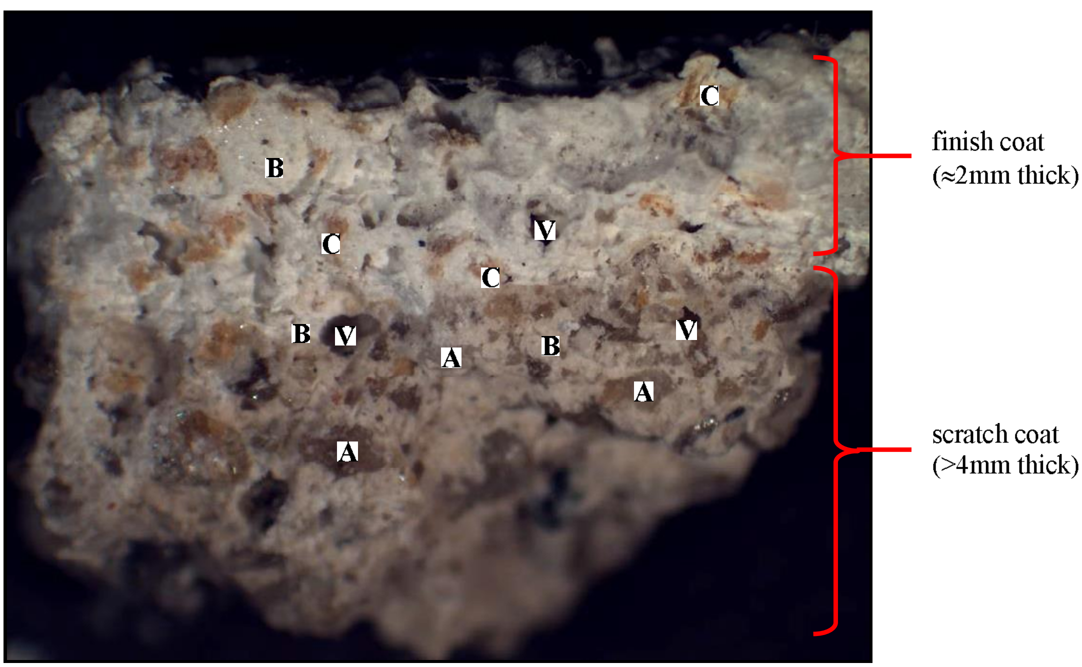


Figure 20. Cross-section of acoustic plaster with aggregate (A), binder paste (B), cellulose (C), air voids (V) and coats denoted (15X).

The outer surface of the plaster is white in color (Munsell N 9.5), similar to Pittsburg Paints PPG 1006-1 “Gypsum” color.[42] Petrographic analysis identified sparse remnants of a thin lime paste coating the surface of the finish coat. While this paste could be an applied lime-based finish, its sparse presence suggests that it is either laitance brought to the surface while the material was being worked or a precipitate of the binder component and not an intentional coating. Indeed, a 1939 magazine article reports that the plaster was installed without a coating.[43] No other evidence of coatings was found except in limited areas previously conserved by in-painting with water colors.[44] [45]

The method of producing the plaster’s textured finish can be discerned from historical accounts and materials analysis. According to the 1977 history of the house written by Ise Gropius, the material was spray-applied directly over a rough coat of plaster.[46] Petrographic analysis determined that the material lacks an air-entraining admixture as is often found in historic acoustical plaster. This evidence suggests that the plaster’s textured finish was achieved through a spray-applied dash finish that was “knocked down” using a broad float or similar tool.

[42] Colors were matched to the surface of plaster in an areas that exhibited less soiling.
[43] Beulah Brown Anthony, “The Massachusetts Home of Dr. and Mrs. Walter Gropius,” *American Home* (July 1939): 21, 54-57.
[44] In her 1997 materials analysis, Susan Buck found a “thin, white paint layer” coating the plaster in the living room (Buck, “A Material Evaluation,” 33). JBC found no evidence of this coating in the samples examined. Buck may have misidentified the lime paste found on the surface of the samples examined by JBC and Highbridge.
[45] Though outside the scope of this project, visual examination of the plaster located on the ceilings of the hallways indicates that the matrix of this material was pigmented (i.e. not painted) to achieve its pink color.
[46] Gropius, *History of the Gropius House*, 11-12.

13
27

CALIFORNIA STUCCO PRODUCTS COMPANY

169 Waverly Street
CAMBRIDGE, MASS.

122 East 42nd Street
NEW YORK, N. Y.

Acoustical Plasters

STUCOUSTIC, TYPE A.D.
and
STUCOUSTIC, TYPE A.C.F.

Other Products

Exterior Cement Stucco, Interior Colored Plasters, Caenstone, Travertine, Colored Floor Finish.

STUCOUSTIC (TYPE A.D.)—AN ACOUSTICAL PLASTER
For Economical Sound Absorption and Sound Control

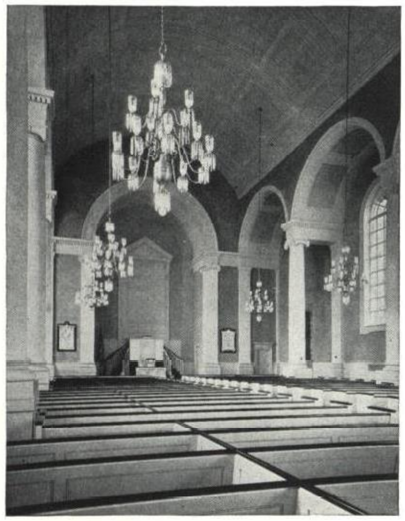
Low Cost—Integral Colors—Architectural Adaptability

Description

Stucoustic was developed to obtain an acoustical plaster that the skilled artisan could readily apply, that would be economical to the owner, and truly permanent, and that would fit accurately into the design of the architect and the acoustical expert. It is unique among acoustical plasters.

Stucoustic can be finished with a steel trowel to a smooth, sanitary, high light-reflecting surface without impairing its remarkable sound-absorbing capacity. It can be furnished white or colored to any desired shade.

With this finish, all particles of aggregate are completely embedded in the body of the plaster, the surface is comparatively smooth, sanitary, high light reflective. It requires less paint for re-decoration and therefore, painting does not appreciably reduce the sound-absorption. Stucoustic can also be floated, stippled, textured, antiqued, or finished in other ways as desired.



All Souls Church, New York, N. Y.
Stucoustic ceilings and walls
HOBART UPJOHN, Architect

Application and Painting

Application—Regular plasterers apply Stucoustic. It is mixed to the consistency of ordinary mortar and applied to a brown coat of gypsum, portland cement, or lime plaster. One plasterer will normally apply from 8 to 10 sq. yds. of ½-in. Stucoustic per hour.

Painting—Water-mixed paints, sprayed on, are recommended. Test data of Stucoustic spray painted with five coats of water mixed paint shows a reduction of 2% of sound absorption. Painting instructions furnished on request.

Specifications for Stucoustic, Type A.D. Acoustical Plaster

"Areas to receive acoustical plaster shall be given a scratch and brown coat in the ordinary manner. The surface of the brown coat shall be scored or cross scratched for bond and allowed to dry thoroughly before the application of the acoustical plaster."

Note: Where Stucoustic is subjected to high humidity or periodic wetting, no gypsum shall be used in base coats. Use plaster base coats consisting of equal parts by weight of portland cement and hydrated lime and two parts of sand.

Note: Where Stucoustic is applied directly to metal lath, use ⅛ in. rib lath weighing not less than 2.75 lbs. or equal, apply Stucoustic scratch coat the same as ordinary gypsum scratch and allow it to dry thoroughly.

"Stucoustic Plaster shall be applied to the dry base coat without sprinkling or otherwise reducing the suction in coats, about ¼-in. thick, to a total thickness of Stucoustic of ½-in. (or ¾-in. as desired). The surface shall be finished as directed by the architect and all mixing and application of Stucoustic shall be done in accordance with the instructions of the CALIFORNIA STUCCO PRODUCTS COMPANY and under the direction of their representative."

52

SOUND ABSORPTION TEST DATA

Results of tests made by Bureau of Standards as listed below. All samples were applied to gypsum base coat plaster and steel trowel finished.

Stucoustic Type	Thickness, in.	Coefficient of Sound Absorption				
		128	256	512	1024	2048
A.D.	½	.14	.16	.49	.59	.61
A.D.	¾	.18	.36	.65	.65	.62
A.C.F.	⅞	.17	.35	.76	.78	.71

A Few Stucoustic Jobs and Their Architects

First National Bank of New York, New York; *Walker & Gillette*
Harvard Club, Boston; *William T. Aldrich*
Union Club, New York; *Delano & Aldrich*
Trumbull College, Yale University; *James Gamble Rogers*
Christian Science Pub. House, Boston; *Chester Lindsey Churchill*
White House, Washington, D. C.; *Eric Gugler*
Harvard Congregational Church, Brookline; *Allen & Collins*
Academy of Medicine, New York; *York & Sawyer*
Melrose High School, Melrose, Mass.; *J. Wm. Beal & Sons*

Service

Our Service Department will supply complete specifications on request, and a supervisor will be sent to each job to advise as to the proper installation of Stucoustic Acoustical Plaster and preparation of the base coat.

Figure 21. "Stucoustic" acoustical plaster product description from 1936 *Sweet's Catalog File.*

V. ACCOUSTICAL PLASTER: CLEANING TESTS AND TREATMENT

Several different treatments were devised and tested for improving the appearance of the stained and soiled acoustical plaster (Figure 22). Due to the hygroscopic nature of the acoustical plaster, it was determined that "wet" cleaning methods and materials should be avoided if possible. JBC's prior experience in cleaning similar acoustical plaster materials suggested that latex poultices would likely be effective and so nine commercially available latex poultices were tested. Dry cleaning tests were also performed using a gentle abrasive rubber sponge and a tacky rubber putty. Following limited success in the cleaning tests, additional tests were conducted using limewash to mask soiling on the plaster. Materials and methods were tested in situ. Methodology, results, and recommendations are reported below.

Figure 22. Typical soiling and staining observed on the plaster ceiling of the living room.

A. Methodology

1. Latex Poultice Tests

Nine latex-based poultice-type products were selected for testing (see Table 1). These products are supplied by their manufacturers in the form of a one or two-part paste that, following application, dries to form a firm, elastic material. Product data sheets are contained in Appendix E. A location for the application of test patches was selected by JBC in consultation with HNE staff (see Figure 23). The western-most window return on the bay of windows fenestrating the living room along the south elevation was selected because the area is normally concealed behind a curtain. The test area was photo-documented and masked before the products were applied.

Table 1. Latex Poultice Products Tested

Manufacturer (abbreviation)	Product	pH	Additives
American Building Restoration Products (ABR)	Type A	11-12	[Ammonia, unk.]*
	Type AM	11-12	[Ammonia, unk.]*
	Type B	11-12	[Ammonia, unk.]*
	Type C	11-12	[Ammonia, unk.]*
Arte Mundit (AM)	Type I	[unk.]	Ammonia
	Type II	9-11 (Comp. A)	Ammonia, Chelating Agent, Solvent
	Type III	9-11 (Comp. A)	Ammonia, Chelating Agent, Solvent
	Eco	9-10	[none]
PROSOCO	MasonRE Latex 20	10.4	Ammonia, Chelating Agent

The products were applied by brush and allowed to dry for a period of 24 hours. A fan was set up to circulate air across the test area to facilitate drying. Once each product felt sufficiently dry to the touch, it was gently removed by peeling the poultice material away from the plaster surface. Visual observations were recorded. Colorimetry measurements were taken to help determine the extent of change in the surfaces color of the plaster.

After the first round of colorimetry was complete, the test area was gently sponged with water (using the least amount of water necessary for the task) to remove any remaining residues and neutralize the surface. The pH of each test patch was measured and sponging was repeated until the surface returned to its normal pH (pH 9, slightly alkaline). The test area was then allowed to dry before final colorimetry measurements and photographs were taken.

* Active ingredients are not disclosed by this product's manufacturer (ABR). The product is believed to contain an aqueas ammonia solution based on the product's odor and a patent filed by ABR. John Tadych, "Rubber masking compound and methods of use," U.S. Patent Application US20050164024 A1, filed Jan. 22, 2004.

Figure 23. Location of cleaning test patches (marked in blue tape) on window return in living room.

2. Abrasive Cleaning Tests

Two gentle abrasive cleaning tests were conducted on soiled plaster on the west alcove wall in the upper southwest corner of the living room (Figure 24). The two products tested included Groom/Stick, manufactured by Picreator Enterprises Ltd. (located in the UK), and Absorene's Dry Cleaning Sponge (also known as "soot sponge"). Groom/Stick is a kneadable, pH-neutral natural rubber product used to trap soiling and lift it from the surface. The product was kneaded into a ball and pressed repeatedly into the surface of the acoustic plaster. The cleaning sponge is made of a non-toxic vulcanized rubber. This product was gently rubbed across the soiled plaster. Both products and treated plaster were then examined to determine whether any soiling had been removed.

Figure 24. Location of abrasive cleaning tests (red arrow) on west living room wall.

3. Coating Tests

Following limited success experienced in the cleaning tests, JBC sought to develop a coating that would mask soiling on the plaster, be compatible with the substrate, and be reversible should future re-treatment be necessary. In a 1936 advertisement for Stucoustic, the manufacturer recommends spray application of "water-mixed" (water-based) paints should a coating or color change be desired (Figure 21). While a diluted water-based latex paint would be compatible with the material, it would be difficult and damaging to reverse and would most likely "read" as a coating rather than the surface of an uncoated plaster. Instead, limewash was selected for the coating tests because it is both compatible with the lime plaster substrate and reversible should future re-treatment be desired. Five test patches of limewash were applied below the latex poultice tests adjacent to the south window in the living room (Figure 25).

Four variations of limewash were prepared using Graymont's Niagara Mature Lime Putty and Type S Dolomitic Hydrated Lime (sold as a dry hydrate) using the following proportions:

- 1:5 Lime Putty : Water
- 1:5 Lime Putty : Acrylic Solution
- 3:8 Type S Lime : Water
- 3:8 Type S Lime : Acrylic Solution

Two variations were prepared using an acrylic additive in order to prevent the chalking that is often observed in limewash. An aqueous acrylic solution was prepared using Acryl 60, a masonry additive, diluted 1:10 with water. Each of the limewash preparations was mixed on a magnetic stir plate for approximately five minutes and then strained through a #30 sieve to remove any large lime particles.

Figure 25. Location of limewash test patches (outlined in red) on window return in living room.

Brush and spray application methods and one and two-coat applications were tested. The surface was first pre-wetted with water and dabbed dry with a paper towel to control capillary uptake into the substrate and pre-mature drying of the limewash. In the brush application, the wash was applied using a china bristle brush and then lightly sponged and dry-brushed to work-in and evenly distribute the lime particles. The surface was then lightly misted with water to promote carbonation and consolidation of the wash 15 to 20 minutes after application, when the surface appeared dry. A second coat was applied to the lower half of each test patch two hours after the initial application. After 24 hours, the treated surfaces were checked for chalking by wiping them with a black-colored cloth and examining the cloth for limewash residue.

After the brushed-on test patches had sufficiently dried and were evaluated, the acrylic-modified Type S preparation was selected for the spray application test. The substrate was pre-wetted as before. A light limewash spray was then applied in two, perpendicular passes to ensure even coating using a hand-pumped spray atomizer. The wash was allowed to set until the surface felt dry and turned opaque (15-20 minutes) and then lightly misted with water as before. This test patch was in the direct path of sun light and had to be covered with a damp paper towel to slow evaporation and ensure proper carbonation. After 24 hours, the surface was checked for chalking as described above.

Following initial limewash tests, a second round of testing was conducted using pigmented limewash and varied proportions of lime to attempt to match the color of the plaster. These variations were prepared in JBC's laboratory to match the reference color of the plaster recorded in the field (PPG 1006-1 "Gypsum") using light-stable, natural "earth" pigments dispersed using a stir plate. Lime plaster samples were cast and coated with the pigmented washes and compared with the acoustic plaster on site. One pigmented wash was selected and applied to a test patch located to the north and adjacent to the living room fireplace (Figure 26).

Figure 26. Location of pigmented limewash test patch (outlined in blue tape) adjacent to living room fireplace.

B. Findings – Latex Poultice Tests

Nearly all of the latex poultice products caused a yellow discoloration of the plaster.[47] The most yellowing occurred in the test patch treated with ABR Type C. No yellowing was observed in only one test patch: that treated with MasonRE Latex 20. This product successfully lightened the substrate but was difficult to remove and caused very minor detachment of some friable plaster. The cleaning effect of the other products was difficult to ascertain because of the discoloration. Observations from each test patch are included below.

American Building Restoration Products (ABR)

Type A: Substrate appeared slightly yellow after treatment.

Figure 27. ABR Type A test patch, post-treatment.

[47] The yellowing observed on treated plaster surfaces is unusual. In JBC's experience, the same treatments applied to similar plaster materials did not have this effect. The manufacturers of these products report the same experience. Regardless of past experience, it is apparent that, barring any change in the formulation of the products, some constituent specific to the acoustical plaster used at the Gropius House must have reacted to a component in the poultice.

An exact cause of the yellowing could not be determined. One plausible theory is that the yellowing is due to oxidation of ferrous metallic particles present in the plaster matrix. Chelating agents, present in some of the products tested, are intended to bond to metal ions so that they can be extracted from the substrate. It may be that the chelators and metallic particles were drawn to the surface of the plaster, where they readily oxidized due to moisture in the poultice materials, but were not completely removed when the poultice was lifted away. If this were the case, re-treating the area might successfully decrease or eliminate any discoloring. However, additional treatments could serve to exacerbate the yellowing. Attempts to recreate the yellowing on plaster samples prepared with iron filings in JBC's laboratory were unsuccessful. The yellowing may alternatively be related to wood fiber present in the plaster matrix.

Type AM: Substrate appeared slightly yellow after treatment. The poultice material felt "stiffer" than others tested. However, this did not appear to have an effect on the substrate (i.e. no excess material removed).

Figure 28. ABR Type AM test patch, post-treatment.

Type B: Substrate appeared slightly yellow after treatment.

Figure 29. ABR Type B test patch, post-treatment.

Type C: Substrate appeared very yellow after treatment (this appears to have yellowed the worst of the products tested).

Figure 30. ABR Type C test patch, post-treatment.

Arte Mundit (AM)

Type I: Substrate appeared slightly yellow after treatment.

Figure 31. AM Type I test patch, post-treatment.

Type II: Substrate appeared slightly yellow after treatment.

Figure 32. AM Type II test patch, post-treatment.

Type III: Substrate appeared very yellow after treatment.

Figure 33. AM Type III test patch, post-treatment.

Eco: Substrate appeared slightly yellow after treatment.

Figure 34. AM Eco test patch, post-treatment.

PROSOCO

MasonRE Latex 20: This poultice was difficult to remove (the most difficult of any of the products tested). Strong adhesion to the plaster substrate provided both favorable and unfavorable results. While the poultice was very effective in trapping and lifting soiling from the surface, a small portion of the substrate was also removed. Yellowing of the substrate, as seen with other products tested, was not observed.

Figure 35. MasonRE test patch, post-treatment.

Figure 36. Poultice test area, post treatment (product names positioned next to test patch location).

1. Colorimetry

The primary goal of the cleaning tests was to try to return the plaster to a more consistent "white" appearance. Color change can be difficult to perceive, especially when the material has a rough texture or is located in area with limited light. In order to more accurately measure color change in the acoustical plaster, colorimetry measurements taken during and after treatment using a Konica Minolta Chroma Meter CR-440 colorimeter. Measurements were recorded in the in CIE L*a*b* color space. Due to the irregular surface of the plaster, an average of three measurements was taken for each test patch. Color difference (ΔE^*_{ab}) was computed against a constant control (untreated area) for all values (L*a*b*) using the CIE1976 formula. A difference in lightness (ΔL^*) was computed using the formula, $\Delta L^* = L^*_2 - L^*_1$.

In the table below, L* corresponds to the measured lightness value, where L* 0 = black and L* 100 = diffuse white. Higher ΔL^* values indicate a lighter surface (than the control). ΔE^*_{ab} indicates overall color change (from the control), where a "just noticeable difference" (JND) corresponds to $\Delta E^*_{ab} \approx 2.3$ (i.e. values ≥ 2.3 are perceptible to the human eye).

Table 2. Color Difference

	Post-Poultice			**Post-Sponge**		
Product	L*	ΔL^*	ΔE^*_{ab}	L*	ΔL^*	ΔE^*_{ab}
Control	71.70	0.05	0.07	71.60	-0.05	0.07
Type A	75.37	3.73	5.55	74.85	3.20	4.58
Type AM	71.01	-0.63	4.36	71.38	-0.27	4.05
Type B	73.23	1.58	1.93	76.00	4.36	6.03
Type C	72.44	0.79	5.77	75.21	3.56	5.55
Type I	74.63	2.99	3.76	73.97	2.32	2.97
Type II	74.41	2.77	6.24	74.60	2.95	6.02
Type III	74.48	2.83	7.22	73.96	2.31	6.30
Eco	75.01	3.36	4.80	76.10	4.46	5.88
MasonRE	71.95	0.31	1.36	74.68	3.03	3.75

Unfortunately, the colorimetry data proved less than useful due to the irregular surface texture and reflectivity of the plaster substrate and discoloration of the test patches caused by the products tested.

C. Findings – Abrasive Cleaning Tests

Both of the abrasive products tested were very easy to use. The surface of Groom/Stick grew noticeably darker with use, indicating that the product successfully lifted soiling from the surface (Figure 37). This product also picked up small friable pieces of the plaster. Following treatment, the test patch cleaned with Groom/Stick appeared no cleaner than before (Figure 38). A similar result was observed with the Dry Cleaning Sponge. While the surface of the sponge appeared soiled after use, the cleaning effect on the plaster was indistinguishable (Figure 37). The Dry Cleaning Sponge did not appear to remove any friable plaster fragments.

Figure 37. Groom/Stick after use. Note darker color of used product (center) compared to unused product in packagaing (left). Also note white plaster fragments embedded in used product.

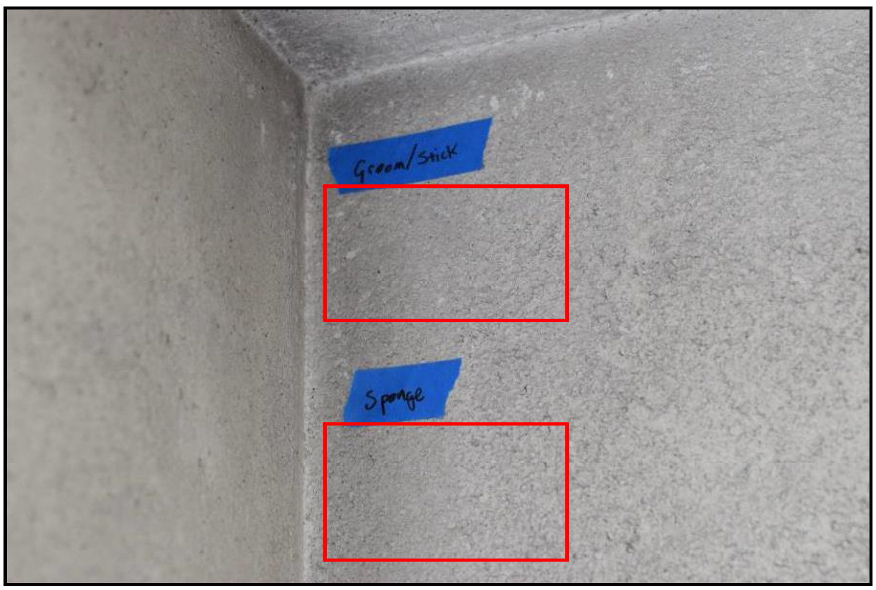


Figure 38. Abrasive cleaning test area with Groom/Stick patch (above) and Dry Cleaning Sponge patch (below) outlined in red.

D. Findings – Coating Tests

Of the four limewash variation tested, the acrylic-modified Type S preparation had the best appearance and working properties. Despite their thin and runny consistency, both modified and un-modified Type S washes provided more opacity than the lime putty preparations. The Type S test patches also exhibited less chalking. The least amount of chalking with each type of lime was observed in the acrylic-modified preparations, confirming the utility of adding a small amount of acrylic. Unfortunately, the brush application method provided undesirable results. With all four variations, the limewash tended to fill the characteristic air voids in the plaster substrate, creating a more homogenous appearance. The second coat provided a more desirable level of opacity but also deposited more lime in the voids. Images of each test patch are included below.

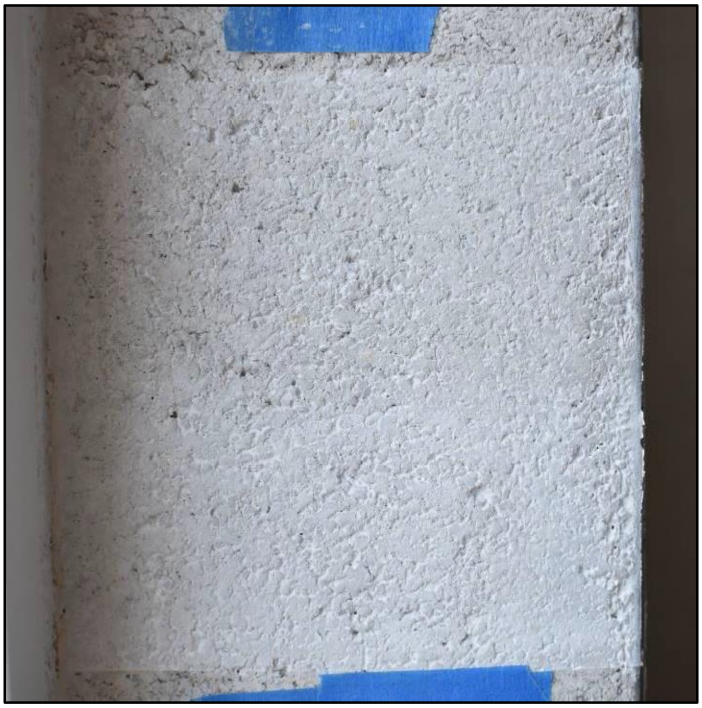


Figure 39. Brushed-on lime putty limewash test patch with one (above) and two (below) coats.

Figure 40. Brushed-on acrylic-modified lime putty limewash test patch with one (above) and two (below) coats.

Figure 41. Brushed-on Type S limewash test patch with one (above) and two (below) coats.

Figure 42. Brushed-on Acrylic-modified Type S limewash test patch with one (above) and two (below) coats.

Based on the results of the brush application tests, the acrylic-modified Type S preparation was selected for a single test patch using the spray application method. This preparation exhibited the least amount of chalking. It also dried more opaque and therefore, would require fewer coats. Further, the lower viscosity of the Type S preparations meant that the selected wash would flow better through the spray nozzle.

Spray application provided excellent results (Figure 43). While the spray inevitably coated the air voids, it didn't fill them as seen with brushing. With only two light passes with the sprayer, the opacity of the finish was excellent and would easily conceal most of the soiling found on the plaster. As before, the acrylic additive performed well and only minimal chalking of the dried finish was observed. Overall, the spray application provided the best results of all the variations tested, creating a very thin coating that effectively masked the soiling while maintaining the appearance of the character defining surface texture of the plaster.

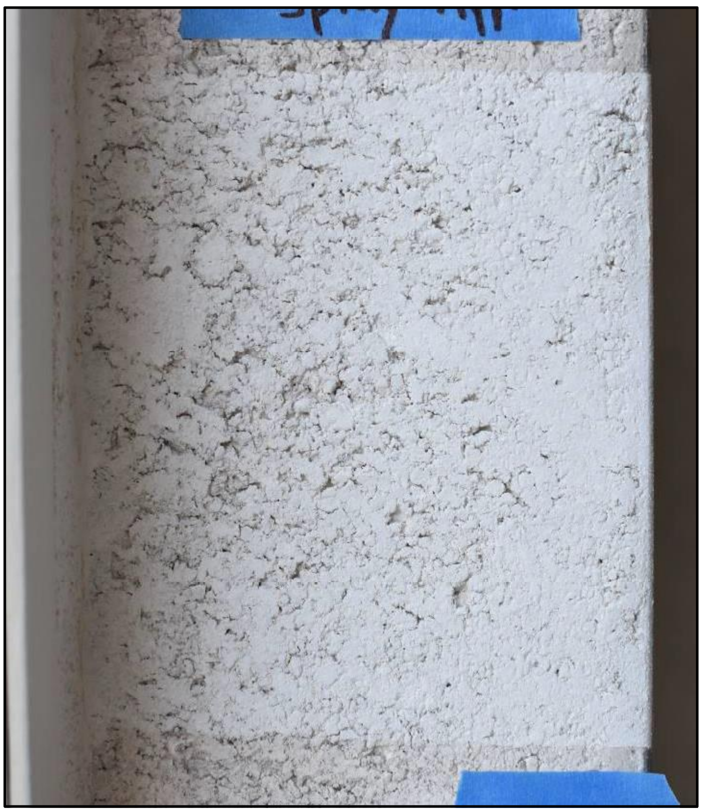


Figure 43. Spray-applied Acrylic-modified Type S limewash test patch.

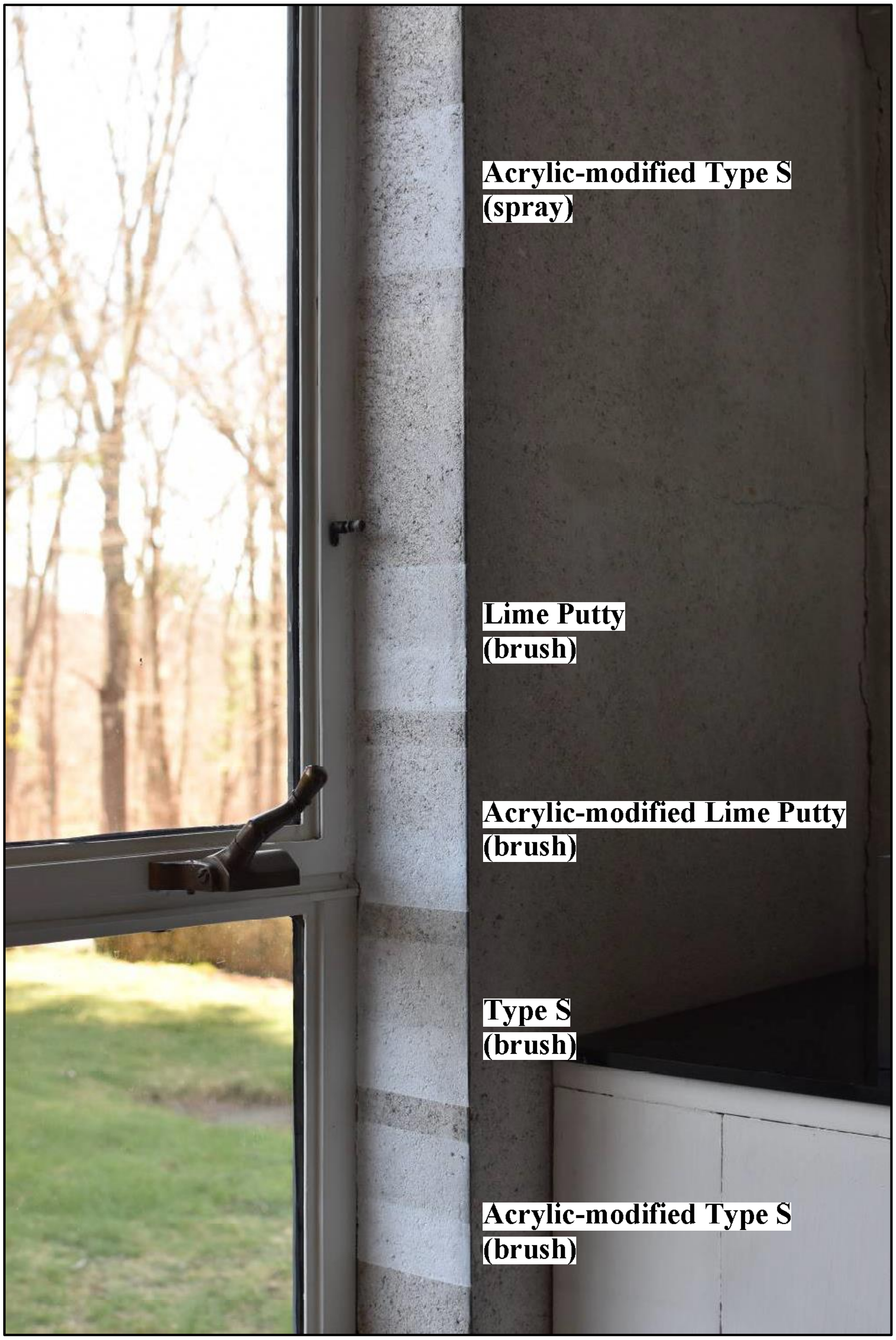


Figure 44. Limewash test area, post treatment, with variations and application methods labeled.

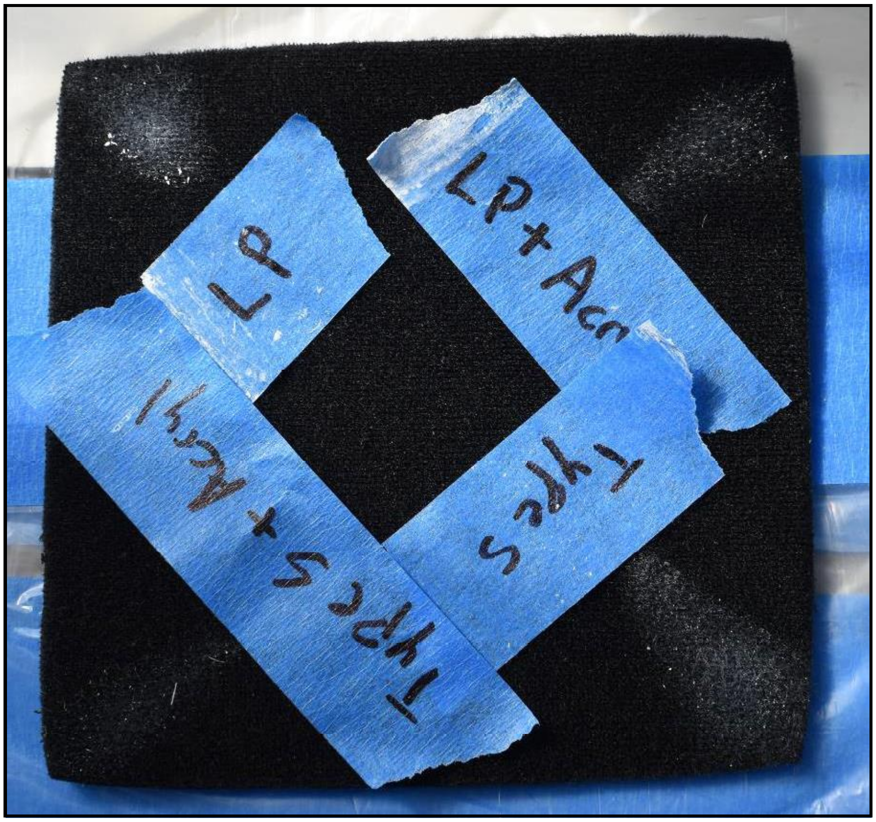


Figure 45. Chalking test cloth with residue from brush applications of (clockwise from top left corner) lime putty, acrylic-modified lime putty, Type S, and acrylic-modified Type S limewash variations.

With the application method and composition of the limewash determined, JBC sought to create a custom tinted wash that would approximate the appearance of unsoiled acoustic plaster. Several pigment combinations were developed in JBC's laboratory to match the reference color of the plaster recorded in the field (PPG 1006-1 "Gypsum"). However, after comparison of samples of each finish with the plaster *in situ,* it was determined that only one of these might provide an appropriate color match (Figure 46). The selected pigmented wash contained 6 parts Type S hydrated lime, 16 parts diluted (1:10) Acryl 60, and 1/128 part light raw umber pigment (manufactured by Rockwood, available from Edison Coatings, stock no. j4605). This was spray-applied (two light coats) to test area adjacent to the fire place in two concentrations: one at full strength and one with twice the amount of limewash to pigment (i.e. 50% less pigment). Both concentrations seemed too white to match the existing plaster. Otherwise, the application verified the validity of the treatment.

Figure 46. Tinted limewash samples (prepared off-site) compared to plaster above living room fireplace mantle (sample at far left selected for test).

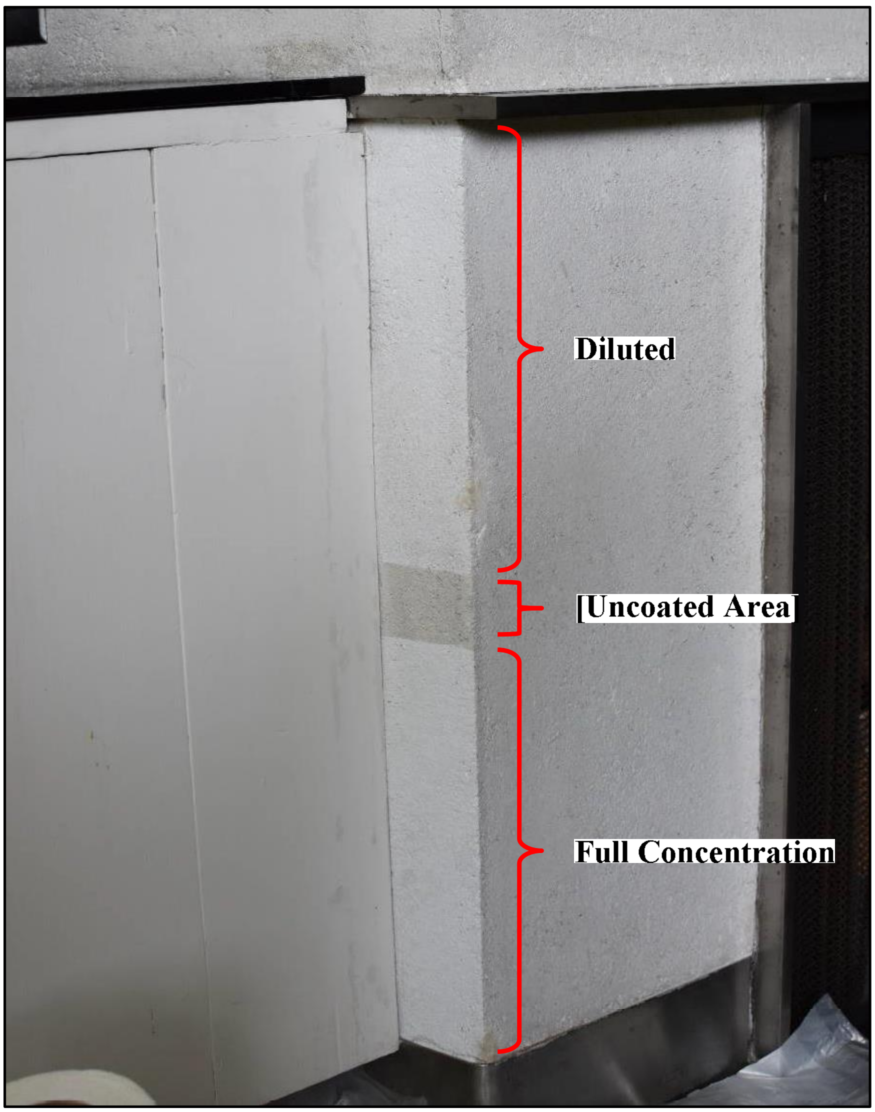


Figure 47. Tinted limewash test area with concentrations labeled.

E. Conclusions

1. Latex Poultice Tests

Most of the poultices tested caused a yellow discoloration of the plaster. The exception to this was MasonRE Latex 20, which removed surface soiling as well as a small amount of friable plaster. Unfortunately, the test area did not include areas of plaster exhibiting water stains or other forms of subsurface staining (these stains are located in more obtrusive areas than the one selected for testing). Therefore, the effect of the latex poultices on this form of staining was not determined.

2. Abrasive Cleaning Tests

Both of the abrasive cleaning products tested removed minor surface soiling. However, neither worked to the same level of effectiveness as the latex poultices. Areas cleaned using abrasives were indistinguishable from soiled areas.

3. Coating Tests

Testing determined that a limewash based on Type S hydrated lime modified with acrylic can be applied to the acoustic plaster with little or no adverse effect to the character defining texture of the material. A diluted acrylic additive successfully mitigated the tendency of limewash to chalk. This makes limewash a more suitable treatment for the house museum where chalking lime could rub off on visitors clothing or historic furnishings. Limewash has an additional advantage in this application in that it can cover water stains and other subsurface stains that may be difficult if not impossible to remove using true cleaning methods.

Attempts to develop an appropriate color tinted limewash were unsuccessful. All of the color variations prepared by JBC appeared too light in comparison with the plaster. This was, in part, due to the indirect method of matching a cleaner area of the plaster to a color reference and developing tinted limewash preparations off-site to match this color rather than directly matching to the plaster *in situ*. Further difficulties arise from the fact that the soiled plaster is not strictly monochrome in appearance, exhibiting many different hues. The “target” color of the original plaster (i.e. the color to be reproduced) is therefore somewhat subjective and should be clearly defined before additional tests or mock-ups are performed.

F. Treatment Recommendations

As a result of testing, JBC recommends that the soiled and stained acoustical plaster located in the living and dining rooms and study be coated with spray-applied limewash. While a less invasive treatment would be to clean the plaster using MasonRE Latex 20, this product is unlikely to produce the desired result. MasonRE Latex 20 was effective in removing some surface soiling but also removed small amounts of plaster. Further, its effectiveness on subsurface staining is unknown.

The limewash should be prepared using a ratio of three parts Type S hydrated lime to eight parts aqueous acrylic solution (Acryl 60 diluted 1:10 with water). The prepared limewash should be thoroughly mixed to ensure adequate dispersion of lime particles and should be passed through a #30 sieve or household strainer to remove any large lime particles.

Pigment may be added to the limewash to more closely approximate the original or "target" color of the plaster. Only natural, light stable pigments should be used. Tinted limewash preparations should be tested in an unobtrusive area on the original plaster as the properties of this material may change the color of the coating.

The plaster should be moistened with water and patted dry before the application of limewash. The limewash should be applied using HVLP spray equipment or similar equipment capable of producing a fine, nebulized mist. The limewash should be regularly stirred or agitated in the sprayer's canister as lime particles can quickly fall out of suspension. Care should be taken to minimize the number of passes, overlap, or coats applied in order to produce thinnest possible coating with the desired opacity. Two coats produced the desired effect in testing, however, additional testing using the same equipment that will be used to execute the full-scale work should conducted to determine the best approach.

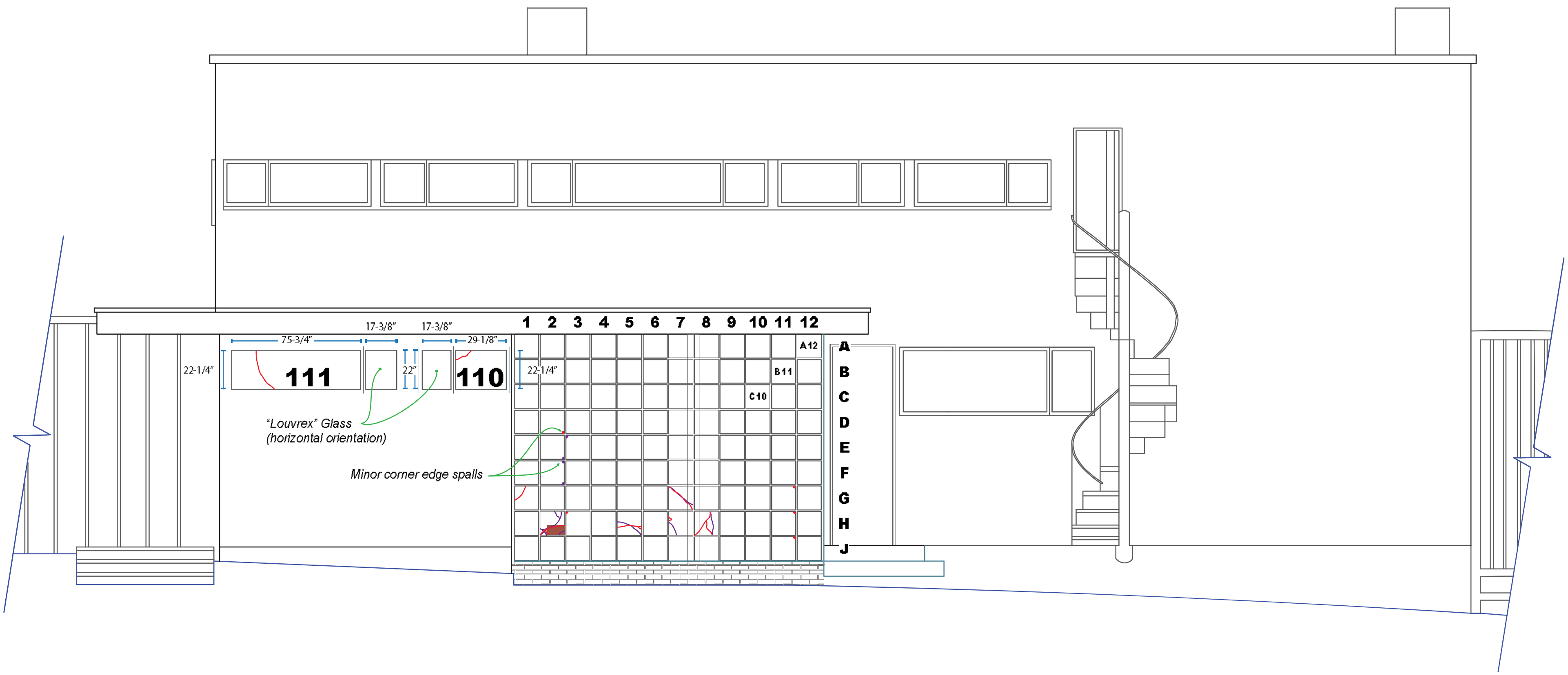
Limewashed surfaces should be protected from direct sunlight or other sources of heat (e.g. forced-air heating) to prevent premature drying. If necessary, periodically mist the limewash with water and/or cover it with a damp cloth while it is curing. Premature drying may cause the limewash to flake-off or chalk.

Limewash test patches should not be over-coated with additional limewash as this will result in an overly-opaque and unsatisfactory appearance. The test patches may be removed by lightly dabbing the surface with a sponge dampened with water. If this does not produce the desired effect, household variety white vinegar may be used instead of water. Care should be taken not to abrade the surface or allow the plaster to become saturated.

Darker colored stains or stains that bleed through the limewash may require spot coating using limewash and a small artist's brush.

APPENDIX A
Condition Drawings: Glass

Gropius House



GLASS CONDITIONS

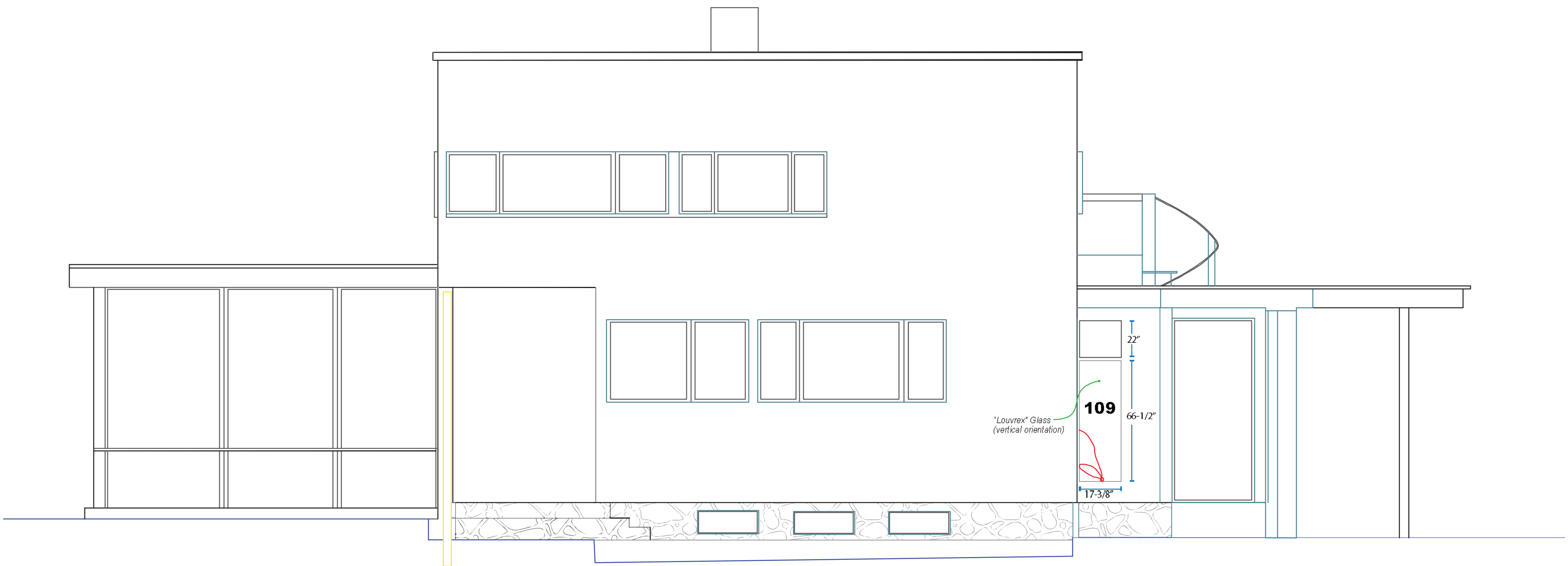
- CRACK
- MISSING
- CRACK ON REVERSE (INTERIOR-FACING) SIDE (GLASS BLOCK)

GLASS SURVEY

NORTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC. ARCHITECTURAL CONSERVATORS	GROPIUS HOUSE LINCOLN, MASSACHUSETTS	NOT FOR CONSTRUCTION	SURVEY DATE OCT. 28-30, 2015	SHEET 1 OF 3



GLASS CONDITIONS

- CRACK
- MISSING

GLASS SURVEY

EAST ELEVATION

NOT TO SCALE

JBC JABLONSKI BUILDING CONSERVATION, INC. ARCHITECTURAL CONSERVATORS	**GROPIUS HOUSE** LINCOLN, MASSACHUSETTS	NOT FOR CONSTRUCTION	SURVEY DATE OCT. 28-30, 2015	SHEET **2** OF 3

GLASS CONDITIONS

CRACK

MISSING

GLASS SURVEY

SOUTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

APPENDIX B
Structural Assessment of Glass Block Wall

Gropius House

CIRRUS STRUCTURAL ENGINEERING

20 November 2015

Mary Jablonski
Jablonski Building Conservation, Inc.
40 West 27th Street #1201
New York, NY 10001

Reference: Gropius House Glass Entry Wall - Conditions Assessment

Dear Mary:

It is a pleasure to present the findings from the Conditions Assessment of the Glass Block Entry Wall at the Walter Gropius House in Lincoln, Massachusetts in the following report.

Executive Summary

We determined the cracking in the glass block wall to be caused by shear stress from the corrosion of the base of the steel channel to the east pushing against the glass. We recommend that the channel and the broken glass block be replaced. Re-caulking the perimeter of wall will prevent additional water infiltration.

Introduction

We visited the Gropius House on 28/October/2015 to survey the condition of the glass block entry wall, assess its integrity and make recommendations for ways to repair it.

For the purposes of this report, the entry wall is considered situated on the north elevation of the house. The south side of the wall faces the entry vestibule, while the north side faces the grounds.

Description

A covered walkway connects the driveway to the main entry of the house. A 7' long vestibule around the steps leading up to the east facing entry door is partially enclosed by the walkway roof above, the wall of the house to the south, and a glass block wall to the north. The glass block wall continues 5' to the west of the entry door to form the north wall of the interior vestibule.

The structure of the covered walkway is concealed above a ceiling and does not appear to rely on the glass block for support.

The glass block entry wall is constructed of 12" by 12" by 4" deep nominal double wall glass blocks. The blocks are mortared together to form a 10' high by 12' long (10 block high by 12 block long) glass wall along the north side of the main entry vestibule. The blocks sit on a single wythe brick foundation wall. Five (5) courses of brick are apparent above grade; the depth below grade is unknown. The bed joints in the glass block portion of the wall are reinforced with double 1/8" wire set into a hard mortar. The outside surface of the glass blocks has a fluted pattern, the direction of which (horizontal and vertical) alternates from course to course.

A 5" structural steel channel section, oriented so that the wall nests between the flanges, frames the east end of the glass wall. A layer of cork board is apparent adjacent to the web of the steel with a vertical mortar joint constructed between the cork and the outer edge of the glass block. The vertical joint between the flanges of the channel and the glass block is filled with a rope backer material and caulking.

The west end of the glass wall forms an outside corner with a board finished (non-glass) wall. A 2" wide steel plate, wrapped in exposed sheet metal to form the corner, encloses the end of the glass. The cork, mortar, rope backer and caulking are similar to the east end.

The top edge of the glass block is concealed by the ceiling of the roof structure. We were not able to view the detail above the ceiling; however the rope backer and caulking joint is similar.

The following photographs provide a general layout of the glass block wall.

Overall layout from the north

Overall layout from the west

Individual Glass Block

Noted Conditions and Recommendations

The following conditions were noted at the site, and are accompanied by our *recommendations.*

1. Glass Block Cracking

Condition:

We observed cracking in approximately 8 locations within the 2nd and 3rd courses of the glass block wall, on both the north and south sides. The glass has remained tight and intact adjacent to the cracks in all but one location on the north side (see Wire Reinforcement Surface Corrosion section for photo) where loss occurred. The cracks generally have a horizontal component to their direction, the pattern of which indicates a local horizontal shear stress not present at other elevations of the wall. See next section for probable cause of shear stress.

Recommended Repair:

We recommend that the unit suffering glass loss be replaced. There is no structural reason to require replacement of cracked units whose glass has remained in-tact.

2. Corroded Steel Channel Framing East End of Wall

Condition:

Significant corrosion is visible on the web of the channel at the base of the east end of the wall. The likely cause of the corrosion is moisture from snow that is often piled against the channel in the winter. Corrosion from steel expands approximately 10 times its volume, and has done so in this case in a lamellar pattern. It appears that as the corrosion grew on the west side of the web it pushed against the glass block wall introducing a shear stress into the wall. Once contact was established between the corroded web and glass wall, further corrosive expansion pushed the base of the steel channel to the east causing a visible deflection.

Recommended Repair:

Ultimately we recommend that the channel be replaced with a corrosion resistant material; however, in order to do this mindfully the connection at the top of the steel channel above the ceiling must be understood and addressed. Obtaining and studying the structural drawings for the house might give some insight to the detail above the ceiling. Removing a few of the fascia boards along the side of the overhang would allow a direct look at the top of the channel and would likely be required for installation of a new steel channel.

3. Caulking Failure at West End of Wall and Ceiling

Condition:

The caulking has failed leaving the rope backer exposed on all edges of the wall.

Recommended Repair:

The caulking and backer should be replaced with materials compatible with the adjacent surfaces and the environment.

Caulking Failure at West End of Wall and Ceiling, continued

4. Wire Reinforcement Surface Corrosion

Condition:
Minor surface corrosion visible in 1/8" diameter steel wire due to exposure to the elements following glass loss at the failed block.

Recommended Repair:

We recommend that the wire be coated with r and embedded in mortar prior to replacement

It has been a pleasure to perform this conditions assessment. If you have any questions regarding this report, please do not hesitate to contact this office.

Respectfully Yours,

Cirrus Structural Engineering, LLC

Elizabeth Acly, PE
Principal

APPENDIX C
Petrographic Analysis of Glass Block Wall Mortar

Gropius House

HIGHBRIDGE
MATERIALS CONSULTING, INC.

404 Irvington Street
Pleasantville, NY 10570
Phone: (914) 502-0100
Fax: (914) 502-0099
www.highbridgematerials.com

MORTAR ANALYSIS REPORT

Client:	Jablonski Building Conservation, Inc.	**Client ID:**	JABL001
Project:	Gropius House	**Report #:**	SL1000-02
Location:	Lincoln, MA	**Date Received:**	11/16/15
Sample Type:	Acoustical plaster and masonry mortar	**Report Date:**	01/13/16
Delivered by:	Client (E. FitzGerald)	**Petrographer:**	J. Walsh
		Chemist:	H. Hartshorn
		Analyst:	K. Riley
		Page 1 of 13	

Report Summary

- One mortar sample from the Gropius House in Lincoln, MA is examined for this report.
- The examined sample is identified as a cement-lime mixture with a natural sand consisting of granitic, metamorphic, and volcanic components. The binder contains a gray portland cement and a dolomitic dry hydrated lime.
- The proportions of the mix are consistent with a properly sanded Type N formulation (historic Type B). The cement to lime ratio is estimated at 1 : 0.64 while the binder to sand ratio is estimated at 1 : 2.5 by volume.
  The mortar has a gray color except where discolored by carbonation (Munsell code approximately N 5.25), and the sand contributes some color and textural variegation to the weathered surfaces.
  The air content is estimated at 6-8% by volume on average and the mortar is well consolidated and compacted. The cured product is hard, indurate, and impermeable.
- Overall, the mortar appears to be in generally sound condition despite some minor microscopic cracking. Carbonation is complete over the thickness examined.
- Corrosion product is identified along some surfaces though the source is not apparent from the provided sample.
- The presence of secondary mineralizations as well as biological growth and soiling on bed surfaces suggests that the mortar may be disbonded from the glass block substrate.
- A more detailed discussion of these findings may be found in the “Petrographic Findings and Discussion” sections beginning on page 3 of this report.

1. Introduction

On November 16, 2015, Highbridge received two samples from Mr. Edward FitzGerald of Jablonski Building Conservation reported to have been taken from the Gropius House in Lincoln, MA. The samples are identified as follows:

GH-001: Mortar removed from exterior glass block wall
GH-007: Acoustical plaster removed from water-damaged interior wall. Likely "Stucoustic" brand manufactured by California Stucco Products Co.

At the client's request, a compositional analysis is performed on the mortar sample. The testing includes petrographic examination and chemical analysis to identify constituents, estimate proportions, and assess overall condition. An acid digestion to recover a sand sample for description and gradation is excluded from the analysis. The results of this testing are presented below. The client has also requested a petrographic examination on the small fragments of acoustical plaster, and these results are presented under separate cover in Highbridge Report SL1000-01.

2. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained within ASTM C1324. Data collection is performed by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 4 of ASTM C856. Chemical analysis is conducted according to the procedures outlined in ASTM C1324. Water, carbon dioxide, and aggregate weight percentages are determined gravimetrically. Oxide weight percentages are determined by inductively coupled plasma-optical emission spectroscopy (ICP-OES). The methods are modified when accounting for dolomitic lime. Rather than approximating lime through DTA with possible errors due to carbonated lime, dolomitic lime is instead calculated directly from the chemical analysis by simultaneous equations based on typical dolomitic lime chemistry.

3. Standard of Care

Highbridge has performed its services in conformance with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time. Interpretations and results are based strictly on samples provided and/or examined.

4. Confidentiality Statement

This report presents the results of laboratory testing requested by the client to satisfy specific project requirements. As such, the client has the right to use this report as necessary in any commercial matters related to the referenced project. Any reproduction of this report must be done in full. In offering a more thorough analysis, it may have been necessary for Highbridge to describe proprietary laboratory methodologies or present opinions, concepts, or original research that represent the intellectual property of Highbridge Materials Consulting and its successors. These intellectual property rights are not transferred in part or in full to any other party. Presentation of any or all of the data or interpretations for purposes other than those necessary to satisfy the goals of the investigation are not permitted without the express written consent of the author. The findings may not be used for purposes outside those originally intended. Unauthorized uses include but are not limited to internet or electronic presentation for marketing purposes, presentation of findings at professional venues, or submission of scholarly articles.

5. Petrographic Findings and Discussion

5.1 - General Summary

The examined sample is identified as a cement-lime mixture with a natural sand consisting of granitic, metamorphic, and volcanic components. The binder contains a gray portland cement and a dolomitic dry hydrated lime. The proportions of the mix are consistent with a properly sanded Type N formulation (historic Type B). The cement to lime ratio is estimated at 1 : 0.64 while the binder to sand ratio is estimated at 1 : 2.5 by volume. The mortar has a gray color except where discolored by carbonation (Munsell code approximately N 5.25), and the sand contributes some color and textural variegation to the weathered surfaces. The air content is estimated at 6-8% by volume on average and the mortar is well consolidated and compacted. The cured product is hard, indurate, and impermeable.

Overall, the mortar appears to be in generally sound condition despite some minor microscopic cracking. Carbonation is complete over the thickness examined. Corrosion product is identified along some surfaces though the source is not apparent from the provided sample. The presence of secondary mineralizations as well as biological growth and soiling on bed surfaces suggests that the mortar may be disbonded from the glass block substrate.

5.2 - Materials

The aggregate contains a mixed assemblage of granitic components, fine-grained metaclastics, metabasite, and volcanic components as well as trace heavy accessories. The granitic component consists of granite, feldspar, and moderately to highly strained quartz. The metaclastics are mostly micaceous quartzites, phyllites, and fine-grained metawackes. The metabasites have varied levels of alteration but contain amphibole and pyroxene as the primary minerals. The volcanic grains are plagioclase-rich and fine-grained siliceous particles might consist of felsite. Both the volcanic grains and the strained quartz in the granitic component are known to be alkali-reactive in concrete mixes. Though these mineralogies comprise a large component of the aggregate employed here, there is no observed deleterious reaction between the aggregate and the cement paste. No significant clay coatings or friable materials are detected. Despite the concentration of potentially reactive components, the sand is considered hard, non-porous, and durable for use in masonry mortar. The aggregate was not extracted from the mortar through acid digestion, and the appearance is not fully described. However, under low magnification of the mortar in hand sample, the sand appears moderately variegated with a mixture of semi-translucent light-colored grains and more opaque pink and grayish green grains.

The sand is somewhat sharp-textured with mostly equidimensional and minor subequant grains that are subangular in shape on average. The grain shape varies from subrounded in the coarser sizes to angular in the finer sizes. The particle size distribution is estimated petrographically rather than quantified through a gradation analysis. Based on petrographic observations, the aggregate is medium-grained and broadly graded. The nominal top size is estimated at the No. 8 mesh with most passing, and there appears to be a peak abundance between the No. 16 and No. 30 sieves. The fines content is low. It is possible that the aggregate is compliant with modern masonry sand gradations as specified by ASTM C144 though this is not confirmed by a sand extraction.

The binder is a mixture of gray portland cement and dolomitic dry hydrated lime. No pozzolanic or pigment additions are present. The binder matrix appears to have been homogeneously developed with a moderate to moderately low capillary porosity. The cement hydration is advanced. Still, residual portland cement grains are detected in moderate abundance. The cement grains are present as agglomerates of former calcium silicate with interstitial iron-bearing ferrite. There is also a notable abundance of ferrite distributed throughout the binder matrix. The ferrite identifies the cement as a gray rather than white variety. This is confirmed by the measured chemistry, which has an SiO_2/Fe_2O_3 ratio of 5.6. The cement has a fine to medium grind with most grains retained between the No. 100 and No. 200 sieves. None of the cement grains have sizes that appear to exceed the No. 100 mesh. These cement textures are consistent with an early to mid-twentieth century product and the ca. 1937-38 construction date provided by the client.

There is also a moderately high abundance of fine-grained lime inclusions. These grains are all carbonated and internally nondescript except for rare inclusions of burned mica from the original lime rock. Most are less than 150 µm, and none exceed 0.5 millimeters in size. The chemical analysis suggests that the lime is a dolomitic rather than high-calcium variety. The particulate texture of the lime suggests the use of a prepackaged dry hydrate product. This is also consistent with the reported ca. 1937-38 construction date. Prepackaged dry hydrates became commercially available in the United States ca. 1910 and were used almost exclusively by the 1930s.

5.3 - Component Proportions

Chemical analysis is performed on the mortar sample, and the results are summarized in Section 6 below. Compared to modern specifications for masonry mortar described in ASTM C270, the mortar is estimated to be in the range of a properly sanded Type N mixture (historic Type B). The cement to lime ratio is estimated at 1 : 0.64, and the corresponding binder to sand ratio is calculated at 1 : 2.5 by volume.

Though modern cements are often considered "harder" than their historic counterparts, the approximate hand sample qualities of the provided sample do not appear to differ significantly from what might be expected of a modern Type N mix with a typical 1 : 1 : 6 proportion. Of course, this is a general statement that is not confirmed through physical testing. Nevertheless, it may be safe to start from the premise that the chemically determined mortar proportions can be used to estimate the physical properties of the mixture. While good restoration practice usually stresses the use of more lime-rich formulations, the type, condition, and exposure of the masonry should always be considered in any repair strategy. The author is not fully aware of these site conditions and it is not within the scope of the testing laboratory to recommend replication mixtures.

5.4 - Condition and Service Performance

Based on the sample pieces examined, the mortar components were mostly well mixed with no sand streaks or binder lumps. The original mix water appears to have been well incorporated with no signs of late retempering. The mortar is compacted, and the air content is estimated at 6-8% by volume on average. The air content is not considered excessive and the mortar is reasonably well consolidated. The air structure varies both within and between pieces but is mostly observed as coarse, irregular voids. The cured product is hard, indurate, and not noticeably water absorptive. These features are consistent with the estimated proportions of the cement-rich mixture.

The binder matrix is fully carbonated, which is usually a normal and desirable consequence of long-term curing. Along surfaces, the carbonation has resulted in a noticeable color change from medium gray to a rich salmon tone. This is not unusual in older portland cement mortars and is often mistaken as an intentional pigmentation. Carbonation results in a reduction of pH due to consumption of calcium hydroxide. This can cause the depassivation of any encased metals and make these susceptible to corrosion. There are semi-circular impressions in the mortar that might represent impressions of some type of metallic embedment. Whether or not this is correct, there is a thin layer of corrosion product opposite the tooled masonry surface. The laboratory is not aware of the construction details. However, it should be noted that carbonated mortar does not offer any protection to encased steel.

In the pieces examined in thin section, there is a low abundance of sharp, hairline cracks parallel to the outer surface. In one piece, there are two main cracks at three and five millimeter depths from the outer surface with fewer subordinate cracks. In another piece, there is a single crack approximately one centimeter from the tooled surface. There is not obvious pattern to the cracking and it is not known if it relates to the possible steel corrosion. Despite this microscopic cracking, the mortar material itself appears rather sound and indurate based on the pieces provided.

Though no secondary mineralizations are observed in the bulk of the mortar, there is some evidence of calcite scale on one bed surface. In thin section, there is one surface with a thin deposit of a clear, viscous-looking material. Though its identification is not confirmed, its association with glass block might suggest the development of a small amount of hydrous silica or an alkali-silica reaction gel. Much of the material is not isotropic and this would indicate some age if it were a reaction gel. There is no evidence for any distress related to this deposit. On other bed surfaces, there is a thin layer of soiling and biological growth. Again, these are only observed on the bed surfaces and do not penetrate the depth of the mortar. However, the presence of these external contaminants suggests that the mortar may be disbonded from the glass block masonry, at least in the sampled area.

6. Chemical Analysis

Table 6.1: Chemical Analysis Results

Sample ID	**GH-001**
Component (wgt. %)	
SiO_2	3.89
CaO	13.88
MgO	2.27
Al_2O_3	0.85
Fe_2O_3	0.70
Insoluble residue	63.94
LOI to 110°C	1.87
LOI 110°C-550°C	3.09
LOI 550°C-950°C	10.01
Measured Totals	**100.48**

Table 6.2: Calculated Components

Sample ID	**GH-001**
Component	
Portland cement (wgt. %)	21
Masonry cement (wgt. %)	Not detected
Lime expressed as dry hydrate (wgt. %)	5.7
Supplementary cementitious materials (wgt. %)	Not detected
Pigment (wgt. %)	Not detected
Sand (wgt. %)	73
Cement : lime ratio (by volume with lime as dry hydrate)	1 : 0.64
Binder : sand ratio (by volume with lime as dry hydrate)	1 : 2.5

Notes:
1. The cement weight percentage is calculated assuming an original SiO_2 content of 21% in gray portland cement. Sufficient CaO and MgO are subtracted from the measured values to satisfy this cement content. The remaining CaO and MgO are reported as their respective dry hydroxides through molecular weight conversion. This presents the weight percentage of lime in dry hydrate form. Sand is taken directly from the acid-insoluble residue. Reported weight percentages are then normalized to 100%. Volumetric ratios are calculated assuming bulk weights for portland cement, hydrated lime, and damp, loose sand of 94 lbs./ft.^{3}, 40 lbs./ft.^{3}, and 80 lbs./ft.^{3} respectively.

Respectfully submitted,

Heather Hartshorn

Heather Hartshorn
Staff Scientist/ Chemist
Highbridge Materials Consulting, Inc.

Reviewed by,

John J. Walsh
President/ Senior Petrographer
Highbridge Materials Consulting, Inc.

Appendix I: Visual Description of Sample as Received

Sample ID	**GH-001**
Description	The sample consists of four small mortar pieces weighing a total of 37 grams. The joint thickness is approximately 0.25" with up to 0.75" of the depth and 1.75" of the joint length represented. The depth is represented up to an area where there is residual corrosion product. This is present on the rear surfaces of the mortar pieces and may represent the location of some reinforcement feature.
Surfaces	Tooled surfaces are concave with moderate relief, medium sand exposure. The entire tooled surface is covered with a dark brownish gray soiling. Bed surfaces are compact. One side of the bed surfaces on each piece is sandy to slightly creamy-textured and soiled within the front five millimeters of the tooled surface. The other bed surface on each piece is somewhat creamy-textured and covered with a nearly white, scaly mineral deposit.
Hardness / Friability	The paste is hard, and the mortar is nonfriable.
Appearance	Freshly exposed surfaces have a subvitreous luster and are gray in color (Munsell code approximately N5.25).
Other Details	No cracking or binder inclusions are visible in hand sample. There is a low abundance of white mineral deposit much less than one millimeter in diameter and possibly filling air-voids. All surfaces are not noticeably water absorptive.

Appendix II: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
µm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

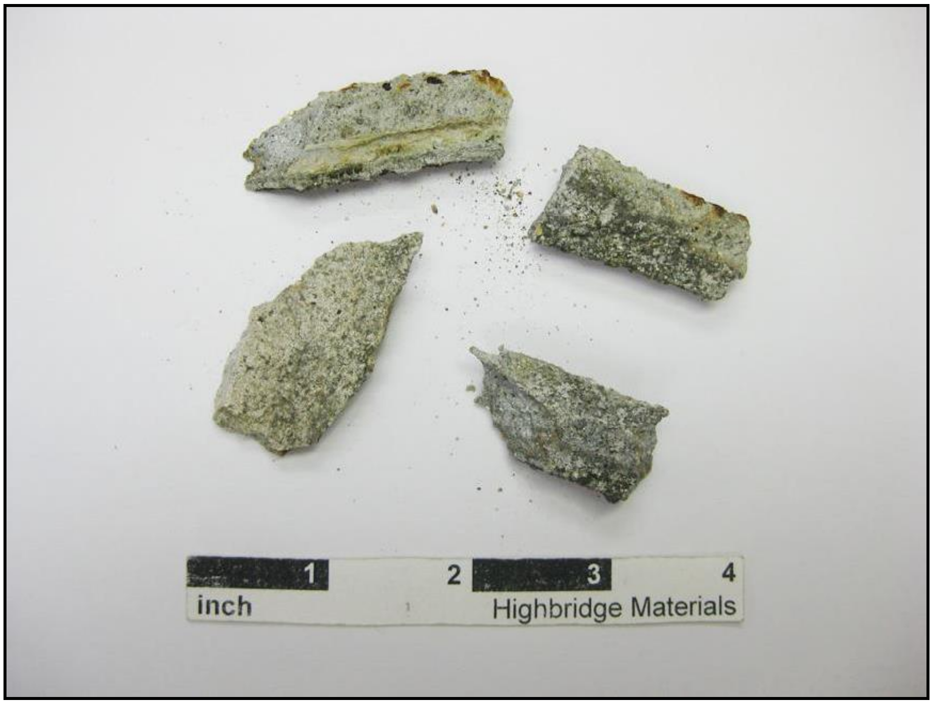
Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, Highbridge also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.



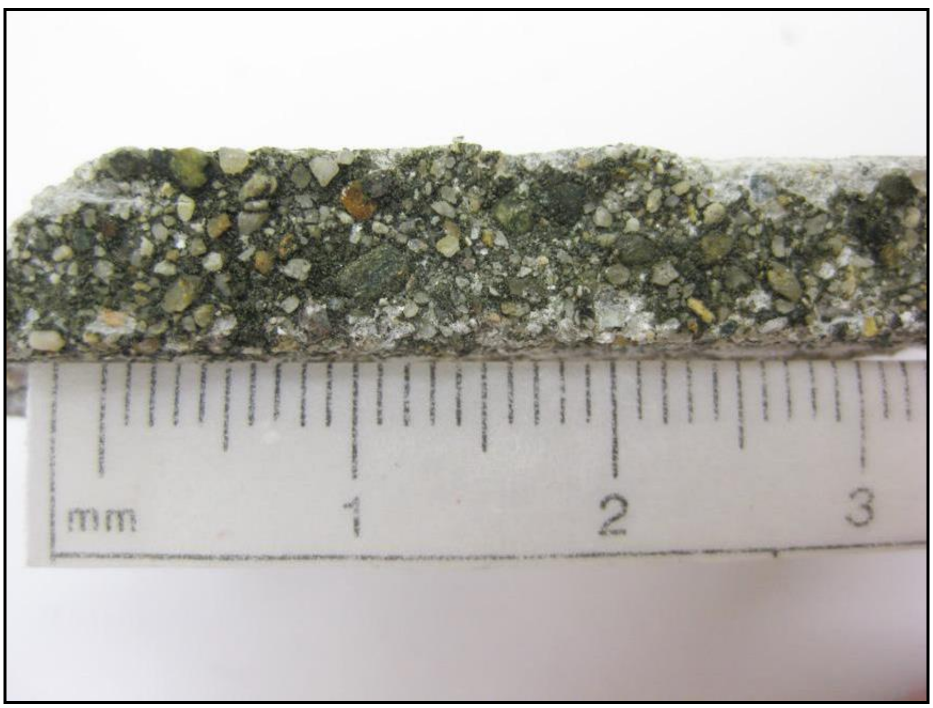


Figure 1: Photographs of the mortar sample provided to Highbridge for examination. The mortar is uniform in appearance with a gray color. The cured product is hard, nonfriable, and not noticeably water absorptive. The lower image shows a closer view of the tooled surface. The exposed aggregate contributes some color and textural variegation to the weathered joint face. However, the overall color is much darker than the fresh paste due to soiling at the surface.

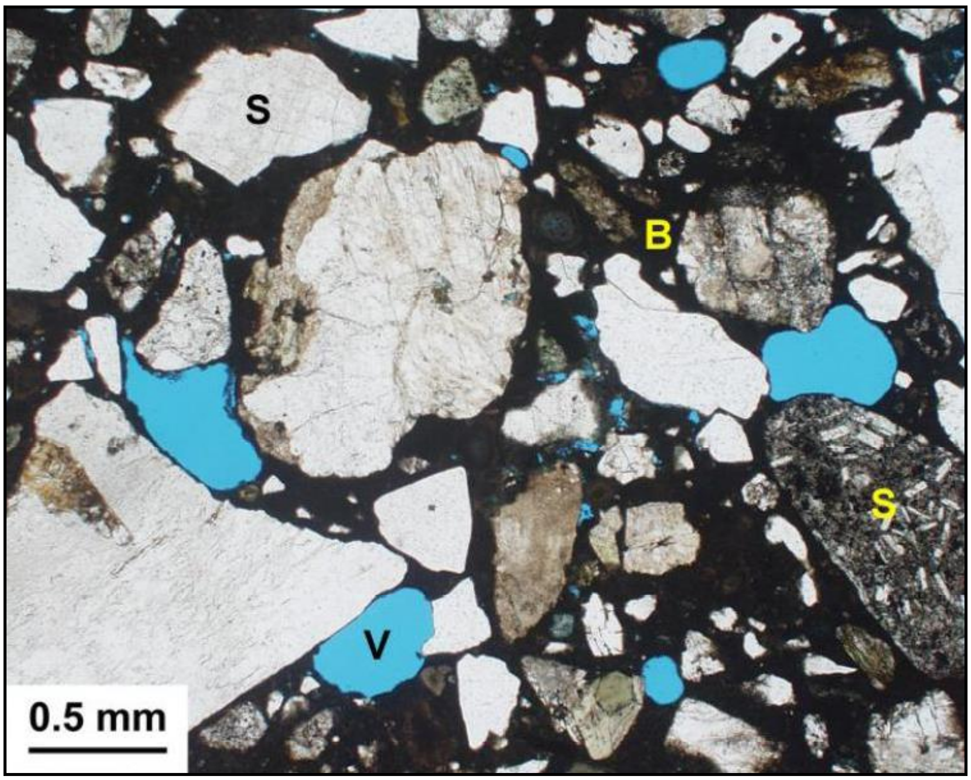


Figure 2: PPL photomicrograph illustrating the overall microtexture of the mortar. The sample is impregnated with a low-viscosity, blue-dyed epoxy in order to highlight cracks, pores, and voids. The homogeneously developed binder matrix (B) has a moderate to moderately low capillary porosity as indicated by lack of absorption of the dyed epoxy. Sand grains (S) are somewhat sharp-textured and well distributed throughout the paste. The content of air-voids (V) is somewhat high but not overly excessive. Overall, the mortar is compacted and rather well consolidated.

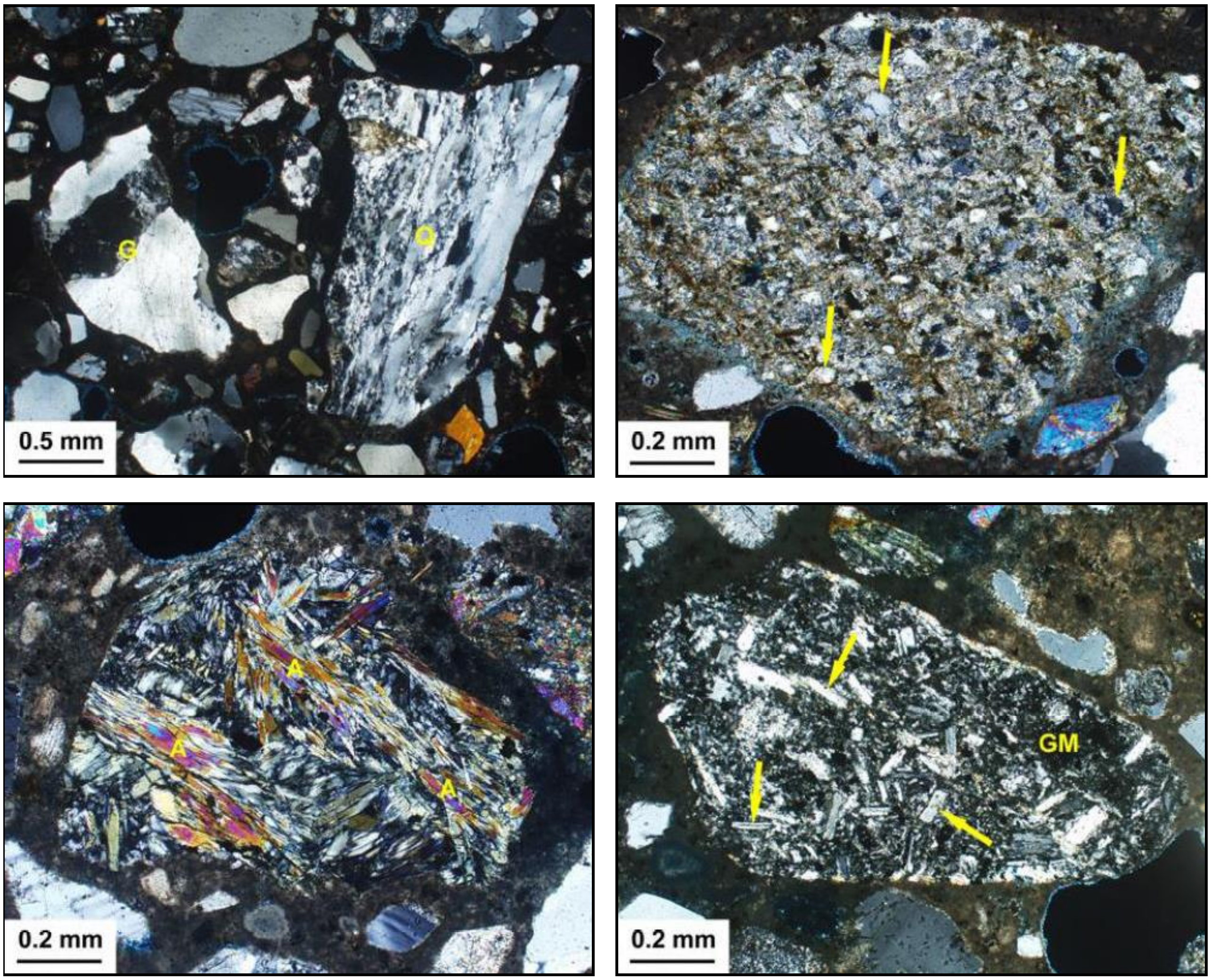
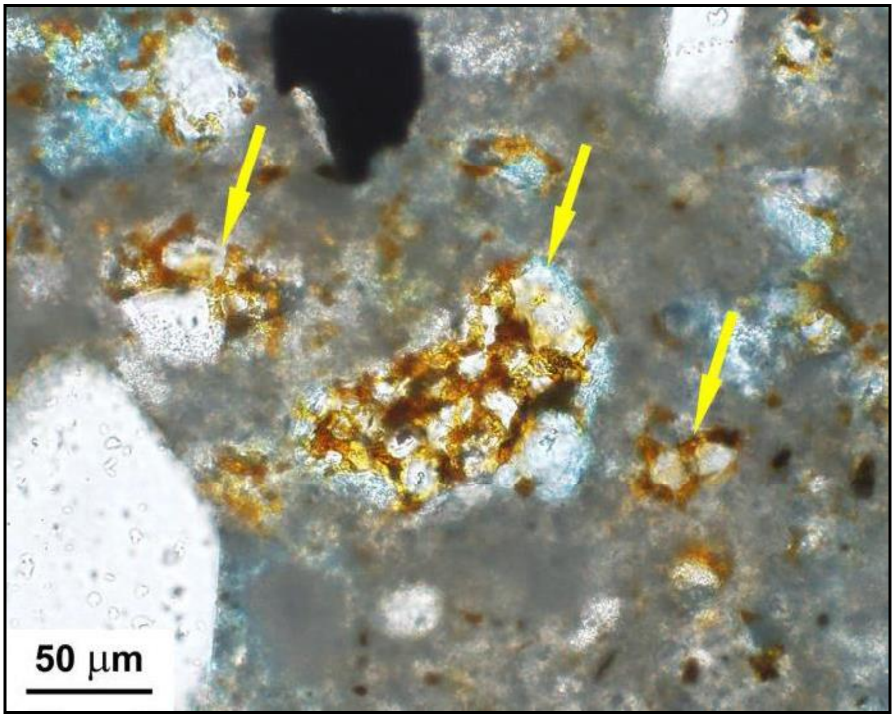


Figure 3: XPL photomicrographs illustrating the mineralogy of the sand, which consists of a mixture of granitic components, fine-grained metaclastics, metabasite, and volcanic components. (Upper left image) Particles belonging to the granitic component are depicted. A granite particle (G) is shown as well as a quartzite grain (Q) containing highly strained quartz. (Upper right image) A metaclastic particle is shown containing a number of fine-grained quartz inclusions (arrows). (Lower left image) A metabasite grain is depicted that contains amphibole (A) as a primary mineral. (Lower right image) A volcanic particle is shown containing an abundance of plagioclase (arrows) in a fine-grained groundmass (GM).



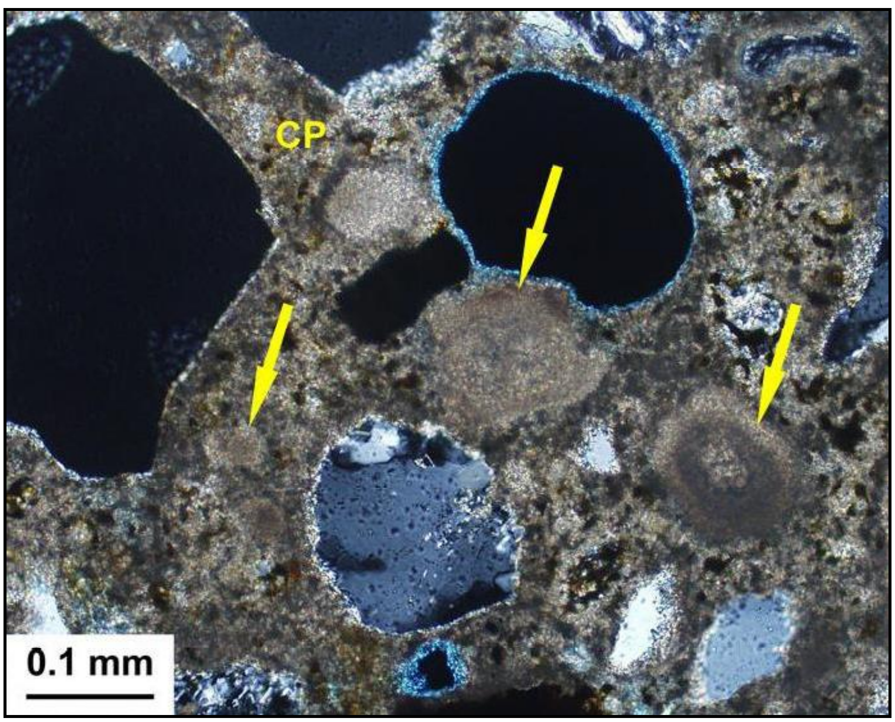


Figure 4: PPL photomicrographs illustrating the binder characteristics identified in the mortar sample. (Upper image) Residual portland cement grains (arrows) are present in moderate abundance as mostly hydrated agglomerates of former calcium silicate with interstitial iron-bearing ferrite. The ferrite identifies the cement as a gray rather than white variety. The ferrite has a distinctly orange color in the area shown in this photograph. This discoloration corresponds to a visual discoloration from gray to salmon. This is not unusual in older carbonated cement mortars. The cement has a fine to medium grind, which is consistent with the 1937-38 construction date provided by the client. (Lower image) There is a moderately high abundance of nondescript lime inclusions (arrows) that are mostly less than 150 μm in size. All of these lime grains are carbonated and well distributed throughout the carbonated paste (CP). The particulate texture of the lime suggests a product that was added as a prepackaged dry hydrate.

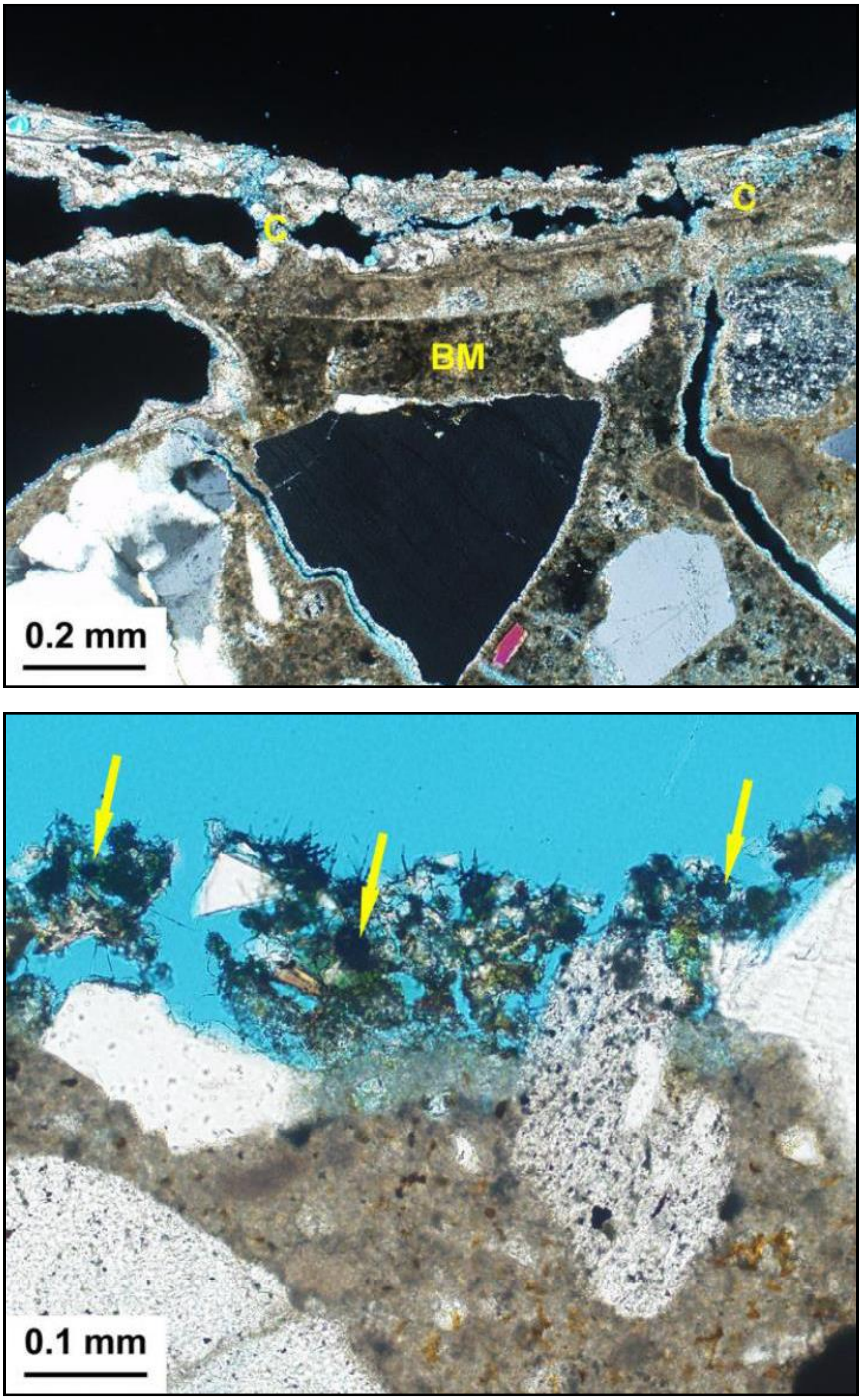
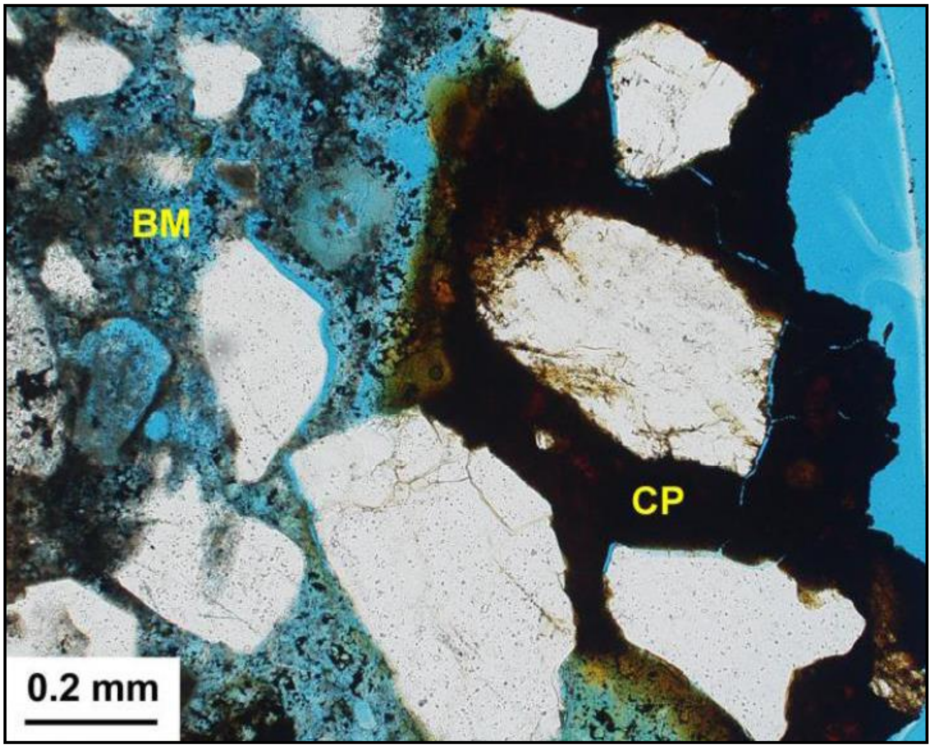


Figure 5: Photomicrographs illustrating secondary effects observed in the mortar sample. (Upper XPL image) One bed surface is covered with thin calcite scale (C). This is differentiated from the carbonated binder matrix (BM) by the coarser texture of the recrystallized carbonate. No other secondary mineralizations are observed in the examined mortar sample. (Lower PPL image) Other bed surfaces are covered with a thin layer of soiling and biological growth (arrows). These features are only observed on the surfaces of the mortar, and the bulk of the sample is considered to be in generally sound condition.



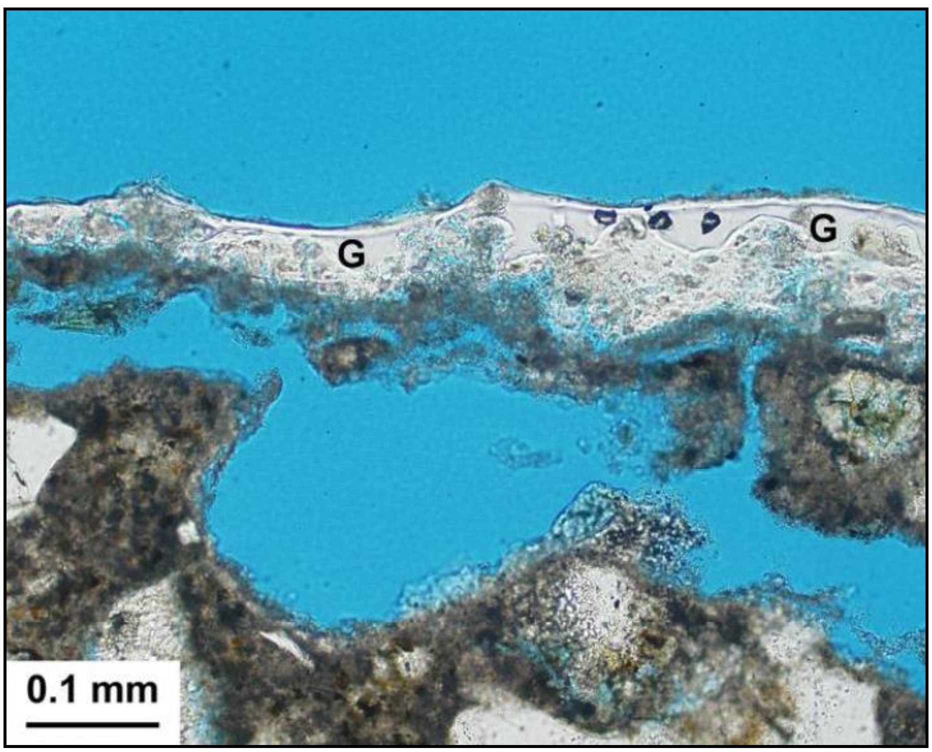


Figure 6: PPL photomicrographs illustrating secondary effects observed in the mortar sample that are potentially related to other materials in the masonry assembly. (Upper image) There is a thin layer of corrosion product (CP) opposite from the tooled joint surface. It is shown here directly adjacent to the binder matrix (BM) and enveloping sand grains. The laboratory is not aware of the construction details but it is possible that this is due to corrosion of some encased steel in the carbonated mortar. (Lower image) There is also one surface with a thin deposit of what could be a silica or alkali-silica reaction gel (G). This identification of the material is not confirmed but is likely due to the association of the bed surface with the glass block masonry units.

APPENDIX D
Petrographic and Asbestos Analysis of Acoustical Plaster

Gropius House

HIGHBRIDGE
MATERIALS CONSULTING, INC.

404 Irvington Street
Pleasantville, NY 10570
Phone: (914) 502-0100
Fax: (914) 502-0099
www.highbridgematerials.com

MATERIALS ANALYSIS REPORT

Client:	Jablonski Building Conservation, Inc.	**Client ID:**	JABL001
Project:	Gropius House	**Report #:**	SL1000-01
Location:	Lincoln, MA	**Date Received:**	11/16/15
Sample Type:	Acoustical plaster and masonry mortar	**Report Date:**	12/19/15
Delivered by:	Client (E. FitzGerald)	**Petrographer:**	J. Walsh
		Page 1 of 15	

Report Summary

- This report presents the results of a qualitative petrographic examination on small fragments of acoustical plaster sampled from the Gropius House in Lincoln, MA.
- Based on the microscopic analysis, the material is a lime-based mixture. No evidence for foaming agents is detected. The lightweight character of the plaster is largely the result of a medium-grained and narrowly graded pumice aggregate along with a woody material. Crushed marble is a relatively minor constituent. The plaster contains a fiber addition that is interpreted to be a textile rather than a mineral fiber. Some ultrafine-grained particulates are detected but an intentional pigmentation is not suspected. The cured product is soft and moderately friable.
- There is some evidence to suggest that a thin outer coating overlies the substrate plaster. This thin layer is spongier due to a high content of spherical air-voids. Sparse remnants of a simple lime paste are detected over this outer layer as well.
- Some secondary mineralizations are identified petrographically in the substrate plaster.
- A more detailed discussion of these findings may be found in the ñPetrographic Findings and Discussionò section on page 3 of this report.

1. Introduction

On November 16, 2015, Highbridge received two samples from Mr. Edward FitzGerald of Jablonski Building Conservation reported to have been taken from the Gropius House in Lincoln, MA. The samples are identified as follows:

GH-001: Mortar removed from exterior glass block wall
GH-007: Acoustical plaster removed from water-damaged interior wall. Likely ñStucousticò brand manufactured by California Stucco Products Co.

At the clientôs request, a compositional analysis is performed on the mortar sample and this will be presented under separate cover when the analysis is complete. The client has also requested a petrographic examination on the small fragments of acoustical plaster. Due to the fragmental condition of the small sample, only a qualitative examination is provided with an emphasis on identifying inorganic constituents. A chemical analysis is excluded from this testing.

2. Important Statement Regarding Detection of Asbestos Containing Materials

The possibility of asbestiform materials are discussed in this report. However, this document must not be used in lieu of a certified asbestos analysis report by an ELAP accredited laboratory or similar agency as local regulations require. Highbridge Materials Consulting is not accredited for any environmental testing and any statements made regarding ACMs cannot be used for abatement or safety assessments.

3. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained in ASTM C856. Data collection is performed or supervised by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 4 of ASTM C856.

4. Standard of Care

Highbridge has performed its services in conformance with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time. Interpretations and results are based strictly on samples provided and/or examined.

5. Confidentiality Statement

This report presents the results of laboratory testing requested by the client to satisfy specific project requirements. As such, the client has the right to use this report as necessary in any commercial matters related to the referenced project. Any reproduction of this report must be done in full. In offering a more thorough analysis, it may have been necessary for Highbridge to describe proprietary laboratory methodologies or present opinions, concepts, or original research that represent the intellectual property of Highbridge Materials Consulting and its successors. These intellectual property rights are not transferred in part or in full to any other party. Presentation of any or all of the data or interpretations for purposes other than those necessary to satisfy the goals of the investigation are not permitted without the express written consent of the author. The findings may not be used for purposes outside those originally intended. Unauthorized uses include but are not limited to internet or electronic presentation for marketing purposes, presentation of findings at professional venues, or submission of scholarly articles.

6. Petrographic Findings and Discussion

6.1 - General Summary

This report presents the results of a qualitative petrographic examination on small fragments of acoustical plaster sampled from the Gropius House in Lincoln, MA. Based on the microscopic analysis, the material is a lime-based mixture and no hydraulic components or gypsum-based binders are positively identified. No evidence for foaming agents is detected. The lightweight character of the plaster is largely the result of a medium-grained and narrowly graded pumice aggregate. A secondary aggregate appears to consist of a woody material though the identification of organic constituents is not within the scope of the petrographic examination. Some crushed marble is also detected but this is a relatively minor constituent that does not appear to have an important function. The plaster contains a fiber addition that is interpreted to be a textile rather than a mineral fiber. Some ultrafine-grained particulates are detected and these may represent a modest pigment addition. However, freshly exposed surfaces are a dull but bright white suggesting that there was no intent for an integral colorant. The cured product is soft and moderately friable.

There is some evidence to suggest that a thin outer coating overlies the substrate plaster. This thin layer is spongier due to a high content of spherical air-voids. Sparse remnants of a simple lime paste are detected over this outer layer as well. Some secondary mineralizations are identified petrographically in the substrate plaster.

6.2 - Materials

The primary aggregate is a medium-grained and narrowly graded pumice. The pumice is highly glassy and vesicular with relatively little crystalline material aside from trace phenocrysts of quartz, feldspar, and opaque phases. In some cases, the pumice is uniform and isotropic. In others, there is a distinctive flow texture with elongate, tube-like void structures. The material has a bright white color. Particles are generally equidimensional with an overall subrounded shape. However, grain surfaces have an exceptionally rough texture resulting from the microscopic embayments created by vesicles that intersect the grain boundaries. The aggregate has a nominal top size estimated at the No. 8 sieve and few grains passing the No. 30 mesh. The pumice is narrowly graded with a strong peak abundance estimated in the range of the No. 16 sieve.

An organic material that appears to be some type of wood fragment represents a secondary aggregate or filler. Highbridge does not have an expertise in organic materials and no speculation on species can be offered. The material has an orange-yellow color. The material is cellular with granules that are relatively equidimensional in shape. Particles are found mostly in the range of the No. 50 to No. 30 sieves.

Crushed carbonate grains are also identified in minor proportion and these are not derived from either aggregate. There source or purpose is not clear especially given the low quantity. The carbonate consists of angular cleavage fragments found to a maximum size of approximately 0.5 mm. A single amphibole grain is found in association with carbonate and this suggests that the grains derive from a marble. The association also importantly indicates that the amphibole does not necessarily derive from an asbestos addition.

Fine fibers represent an important constituent of the mixture. When extracted from the plaster through acid digestion, the fibers are revealed to be tangled mats of individual flexible fibers with thicknesses no greater than 10 µm and lengths of about one to two millimeters. Most of the fibers are bright white. However, red and blue fibers are also identified. Optically, the fibers have low relief and moderately low birefringence. The active birefringence indicates that the fibers are not glass. Technically, Highbridge is not accredited to make statements regarding asbestos-containing materials (ACMs) and the absence of asbestos must be formally recognized by an accredited environmental laboratory as local regulations require. Nonetheless, the fibers do not exhibit amphibole-type characteristics meaning that only chrysotile asbestos could be possible. But this also appears to be excluded as a possibility. A portion of the extracted fibers were fired to approximately 400°C and were found to char after a short period. Due to this, it is suspected that the fibers are some type of textile.

The binder itself appears to be altered in most places examined and this may limit the ability to positively identify all constituents. The exclusion of a chemical analysis also limits the characterization. Where visible, the binder is an ultrafine-grained homogeneous mass with relatively low birefringence in many areas. Near regions that appear to represent the outermost surface, the binder is carbonated as indicated by the locally higher birefringence. Essentially, the hardened paste is consistent with a nonhydraulic lime binder. Undispersed lime grains are detected in moderate concentration as discrete particulates that are fully carbonated even where the paste is not. The fine agglomerate sizes below a No. 200 sieve and the particulate nature of the lime are typical of lime added as a dry hydrate.

No other binder materials are positively identified. A more careful chemical analysis modified to avoid including components from the other additives would be required to confirm the identification. Even still, portions of the binder appear to be altered by a diffuse sulfate precipitation (possibly gypsum) and this would interfere with a chemical analysis as well. An isotropic salt is also detected as a void lining and this is likely to be chloride-based. Despite what appears to be a broad sulfate deposition, there is no positive evidence for any type of gypsum plaster. The binder itself lacks the ultrafine-grained network of gypsum crystallites that accompany all types of gypsum plaster hydration. There are no discrete hydration pores containing coarser-grained fibrous gypsum. There are also no anhydrite crystals or other impurities that often accompany gypsum plasters. Evidence for a portland cement addition is also absent. There are no calcium silicate residuals or pores that retain the morphology of hydrated cement grains.

Though petrographic examination cannot positively identify organic admixtures, their influence on paste microstructure can often be discerned. In acoustical plasters, there is always a question of foaming agents. In this case, the binder does not have the microscopically frothy texture that usually accompanies such admixtures. There is a region interpreted to represent the outermost face of the plaster where spherical air-voids are somewhat more concentrated. This could indicate some type of air-entraining agent but this does not appear to be widespread.

The client has reported that historical records indicate a pigment addition. There is a moderately low abundance of ultrafine-grained reddish-brown and orange-brown particulates distributed throughout the hardened binder paste. Extremely fine ñflecksò of color are also detected in the acid-insoluble residue after digesting the binder in a 10% v/v hydrochloric acid solution. In both cases, these could represent a modest pigment dosage. However, the sample pieces provided for analysis are bright white where freshly exposed suggesting that there was no intent for an integral colorant.

6.3 - Notes on Original Placement

The quality of the sample did not permit an evaluation of the plaster placement and the petrographic examination was focused solely on an identification of constituents. Nevertheless, a few of the pieces examined in thin section appear to contain evidence suggestive of more than one layer or lift. In some cases, there is an outer layer at least 0.5 millimeters thick that exhibits an increase in fine, spherical bubbles. It is difficult to determine whether this is truly a separate layer since no discrete boundary with the substrate is detected in the few places observed. Over this spongier layer are traces of an adhered lime paste similar to what might be found in a lime wash. No components other than carbonated lime are identified in these sparse remnants.

6.4 - Secondary Alteration

The client has indicated that mineralizations are visible in association with the plaster layer. An identification of salt species was not included as part of the scope of the examination. Nevertheless, some evidence of these is detected petrographically. In some areas of the binder, there are patches of diffuse mineralization within the capillary pores of the binder. Though not confirmed through chemistry or other instrumental analysis, these have optical characteristics consistent with the sulfate phases. There are also exceptionally thin linings along the surfaces of some air-voids. These are optically isotropic suggesting that they are chloride rather than sulfate species.

Respectfully submitted,

John J. Walsh
President/ Senior Petrographer
Highbridge Materials Consulting, Inc.

Appendix I: Visual Description of Sample as Received

Sample ID	**GH-007**
Description	The sample consists of multiple small acoustical plaster fragments weighing a total of 8 grams. None are larger than approximately 1ò x 0.5 ñ in area. A maximum of about 3/16ò depth is represented.
Surfaces	It is not obvious whether any prepared surfaces are included with the sample pieces. Two distinctive sides are present on most larger pieces. One is slightly ñsandyò in character with a very light gray color (Munsell code approximately 1Y 8/1). The other is smoother and bright white (Munsell code approximately N9). The darker surface simply appears to be soiled relative to the opposite face.
Hardness / Friability	The paste is soft and the mixture is moderately friable.
Appearance	Freshly exposed surfaces have a dull luster.
Other Details	The material is rapidly water absorptive. Other details are not easily assessed due to the fragmental condition of the sample.

Appendix II: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
µm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, Highbridge also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.

Figure 1: Photograph of the sample provided to Highbridge for examination. The acoustical plaster is nearly white except where soiled to a light gray color.

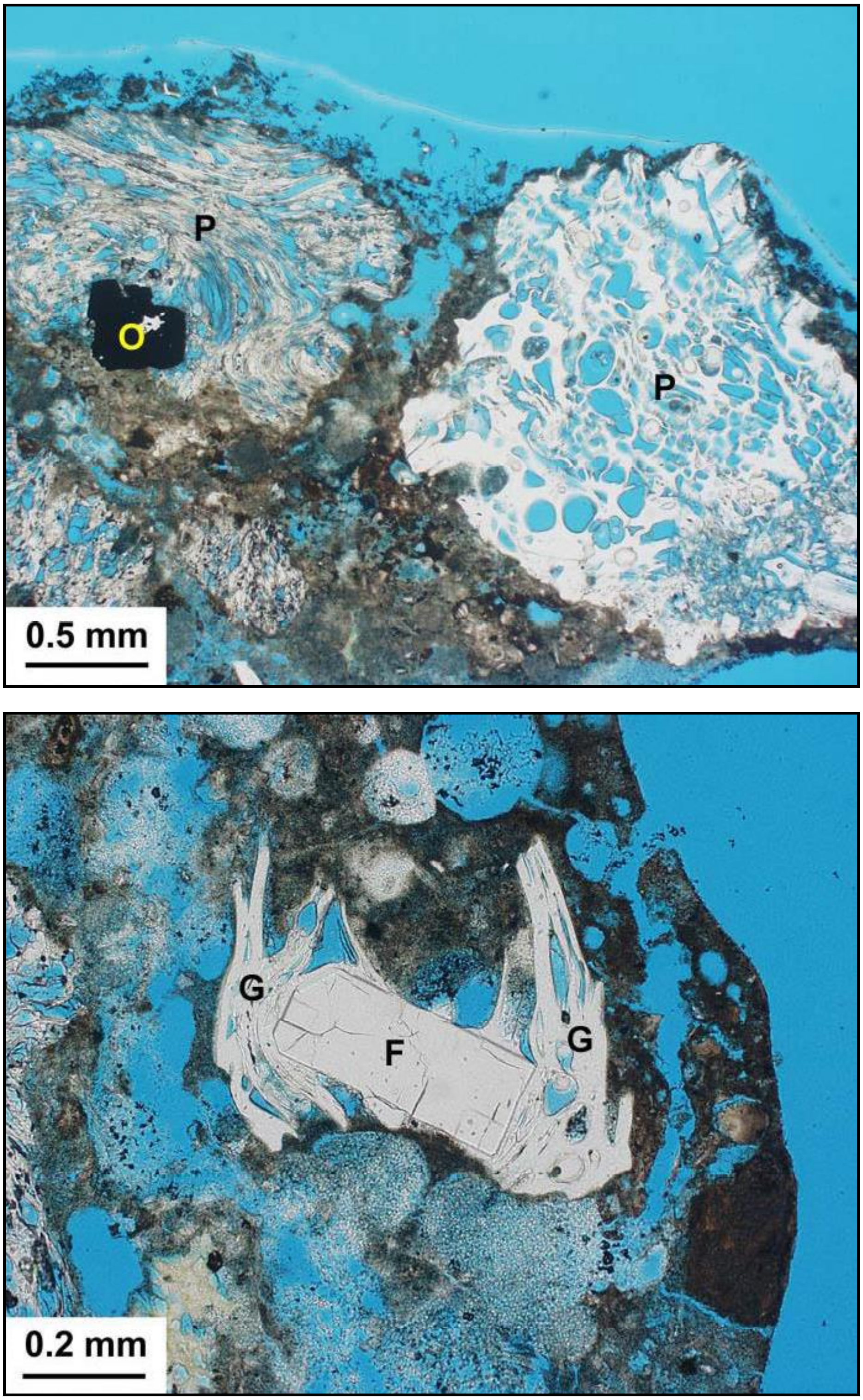
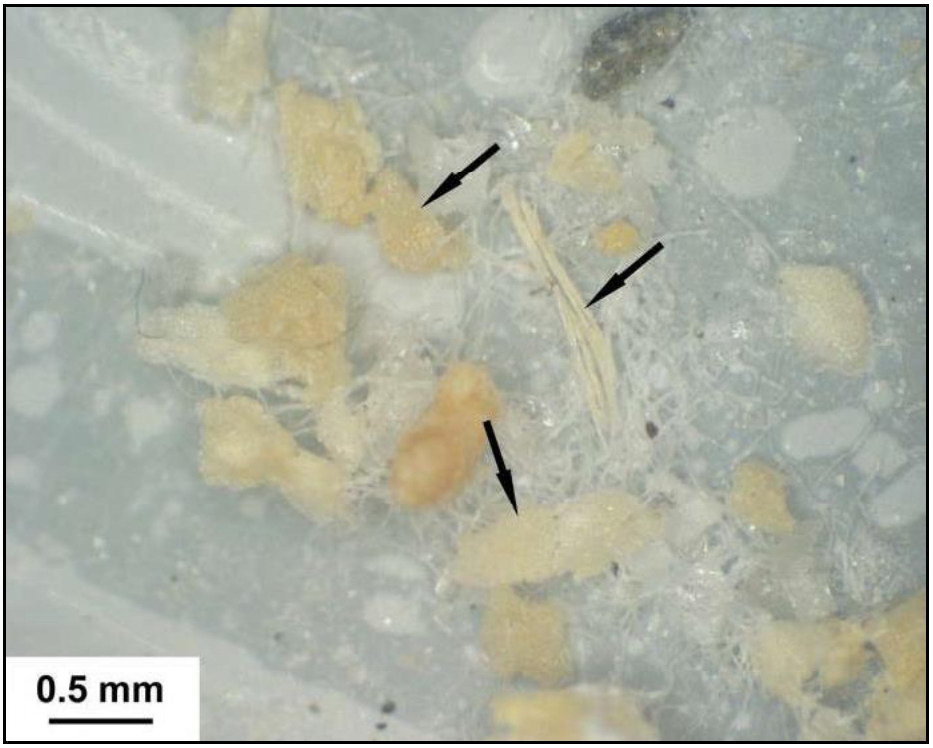


Figure 2: PPL photomicrographs illustrating the pumice aggregate (P). The sample is impregnated with a blue-dyed epoxy to highlight pores and other void structures. The pumice consists primarily of glass (G) that appears white in these images. Vesicles (V) appear blue. In the upper image, the grain at left exhibits an elongate flow texture while the grain at right is more uniform in texture. Phenocrysts are relatively rare. Opaque phases (O) are shown in the upper image. A well-crystallized feldspar (F) is shown in the lower image.



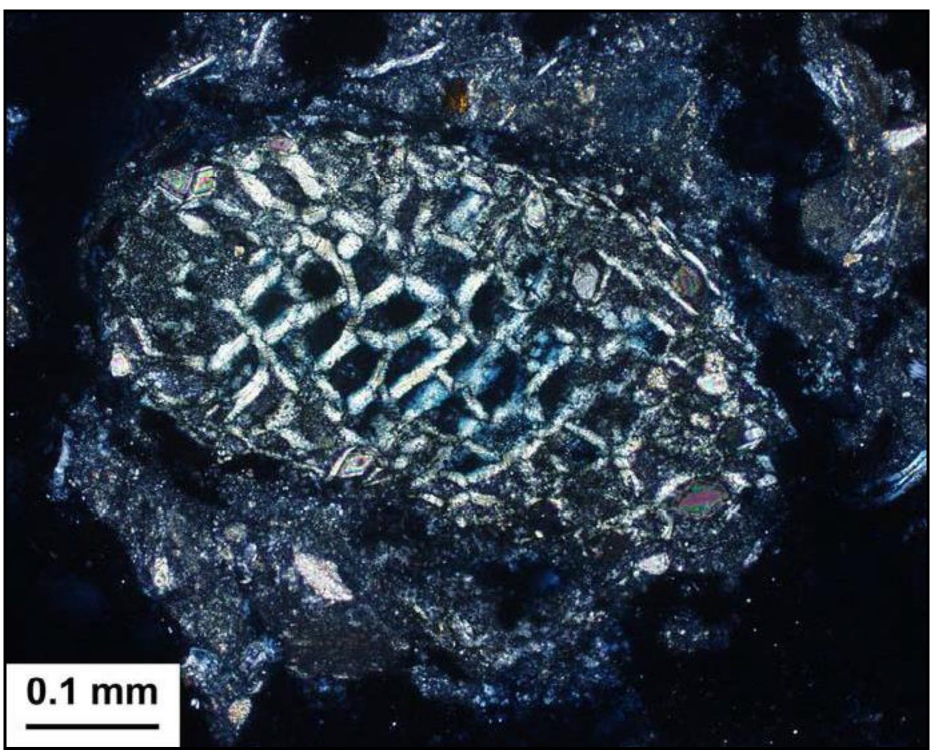


Figure 3: (Upper reflected light image) The arrows indicate cellular material extracted from the plaster by dissolving the binder in acid. The granules are consistent with some type of woody material. (Lower XPL image) The cellular nature of these fragments is more apparent in petrographic thin section.

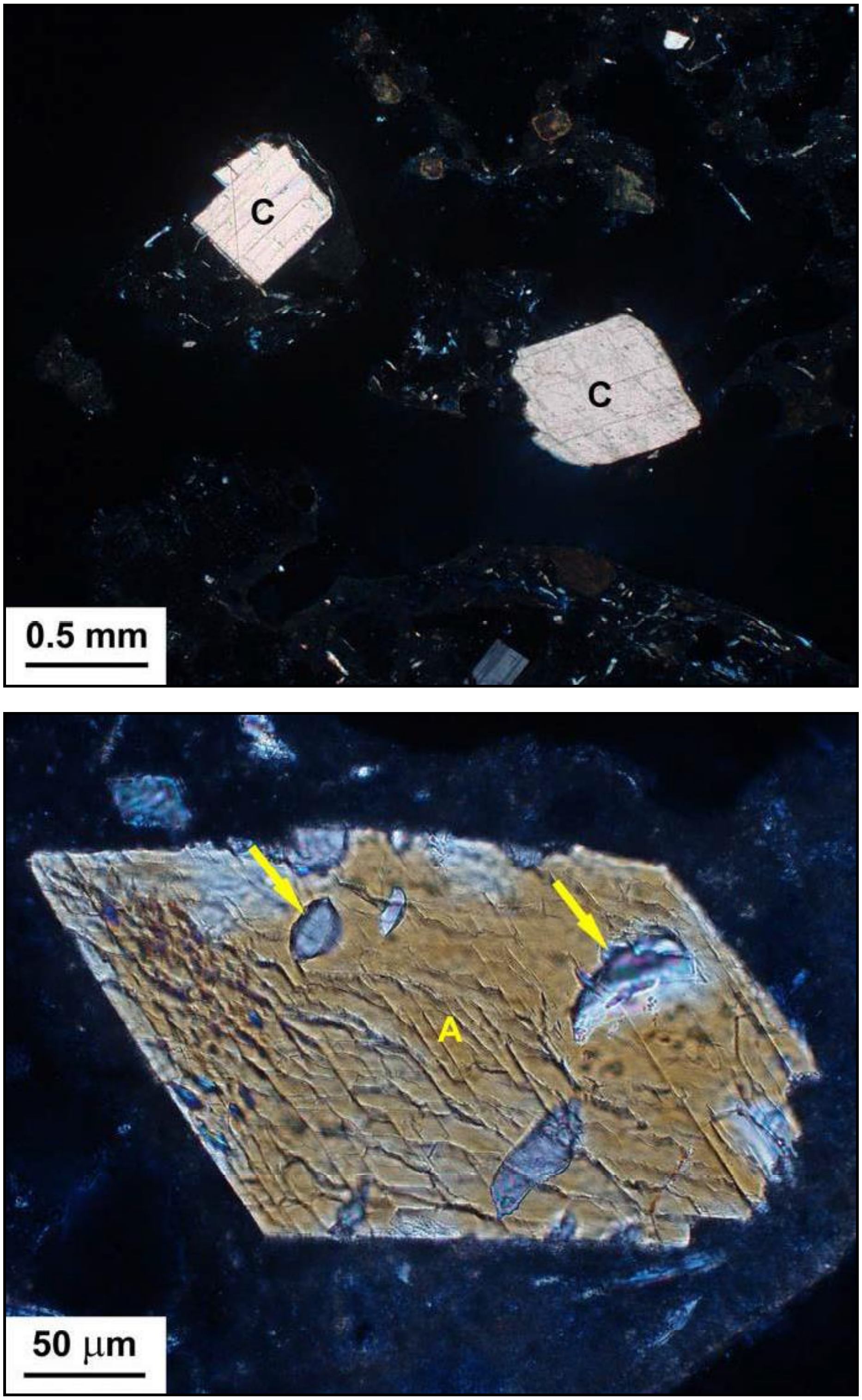


Figure 4: XPL photomicrographs. A minor component of crushed marble is also observed in the plaster. Angular carbonate cleavage fragments are shown in the upper image (C). An amphibole particle is shown in the lower image (A). The arrows indicate calcite inclusions that associate the amphibole with a marble.

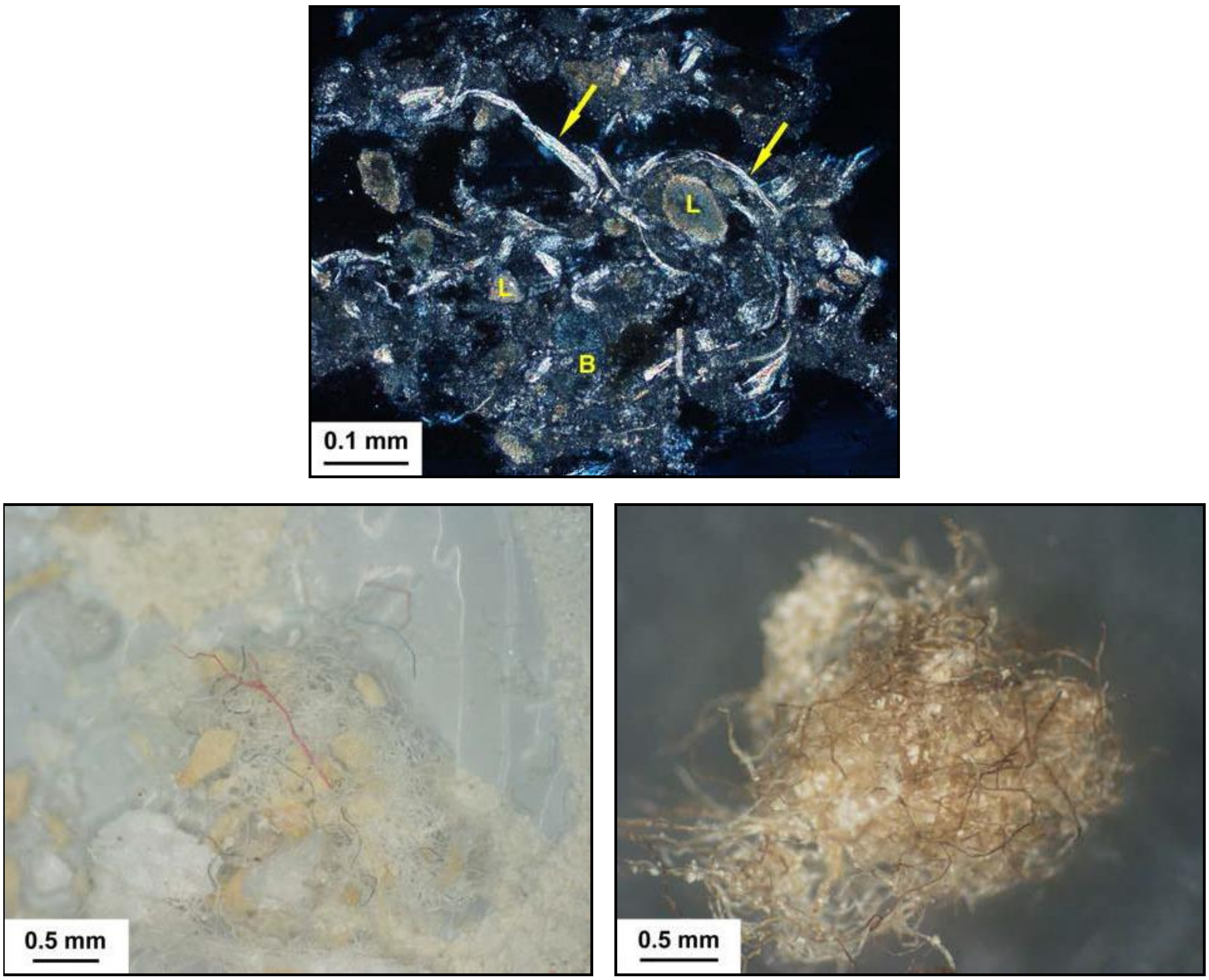


Figure 5: (Upper XPL image) The binder (B) is homogeneous with a low birefringence and appears to consist solely of hydrated lime. Undispersed lime grains (L) are relatively common. The arrows indicate fine fibers that are embedded in the binder. (Lower left reflected light image) The fibers were extracted from the binder through acid digestion. A tangled mat is shown on a filter paper in the same manner it existed within the plaster. Note that most of the fibers are white and difficult to distinguish against the similarly light background. A few red and blue fibers are also detected. (Lower right reflected light image) The fibers were fired at relatively low temperature. Note the charring that indicates the fibers are not mineral based.

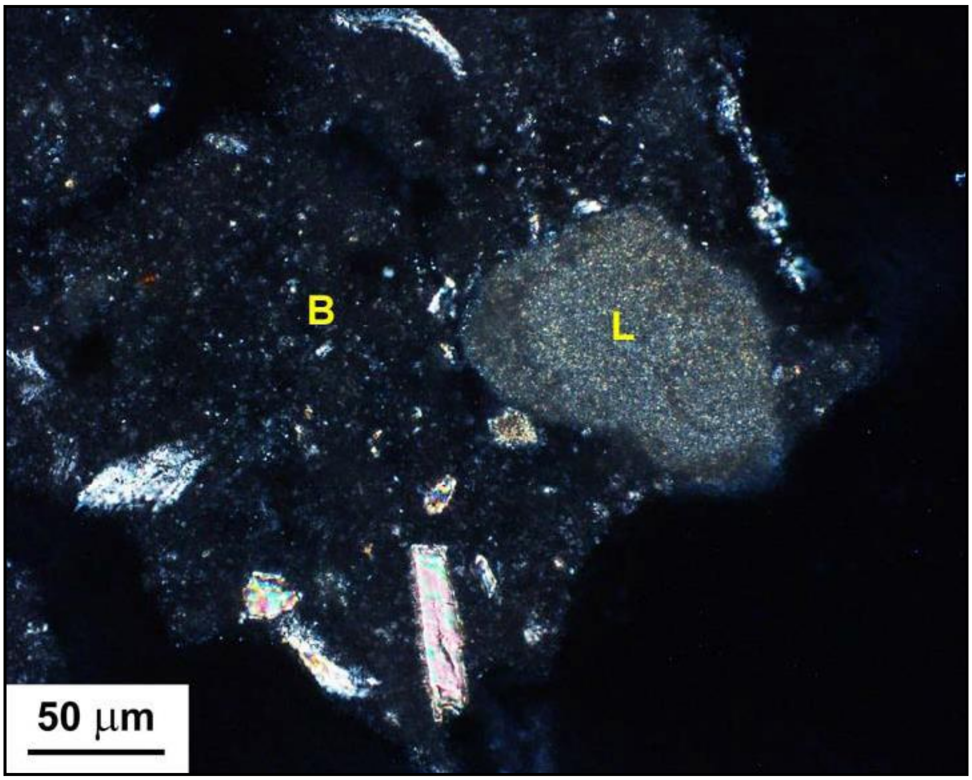
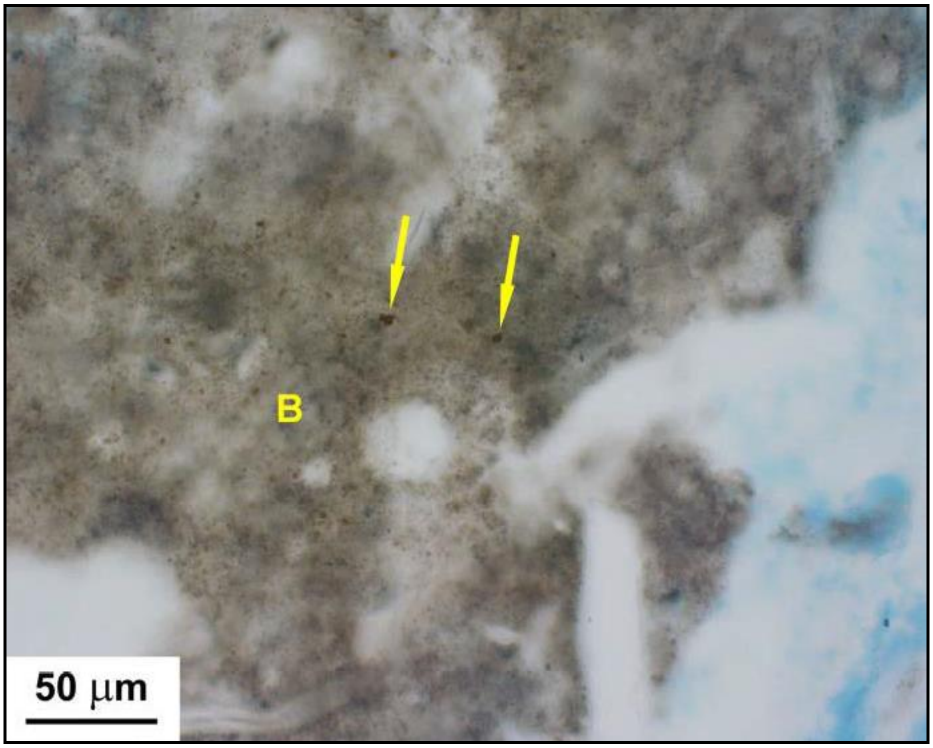


Figure 6: XPL photomicrograph of the hardened binder taken at high magnification. The weakly birefringent binder (B) contains no evidence for gypsum-based plaster. In this area, the binder is identified as slaked and uncarbonated lime. A carbonated lime particle (L) is also shown. The fine size and particulate quality of the lime inclusions is consistent with lime added as a dry hydrate.



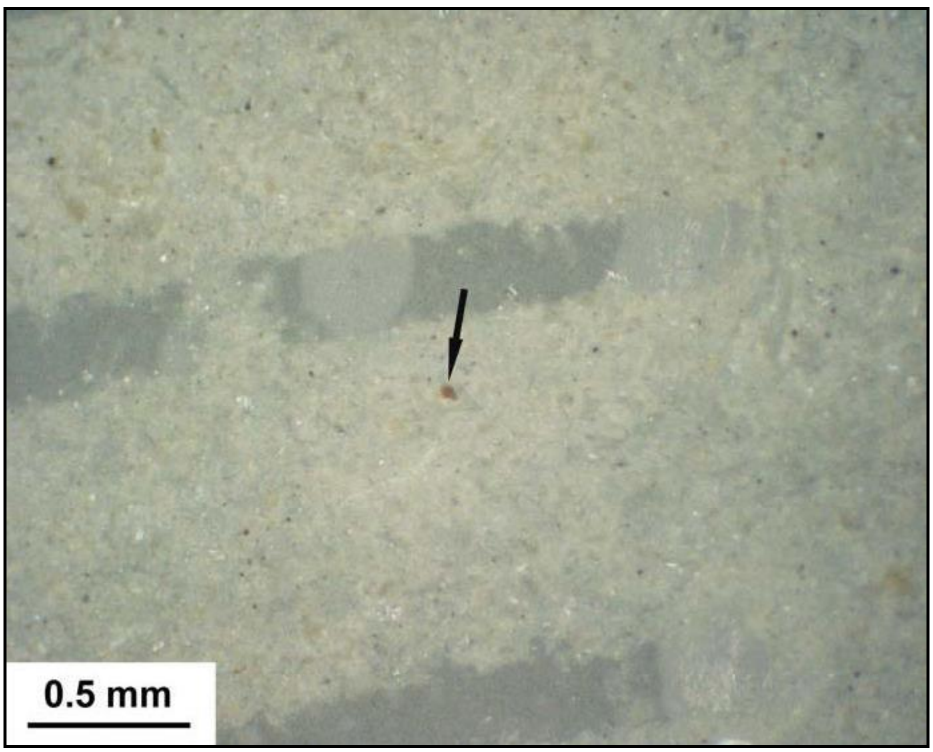
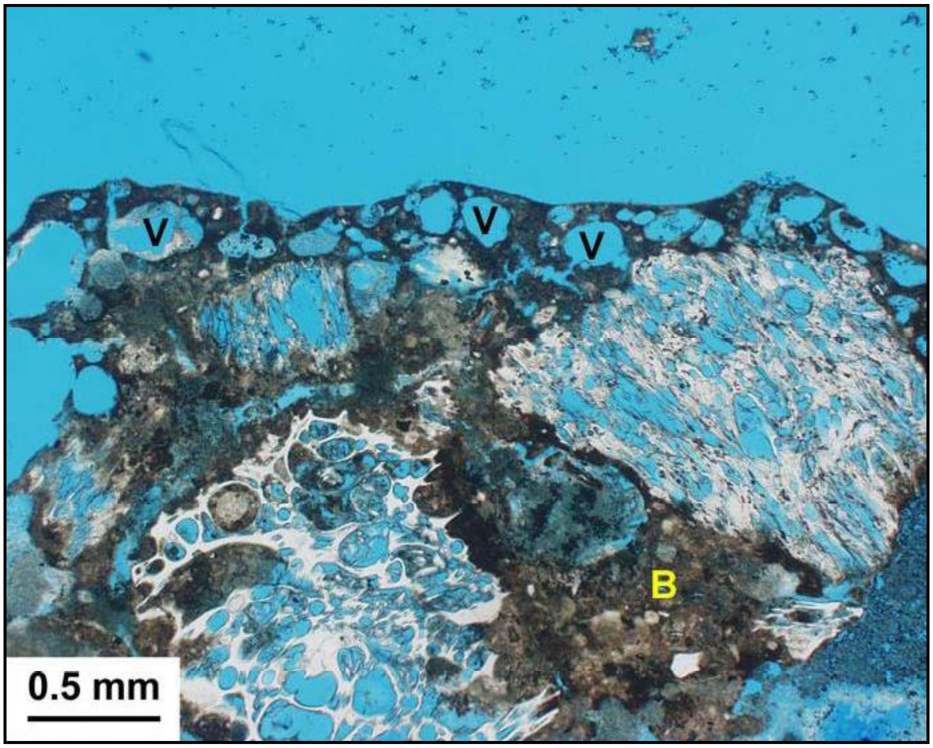


Figure 7: (Upper PPL image) The image is taken with a condenser lens inserted into the light path. The condenser blurs the image but allows for increased contrast of ultrafine-grained particles. The arrows indicate brownish particulates detected within the binder (B). (Lower reflected light image) A similar type of particle is shown on a filter paper after acid-dissolution of the binder. While any of these particles might represent an intentional pigment, the binder is a bright white color when freshly exposed.



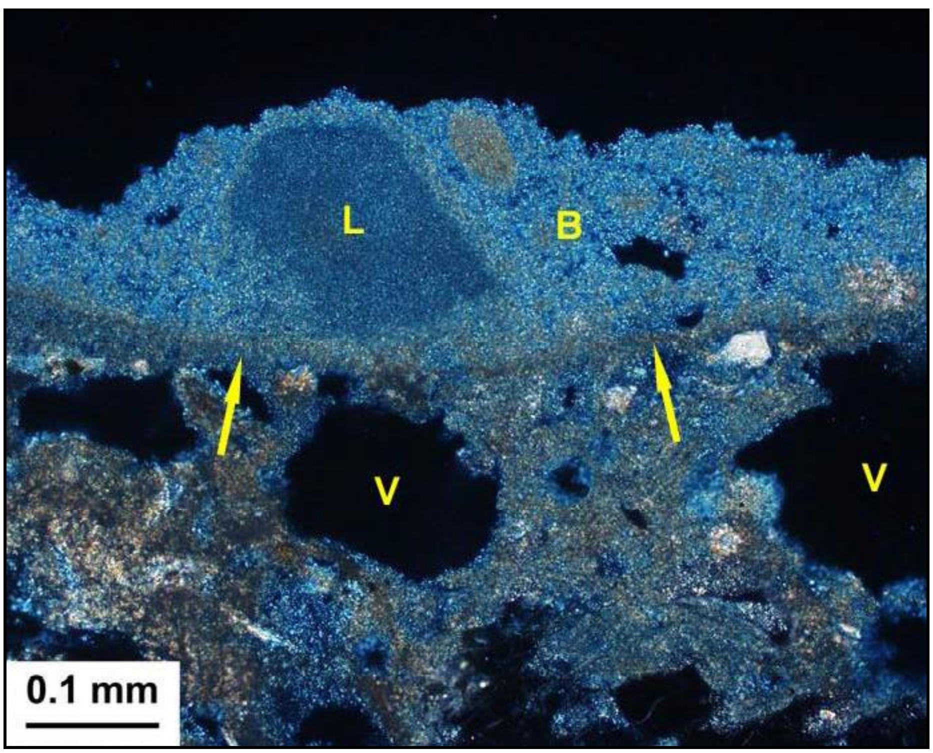


Figure 8: (Upper PPL image) In a few places, what appears to be the outermost skin of the plaster contains a concentration of fine, spherical air-voids (V). There is no discrete boundary with the substrate plaster. However, note that the binder within (B) is uniform with relatively few micropores. Note also that this microstructure is not consistent with the addition of a foaming agent. (Lower XPL image) A higher magnification view is shown for one of these outer layers. The voids (V) appear dark under crossed polars. The arrows indicate the boundary between the plaster and an adhered remnant of lime paste. The paste consists solely of carbonated lime binder (B) with fine-grained undispersed lime inclusions (L).

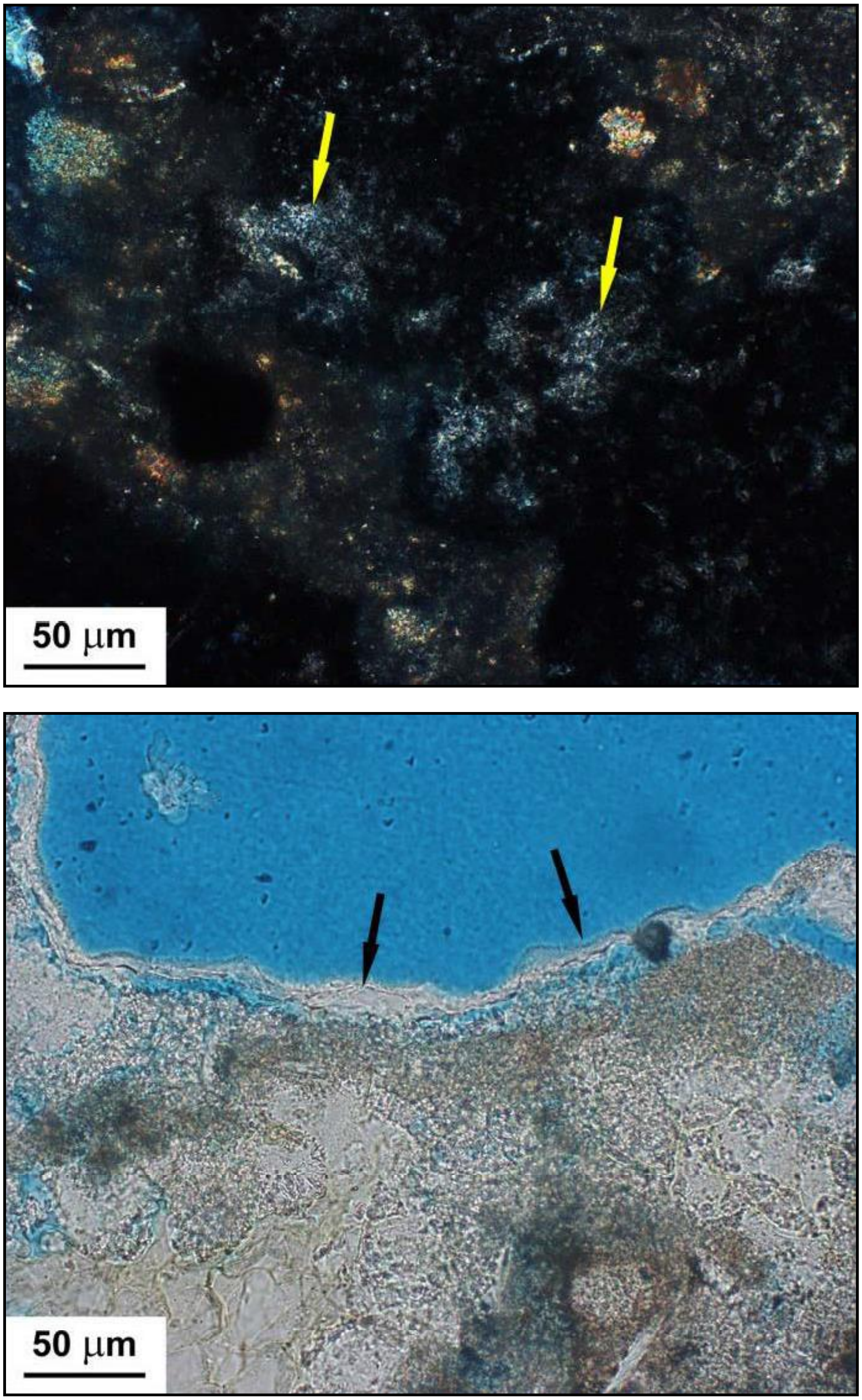


Figure 9: Photomicrographs illustrating secondary mineralizations. (Upper XPL image) The arrows indicate diffuse patches of birefringent material within the micropores of the lime binder. These are consistent in optical character with sulfate deposits. (Lower PPL image) The arrows indicate a fine mineral lining along an air-void surface. The optical properties are consistent with chloride salts.

Please Reply To:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

FACSIMILE TELECOPY TRANSMISSION

To: Individual
Jablonski Building Conservation
Fax #:

Email:

From: David W. Roderick
AmeriSci Job #: 215112760
Subject: PLM 3 day Results
Client Project: Gropius House; 68 Baker Bridge Rd., Lincoln, MA

Date: Friday, November 20, 2015
Time: 06:43:07
Comments:

Number of Pages: 3
(including cover sheet)

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Jablonski Building Conservation
Attn: Individual
40 W 27th St.

New York, NY 10001

Date Received 11/17/15 **AmeriSci Job #** 215112760
Date Examined 11/20/15 **P.O. #**
Page 1 **of** 1
RE: Gropius House; 68 Baker Bridge Rd., Lincoln, MA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GH-006	215112760-01	***No***	NAD

Location: 1st Floor Office, Above Ext. Door - Friable Plaster Sample

(by CVES)
by David W. Roderick
on 11/20/15

Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Cellulose 2 %, Non-fibrous 98 %

Reporting Notes:
Analyzed by: David W. Roderick
*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that car be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:______________ ______END OF REPORT______

Relinquished By: E.G. [signature] Date/Time: 11/13/15
Received By: [signature] Date/Time: 11/17/15 1041
Relinquished By: Date/Time:
Received By: Date/Time:

AmeriSci
WWW.AMERISCI.COM

Bulk Chain of Custody

AmeriSci New York
117 East 30th Street
New York, NY 10016
Toll Free: (800) 705-5227
Phone: (212) 679-8600
Fax: (212) 679-9392

Company: Jablonski Building Conservation
Street Address: 40 W 27th St.
City: New York State: NY Zip: 10001
Phone: (212) 532-7775 ex.11 Fax: (212) 532-2188
Cell: Fax:
E-mail efitzgerald@jbconservation.com Verbal Results: Y / N (circled N)
Results to: " "

AmeriSci #:
Project: Gropius House
Proj Mgr: Edward G. FitzGerald Proj #:
Proj Address: 68 Baker Bridge Rd, Lincoln Proj State: MA
Analysis: ✓ PLM; __ Positive Stop; __ TEM; __ NY ELAP PLM/TEM w/ NOB Prep.
ASTM Dust __ (Microvac) __ (Wipe); ✓ Qualitative; __ Other (describe in comments)
Turnaround Time: 4-6 wks Material Type: ✓ Bulk __ Dust __ Water
Sampled By: FitzGerald Date Sampled: 10/30/2015

Special Instructions or Comments: No larger sample available. Perform analysis as required for state of Massachusetts. Contact me if cost will exceed $200.00.

Lab ID	Field ID	Location	Sample Description (dust area)	Homogenous Area
	GH-006	1st Floor office, above ext. door.	Friable plaster sample	
			#215112760	

APPENDIX E
Product Data

Gropius House

To improve bonding and durability of cement-based materials.

THORO®

CONSUMER PRODUCTS

ACRYL® 60
LIQUID ADMIXTURE

Acryl® 60 significantly improves adhesion, cohesion, tensile, compressive, and flexural strengths of cement-based materials. Will not re-emulsify when exposed to water. Excellent chemical and UV resistance. Improves freeze/thaw stability of Portland cement-based materials. Acryl® 60 can be used straight or be diluted with water. Coverage will vary depending on application and use.

Surface Preparation
Surface must be clean and sound. Remove all loose and disintegrated material. Remove any and all traces of oil, grease, dirt, dust, efflorescence, biological, mold or mildew, release and curing agents. Vacuum, sweep or blow out the areas to be patched with clean, oil free air.

Mixing
The normal ratio of Acryl® 60 to clean potable water is 1 part Acryl® 60 to 3 parts water (1:3). Where increased physical and chemical resistance requirements are more stringent, increase the Acryl® 60 content in the mixing liquid to a 1:2 or 1:1 Acryl® 60 to water ratio. Always mechanically mix. Do not overmix or mix at a high speed.

Application
Sand/Cement Mortar

Thoroughly mix all cement and sand first. The sand must be clean, free of clay, and dry. Make up mixing liquid from a 1:3 or 1:2 Acryl® 60 water ratio depending upon requirements. Slowly add the mixing liquid to the cement sand mixture, and mix for a short time (1-2 minutes) to avoid entrapping air. After preparing, cleaning, and predampening the surface, brush apply a bond coat (not diluted) of Acryl® 60 modified cement sand. Mix vigorously into the surface to displace any air pockets. Place the mix into the bond coated repair area while the bond coat is still wet or tacky. Maximum time for placement should not exceed 20 minutes. Higher air and surface temperatures will decrease working/placement time. Place the mix and avoid overtroweling. The trowel should be cleaned frequently, kept wet, and used with minimal pressure. When drying is rapid, due to high temperature or breeze, cover surface with wet burlap. For normal use, allow a 24-hour curing period. For heavy wheeled traffic, allow a 4-day curing period.

Limitations
- Do not use with air entrained cement.
- Do not use Acryl® 60 where air circulation is limited.
- Do not use Acryl® 60 modified mixes when the ambient air or surface temperature is below 40°F (4°C) or expected to fall below there within 48 hours.
- Make certain the most current version of the data guide is being used; call 1 (216) 839-7171 to verify.

Protect From Freezing
Prolonged freezing may damage contents. Frozen material should be placed immediately in a warm spot to thaw, but direct heat should not be applied. If Acryl® 60 can be stirred after thawing, bonding qualities have not been impaired.

BASF
The Chemical Company

Thoro Consumer Products • BASF Construction Chemicals, LLC • 23700 Chagrin Blvd. • Cleveland, Ohio 44122
phone 216-839-7171 or 866-518-7171 • fx 216-839-8833 or 866-494-8833 • ThoroProducts.com

CONSUMER PRODUCTS

ACRYL® 60

1. Product and Company Information

Company:	Thoro Consumer Products BASF Construction Chemicals, LLC 23700 Chagrin Blvd. Cleveland, Ohio 44122
Telephone:	(216) 839-7171 or (866) 518-7171
Emergency telephone:	(800) 424-9300 (703) 527-3887 (Outside continental U.S.)
Product name:	Thoro ACRYL® 60
Product Use Description :	Admixture

2. Hazardous Ingredients

Does not contain hazardous chemicals as defined by 29 CFR 1910.1200 and WHMIS.

3. Hazards Identification

HMIS® rating:	Health	Flammability	Physical Hazard
	1	0	0

WHMIS class: D2B

Effects of Overexposure

Inhalation:	Can cause slight irritation.
Skin:	Can cause slight irritation.
Eyes:	Can cause slight irritation.
Ingestion:	Can cause slight irritation.
Chronic exposure:	Can cause slight irritation.

CONSUMER PRODUCTS

ACRYL® 60

4. First Aid Measures

Eye contact:	Flush eyes with water, lifting upper and lower lids occasionally for 15 minutes. Seek medical attention.
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. If irritation persists seek medical attention. Wash contaminated clothing before reuse.
Ingestion:	Do not induce vomiting without medical advice. If conscious, drink plenty of water. If a person feels unwell or symptoms of skin irritation appear, consult a physician. If a person vomits, place him/her in the recovery position. Never give anything by mouth to an unconscious person.
Inhalation:	Remove victim from exposure. If difficulty with breathing, administer oxygen. If breathing has stopped administer artificial respiration, preferably mouth-to-mouth. Seek immediate medical attention.

5. Fire-Fighting Measures

Flash point:	Not combustible.	Autoignition temperature:	Not combustible.
Lower explosion limit:	No data available	Suitable extinguishing media:	CO_2 Foam Dry chemical Water fog
Upper explosion limit:	No data available		

Fire and explosion hazards: Containers can build up pressure if exposed to heat (fire). Cool closed containers exposed to fire with water spray.

Special fire-fighting procedures: As in any fire, wear self-contained breathing apparatus pressure-demand (MSHAINIOSH approved or equivalent) and full protective gear.

6. Accidental Release Measures

Methods for cleaning up: Wear appropriate protective equipment. Take action to eliminate source of leak; prevent from entry into open streams or sewers; contain spill by diking; vacuum up liquid or use absorbent media; remove to storage for disposal and rinse residual stain with water.

7. Handling and Storage

Handling:	Keep out of reach of children. For personal protection see section 8.
Storage:	Keep tightly closed.

CONSUMER PRODUCTS

ACRYL® 60

8. Exposure Controls / Personal Protection

Eye protection:	Wear as appropriate: safety glasses with side-shields goggles face-shield
Hand protection:	Wear as appropriate: impervious gloves
Body protection:	Wear as appropriate: impervious clothing preventive skin protection
Respiratory protection:	In case of insufficient ventilation wear suitable respiratory equipment. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygienic practices:	Avoid contact with skin, eyes and clothing. Ensure adequate ventilation, especially in confined areas. Wash hands before breaks and at the end of workday. When using, do not eat, drink or smoke. Handle in accordance with good industrial hygiene and safety practice.
Engineering Controls :	Local exhaust ventilation can be necessary to control any air contaminants to within their TLVs during the use of this product.

9. Physical and Chemical Properties

Color:	White	Physical state:	Liquid
Odor:	Slight ammoniacal	pH (at 100 %):	9.5-10
Odor threshold:	No data available	Vapor pressure:	No data available
Vapor density:	Heavier than air	Boiling point/range:	No data available
Freeze point:	Not determined	Water solubility:	Dilutable
Specific gravity:	1.04	Viscosity:	No data available
Evaporation rate:	Slower than Butyl acetate	Partition coefficient: (n-octanol water)	No data available

VOC Concentration as applied
(less water and exempt solvents): 1 g/l

10. Stability and Reactivity

Stability:	Stable under recommended storage conditions.
Conditions to avoid:	Prolonged exposure to high temperatures.
Materials to avoid:	Strong mineral acids, Lewis acids, oxidizing agents, strong bases.
Hazardous polymerization:	Will not occur under normal conditions.

CONSUMER PRODUCTS

ACRYL® 60

11. Toxicological Information

	Type	Value	Species	Exposure Time
Acute inhalation toxicity				
Product	LC50	No data available		
Acute oral toxicity				
Product	LD50 (Oral)	No data available		
Acute dermal toxicity				
Product	LD50 (Dermal)	No data available		

12. Ecological Information

Ecotoxicological Information: There is no data available for this product.

13. Disposal Considerations

Recommendations: Use excess product in an alternate beneficial application. Handle disposal of waste material in manner which complies with local, state, province and federal regulation.

14. Transportation Information

DOT:	Proper shipping name	Not regulated
IATA:	Proper shipping name	Not regulated

15. Regulatory Information

SARA 313

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and the Reauthorization Act of 1986 and 40 CFR Part 372:

This product contains no chemicals subject to the SARA 313 supplier notification requirements.

CERCLA

CERCLA section 103(a) specifically requires the person in charge of a vessel or facility to report immediately to the National Response Center (NRC) a release of hazardous substances whose amount equals or exceeds the assigned RQ.

The following hazardous substances are contained in this product:

RQ	CAS Number	Chemical Name

No CERCLA chemicals exist in this product above reportable concentrations.

TSCA Section 12(b) Export Notification

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

CAS Number	Chemical Name

There are no TSCA 12(b) Chemicals in this product.

CONSUMER PRODUCTS

ACRYL® 60

California Proposition 65

The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm. Unless otherwise specified in Section 2 of this MSDS, these chemicals are present at < 0.1%:

CAS Number	Chemical Name
50-00-0	Formaldehyde
75-21-8	Ethylene oxide

16. Other Information

Legend:

N.E. - Not established
TLV - Threshold limit value
STEL - Short term exposure limit
PEL - Permissible exposure limit
CEIL - Ceiling

Prepared by: Environment, Health and Safety department

This information is furnished without warranty, representation, or license of any kind, except that this information is accurate to the best of the manufacturer's knowledge, or is obtained from sources believed by the manufacturer to be accurate and is not intended to be all inclusive. No warranty is expressed or implied regarding the accuracy of this information or the results to be obtained from its use thereof. The manufacturer assumes no responsibility for injuries proximately caused by use of the Material if reasonable safety procedures are not followed as stipulated in this Data Sheet. Additionally, the manufacturer assumes no responsibility for injuries proximately caused by abnormal use of the Material even if reasonable safety procedures are followed. Buyer assumes the risk in its use of the Material.

End of MSDS.

GRAYMONT

GRAYMONT DOLIME (OH) INC.

HEAD OFFICE / PLANT
21880 West State Route 163
P.O. Box 158
Genoa, Ohio 43430
Tel: (419) 855-8336
(800) 537-4489
Fax: (419) 855-4602

Website: www.graymont-oh.com
E-mail: Info@graymont-oh.com

BONDCRETE®
MASON'S PRE-BLEND®
MORTASEAL®
GRAND PRIZE®
IVORY®
NIAGARA®
SNOWDRIFT®
KEMIDOL®
SUPER LIMOID®
LIMOID®
HI-MAG®

MASON'S LIME PRODUCTS
TYPICAL CHARACTERISTICS

I. BRAND NAMES	Mortaseal® Super Limoid® S	Bondcrete® Super Limoid® SA
II. HYDRATED LIME TYPE (ASTM C-207)	S	SA
III. CHEMICAL ABSTRACT SERVICE NUMBER	39445-23-3	39445-23-3
IV. CHEMICAL CHARACTERISTICS		
a. Calcium Oxide (%)	43.09	43.09
b. Magnesium Oxide(%)	28.23	28.23
c. Acid Insolubles (%)	0.71	0.74
d. Iron & Alumina Oxide (%)	0.59	0.59
e. Loss on Ignition (%)	26.6	26.6
f. Carbon Dioxide (%)	2.9	2.9
g. Hydrated Oxides (%)	94.59	94.59
V. PHYSICAL CHARACTERISTICS		
a. Particle Size Distribution		
1. Plus 30 Mesh (Cum % On)	0	0
2. Plus 200 Mesh (Cum % On)	4	2
3. Plus 325 Mesh (Cum % On)	9.75	6.25
b. Blaine Surface Area (cm^2/gm)	30,400	31,800
c. Vicat Consistency (ml/gm)	101	31,800
d. Plasticity (Emley Units)	310	360
e. Product Soundness		
1. Pops (#/Plate)	0	0
2. Pits (#/Plate)	0	0
VI. MORTAR CHARACTERISTICS		
a. ASTM Type S Mortar (1:1/2:4 1/2)		
1. Compressive Strength - 28 Days (psi)	4,984	4,973
2. Water Retention (%)	87	87
b. ASTM Type N Mortar (1:1.6)		
1. Compressive Strength - 28 Days (psi)	2,532	2,550
2. Water Retention (%)	89	89
c. ASTM Type O Mortar (1 :2:9)		
1. Compressive Strength - 28 Days (psi)	904	774
2. Water Retention (%)	90	90

***** Based on materials having an initial flow of 110 ± 5%*

GRAYMONT

SAFETY DATA SHEET

DOLOMITIC HYDRATED LIME

Section 1. Identification

GHS product identifier : DOLOMITIC HYDRATED LIME

Other means of identification : Hydrated dolomitic lime ($Ca(OH)_2MgO$), Double hydrated dolomitic lime ($CaMg(OH)_4$)

Product code : Not available.

Product type : Solid.

Identified uses

Neutralization, flocculation, stabilization, polishing, masonry mortar, plaster, stucco, fresco paints and lime wash.

Supplier/Manufacturer :
GRAYMONT
#200-10991 Shellbridge Way
Richmond, BC V6X 3C6
Canada
Phone: 1 604 207-4292
Toll free : 1 866 207-4292
Fax: 1 604 207-9014
Web Site: http://www.graymont.com/

Emergency telephone number (with hours of operation) :
CANUTEC (613-996-6666)
CHEMTREC, US (800-424-9300
INTERNATIONAL: (703-527-3887)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture :
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
CARCINOGENICITY (inhalation) - Category 1A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
H318 - Causes serious eye damage.
H315 - Causes skin irritation.
H350 - May cause cancer if inhaled.
H335 - May cause respiratory irritation.
H372 - Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

Section 2. Hazards identification

Prevention : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P281 - Use personal protective equipment as required.
P280 - Wear protective gloves. Wear eye or face protection.
P271 - Use only outdoors or in a well-ventilated area.
P260 - Do not breathe dust.
P270 - Do not eat, drink or smoke when using this product.
P264 - Wash hands thoroughly after handling.

Response : P314 - Get medical attention if you feel unwell.
P308 + P313 - IF exposed or concerned: Get medical attention.
P304 + P340 + P312 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell.
P302 + P352 + P362 + P363 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse.
P332 + P313 - If skin irritation occurs: Get medical attention.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : P401 - Store to minimize dust generation.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified (HNOC)

Physical hazards not otherwise classified (PHNOC) : None known.

Health hazards not otherwise classified (HHNOC) : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Hydrated dolomitic lime ($Ca(OH)_2MgO$), Double hydrated dolomitic lime ($CaMg(OH)_4$)

CAS number/other identifiers

CAS number : Not applicable.

Product code : Not available.

Ingredient name	%	CAS number
Calcium Magnesium Tetrahydroxide	60 - 100	39445-23-3
Calcium Magnesium Dihydroxide Oxide	60 - 100	58398-71-3
Calcium Hydroxide	30 - 60	1305-62-0
Crystalline silica, quartz	0.0001 - 1	14808-60-7

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source.

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Get medical attention immediately. Call a poison center or physician.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
burning sensation

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
burning sensation
abdominal cramps and pain
vomiting

Section 4. First aid measures

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	: No specific treatment.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	: Use an extinguishing agent suitable for the surrounding fire.
Unsuitable extinguishing media	: None known.
Specific hazards arising from the chemical	: No specific fire or explosion hazard.
Hazardous thermal decomposition products	: None.
Special protective actions for fire-fighters	: No special measures are required.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	: No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill	: Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store to minimize dust generation. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Calcium Hydroxide	**OSHA PEL (United States, 2/2013).** TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust **ACGIH TLV (United States, 4/2014).** TWA: 5 mg/m³ 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 5 mg/m³ 10 hours. **MSHA PEL** TWA 8/40 hours: 5 mg/m³
Crystalline silica, quartz	**OSHA PEL Z3 (United States, 2/2013).** TWA: 10 mg/m³ 8 hours. Form: Respirable TWA: 250 mppcf 8 hours. Form: Respirable **NIOSH REL (United States, 10/2013).** TWA: 0.05 mg/m³ 10 hours. Form: Respirable dust **ACGIH TLV (United States, 4/2014).** TWA: 0.025 mg/m³ 8 hours. Form: Respirable fraction **MSHA PEL** TWA 8/40 hours: 30 mg/m³/(%SiO2)+2 mg/m³ Form: Total dust 10 mg/m³/(%SiO2)+2 mg/m³ Form: Respirable dust

Canada

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredient	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Magnesium oxide	US ACGIH 4/2014	-	10	-	-	-	-	-	-	-	[a]
	AB 4/2009	-	10	-	-	-	-	-	-	-	[b]
	BC 7/2013	-	10	-	-	-	-	-	-	-	[c]
		-	3	-	-	10	-	-	-	-	[d]
Magnesium oxide, Mg	ON 1/2013	-	10	-	-	-	-	-	-	-	[a]
Magnesium oxide, as Mg	QC 1/2014	-	10	-	-	-	-	-	-	-	[b]
Calcium dihydroxide	US ACGIH 4/2014	-	5	-	-	-	-	-	-	-	
	AB 4/2009	-	5	-	-	-	-	-	-	-	[3]
	BC 7/2013	-	5	-	-	-	-	-	-	-	
	ON 1/2013	-	5	-	-	-	-	-	-	-	

Section 8. Exposure controls/personal protection

	QC 1/2014	-	5	-	-	-	-	-	-	-	
Crystalline silica, quartz	US ACGIH 4/2014	-	0.025	-	-	-	-	-	-	-	[e]
	AB 4/2009	-	0.025	-	-	-	-	-	-	-	[f]
	BC 7/2013	-	0.025	-	-	-	-	-	-	-	[g]
	ON 1/2013	-	0.1	-	-	-	-	-	-	-	[e]
	QC 1/2014	-	0.1	-	-	-	-	-	-	-	[h]

[3]Skin sensitization
Form: [a]Inhalable fraction [b]Fume [c]Inhalable fume [d]Respirable dust and fume. [e]Respirable fraction [f]Respirable particulate. [g]Respirable [h]Respirable dust

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Engineering controls may be required to control the primary or secondary risks associated with this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Solid. [Fine powder.]
Color	: White.
Odor	: Sweet, soil like odor.
Odor threshold	: Not available.
pH	: 12.45 [Sat. soln.] at 25°C
Melting point	: Not available.
Boiling point	: Not available.
Flash point	: Not applicable.
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not applicable.
Lower and upper explosive (flammable) limits	: Not applicable.
Vapor pressure	: Not available.
Vapor density	: Not available.
Relative density	: 2.2 to 2.6
Solubility	: Not available.
Solubility in water	: 0.1 g/100 g at 20°C
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: 345°C (653°F)
Viscosity	: Not available.
Volatility	: Not available.
VOC (w/w)	: 0 % (w/w)

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: None.
Conditions to avoid	: Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds. reactive powered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible materials	: Reactive or incompatible with the following materials: oxidizing materials and acids.
Hazardous decomposition products	: None.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium Hydroxide	LD50 Oral	Rat	7340 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Calcium Hydroxide	Eyes - Severe irritant	Rabbit	-	10 mg	-

Sensitization

There is no data available.

Carcinogenicity

Classification

Product/ingredient name	OSHA	IARC	NTP	ACGIH	EPA	NIOSH
Magnesium oxide	-	-	-	A4	-	-
Crystalline silica, quartz	-	1	Known to be a human carcinogen.	A2	-	+

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Calcium Magnesium Tetrahydroxide	Category 3	Not applicable.	Respiratory tract irritation
Calcium Magnesium Dihydroxide Oxide	Category 3	Not applicable.	Respiratory tract irritation
Calcium Hydroxide	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Crystalline silica, quartz	Category 1	Inhalation	kidneys, respiratory tract and testes

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
burning sensation

Section 11. Toxicological information

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
burning sensation
abdominal cramps and pain
vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer if inhaled. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Calcium Hydroxide	Acute LC50 33884.4 µg/L Fresh water	Fish - Clarias gariepinus - Fingerling	96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

AERG : Not applicable.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined

United States inventory (TSCA 8b): Dolomitic Hydrated Lime is subject to inventory update reporting (IUR).

RCRA classification: Dolomitic Hydrated Lime is not listed or classified.

CWA-311: Dolomitic Hydrated Lime is not listed.

CERCLA: Dolomitic Hydrated Lime is not listed.

FDA: Not applicable

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Calcium Magnesium Tetrahydroxide	60 - 100	No.	No.	No.	Yes.	No.
Calcium Magnesium Dihydroxide Oxide	60 - 100	No.	No.	No.	Yes.	No.
Calcium Hydroxide	30 - 60	No.	No.	No.	Yes.	No.
Crystalline silica, quartz	0.0001 - 1	No.	No.	No.	No.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Not listed	-	-
Supplier notification	Not listed	-	-

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

New York : None of the components are listed.

New Jersey : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

Pennsylvania : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Crystalline silica, quartz	Yes.	No.	No.	No.

Section 15. Regulatory information

Canada

Canadian lists

Canadian NPRI	: None of the components are listed.
CEPA Toxic substances	: None of the components are listed.
Canada inventory	: At least one component is not listed in DSL but all such components are listed in NDSL.

International lists

National inventory

Australia	: Not determined.
China	: All components are listed or exempted.
Europe	: All components are listed or exempted.
Japan	: Not determined.
Malaysia	: Not determined.
New Zealand	: Not determined.
Philippines	: Not determined.
Republic of Korea	: All components are listed or exempted.
Taiwan	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health : 3 * **Flammability :** 0 **Physical hazards :** 1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Health : 3 **Flammability :** 0 **Instability :** 1

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of issue mm/dd/yyyy	: 04/15/2015
Version	: 1
Prepared by	: KMK Regulatory Services Inc.

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Section 16. Other information

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

masonRE **Latex 20**

Waterless Poultice Cleaner

The masonRE Latex 20 is formulated with natural rubber and intended for the removal of heavy dirt and grime on limestone, sandstone, marble, concrete, plaster, brick, tile and terra cotta. The product is designed for interior use on structures where adequate ventilation can be provided. Exterior applications are possible with protection from direct sunlight and rain.

Features and Benefits

- **No water required**
- **Brush or spray applied**
- **Effective nicotine and soot removal**

Application Procedures

Test Area

Always prepare a test area prior to full application. This will indicate the time required for project completion and suitability of product for effective cleaning of the substrate. Additionally, specific jobsite consumption rates can be calculated after the test area is completed.

Equipment and Tools

This product is engineered for airless spray or brush application. A minimum of 1 GPM capability is adequate however a Graco UltraMax 695 or equivalent is recommended. Equip the sprayer with a minimum tip size of 0.013 inches or 0.015 inches. (Example: a 413 or 515 tip). Larger tips may be used depending on airless pump capacity. Other equipment required: brushes, masking tape, plastic (polyethylene) sheet, which can be used for protecting surfaces not to be treated with masonRE Latex 20.

Preparation

MASKING: Cover/protect areas where cleaning is not desired, including adjoining surfaces where over spray may travel. Plastic (polyethylene) sheets make a very effective barrier. Plants should be covered before and during application.

MIXING: If the product appears to have separated, thoroughly mix the masonRE Latex 20 with a drill until it becomes homogeneous once again. DO NOT SHAKE. DO NOT DILUTE.

EQUIPMENT: Ensure application equipment is free of any previously applied products or chemicals or solvents.

Application

Apply a thick, even layer of masonRE Latex 20 onto the substrate to be cleaned. An airless sprayer is the most effective means of application. Always start the sprayer pump at the lowest pressure setting and slowly build up the pressure until an adequate fan pattern has been generated. The minimum wet film thickness should be 1/8 - 3/16 inch. If too little product is applied the removal of the latex film will be more difficult. Once applied, leave the product alone. When applying masonRE Latex 20 by brush, try to build a thick uniform layer to ensure ease of removal after film formation.

Dwell Time

The time required for the masonRE Latex 20 to cure and form a dry latex film will vary depending on temperature, thickness of application, and relative humidity. Product applied on a substrate at 68° F with 40% relative humidity will be dry in approximately 24 hours. Once product has completely turned a shade of yellow and is rubbery to the touch it is ready to be removed. Do not leave the product on more than 3 days after polymerization. Do not apply to exterior surfaces if temperature is above 90° F or rain is predicted. Protect from direct sun and rain.

Removal and Cleanup

Substrate Cleanup: Once the masonRE Latex 20 has been removed wipe down the surface of the substrate with a damp sponge.

Pump Cleanup: Cleanup should be completed at the end of every day to ensure spray equipment is not damaged. Please follow the steps below.

1. Remove the intake or suction hose from the unit of latex 20.
2. Clean the latex from the outside of the intake hose using a damp cloth.
3. Place the intake hose in a 5-gallon bucket of clean water.
4. Place the pump's prime hose in a empty waste bucket.
5. Switch the pump to prime and turn on the pump.

Allow the pump to cycle on prime until the fluid coming out of the prime hose is nearly clear. The pump, intake hose and prime hose are now clean enough to clear the spray line and gun.

6. Turn off the pump.
7. Remove the spray gun from the line. Place the line in the waste bucket.
8. Turn the pump on and adjust the pressure to the lowest setting.
9. Switch the pump from prime to spray.

Allow the pump to cycle on prime until the fluid coming out of the spray hose is nearly clear. The pump, intake hose and spray hose are now clean enough to clear the gun.

10. Turn the pump off.
11. Reinstall the spray gun.
12. Turn the pump on and squeeze the trigger while pointing the gun into the waste bucket.
13. Flip the spray tip between clean and spray a few times to clean the tip.
14. Remove the entire spray nozzle and the spray tip.
15. Spray the gun without tip holder and nozzle installed.
16. Switch the pump to prime and turn off the power.

The final step is a safeguard to keep the gun clean. Remove the gun from the spray hose and place it in a container of clean water overnight. Any brushes used in application should be placed in a bucket of water overnight. Do not use paint thinners or other solvents.

Safety Requirements

Proper safety procedures should be followed at all times while handling this product. Refer to the Safety Data Sheet for important health/safety information before use.

Limitations

Surface temperatures should be 50° to 90°F (10° to 32°C). The product performs effectively at lower temperatures (even at 40°F, 5°C), but the dwell time increases.

Packaging and Coverage

Packaging: Approximately 5 gallons
The product is engineered for thick film build up on vertical and overhead surfaces. Minimum wet film thickness should be **62** mil (**1/16 inches**). Typical coverage is approximately 25 to 30 sq. ft. per gallon (smooth surface)

Technical Data

Appearance	Thick white liquid
Specific Gravity	>0.93
Boiling Point	98.1ºC
pH	10.4
VOC content	**NO**

DO NOT ALLOW PRODUCT TO FREEZE!

Notice: The information contained herein is based on our own research and the research of others, and it is provided solely as a service to help users. It is believed to be accurate to the best of our knowledge. However, no guarantee of its accuracy can be made, and it is not intended to serve as the basis for determining this product's suitability in any particular situation. For this reason, purchasers are responsible to make their own tests and assume all risks associated with using this product.

7/2015

MasonRE Latex 20
Safety Data Sheet

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name : MasonRE Latex 20

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Manufacturing

1.3. Details of the supplier of the safety data sheet

Cathedral Stone Products
7266 Park Circle Drive
Hanover, MD 21076
T 410-782-9150

1.4. Emergency telephone number

Emergency number : 800-331-1696

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2 H315
Eye Irrit. 2A H319
STOT SE 3 H335

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) :
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - If on skin: Wash with plenty of water
P304 + P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a poison center/doctor if you feel unwell
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification (GHS-US)
Rubber, natural, latex, reaction products with ammonium hydroxide	(CAS No) 129311-51-9	75	Not classified
Tetrasodium EDTA	(CAS No) 64-02-8	5	Not classified
Cellulose, 2-hydroxyethyl ether	(CAS No) 9004-62-0	0.5 - 2	Not classified

Full text of H-phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Obtain medical attention if breathing difficulty persists.

First-aid measures after skin contact : Rinse with plenty of water. Get medical attention if irritation develops or persists.

First-aid measures after eye contact : Remove contact lenses immediately. Flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

First-aid measures after ingestion : Seek immediate medical attention. The latex will coagulate (solidify) in the digestive tract.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : May cause respiratory irritation.

Symptoms/injuries after skin contact : Causes skin irritation.

Symptoms/injuries after eye contact : Causes eye irritation, redness, tearing and blurred vision.

Symptoms/injuries after ingestion : May be harmful if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use carbon dioxide, foam, dry chemical or water.

Unsuitable extinguishing media : None.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Not flammable.

Explosion hazard : None known.

5.3. Advice for firefighters

Protection during firefighting : Firefighters should wear full protective gear.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment : Stop the flow of material, if this is without risk.

Methods for cleaning up : Confine spill and soak up with absorbent. Place in an approved container and dispose in accordance with local, state and federal regulations.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid breathing vapors.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Cellulose, 2-hydroxyethyl ether (9004-62-0)	
ACGIH	Not applicable
OSHA	Not applicable

Tetrasodium EDTA (64-02-8)	
ACGIH	Not applicable
OSHA	Not applicable

Rubber, natural, latex, reaction products with ammonium hydroxide (129311-51-9)	
ACGIH	Not applicable
OSHA	Not applicable

8.2. Exposure controls

Hand protection : Wear neoprene or nitrile gloves to minimize skin contact.

Eye protection : Use goggles or face shield.

Skin and body protection : Wear suitable working clothes.

Respiratory protection : If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid
Appearance : Milky.
Color : White
Odor : Ammonia
Odor threshold : No data available
pH : 10.4
Melting point : No data available
Freezing point : No data available
Boiling point : 98.1 °C
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available
Explosion limits : No data available
Explosive properties : No data available
Oxidizing properties : No data available
Vapor pressure : 760 mm Hg (for water phase)
Specific gravity : >0.93
Relative vapor density at 20 °C : No data available
Solubility : Soluble
Log Pow : No data available
Log Kow : No data available
Auto-ignition temperature : No data available

Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information
No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity
No additional information available

10.2. Chemical stability
The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions
Will not occur.

10.4. Conditions to avoid
Contact with acids or salts will cause coagulation.

10.5. Incompatible materials
Not determined.

10.6. Hazardous decomposition products
Oxides of carbon.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Tetrasodium EDTA (64-02-8)	
LD50 oral rat	1658 mg/kg
ATE US (oral)	10000000.000 mg/kg

Skin corrosion/irritation	:	Causes skin irritation. pH: 10.4
Serious eye damage/irritation	:	Causes serious eye irritation. pH: 10.4
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

Tetrasodium EDTA (64-02-8)	
LC50 fish 1	41 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 fish 2	59.8 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on the global warming	:	No known ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	:	Dispose of contents/container in accordance with local/regional/national/international regulations.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	:	UN1760 Corrosive liquids, n.o.s., 8, III
UN-No.(DOT)	:	UN1760
DOT Proper Shipping Name	:	Corrosive liquids, n.o.s.
Department of Transportation (DOT) Hazard Classes	:	8 - Class 8 - Corrosive material 49 CFR 173.136
Hazard labels (DOT)	:	8 - Corrosive 
Packing group (DOT)	:	III - Minor Danger
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	203
DOT Packaging Bulk (49 CFR 173.xxx)	:	241
DOT Symbols	:	G - Identifies PSN requiring a technical name
DOT Special Provisions (49 CFR 172.102)	:	IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672). T7 - 4 178.274(d)(2) Normal............. 178.275(d)(3) TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling. TP28 - A portable tank having a minimum test pressure of 2.65 bar (265 kPa) may be used provided the calculated test pressure is 2.65 bar or less based on the MAWP of the hazardous material, as defined in 178.275 of this subchapter, where the test pressure is 1.5 times the MAWP.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	60 L
DOT Vessel Stowage Location	:	A - The material may be stowed ôon deckö or ôunder deckö on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	40 - Stow ôclear of living quartersö

SECTION 15: Regulatory information

15.1. US Federal regulations

Cellulose, 2-hydroxyethyl ether (9004-62-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Tetrasodium EDTA (64-02-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. US State regulations

No additional information available

SECTION 16: Other information

Full text of H-phrases::

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

CONSERVATION PLAN: EXTERIOR WOOD SIDING

GROPIUS HOUSE
LINCOLN, MA

Prepared for:
Historic New England
Lyman Estate
185 Lyman St.
Waltham, MA 02452

Prepared by:
Jablonski Building Conservation, Inc.
40 West 27th Street, Suite 1201
New York, NY 10001

October 5, 2016

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Jablonski Building Conservation, Inc. (JBC) was retained by Historic New England (HNE) to identify materials and analyze conservation issues related to the exterior wood siding at the Gropius House in Lincoln, Massachusetts, in order to determine how to treat and monitor the material over time.

Materials Identification

JBC removed samples of original siding to confirm the wood species and examine it for signs of deterioration. A total of three samples from the north and east elevations were removed, sectioned, and mounted to glass slides for microscopic examination.

Based on microscopic observation, the diagnostic features of the three samples examined are consistent with *sequoia sempervirens*, more commonly known as redwood. Little in the way of deterioration features were observed outside of a scarcity of extractives filling parenchyma cells (as would be seen in freshly cut wood). However, this condition is consistent with wood that has been exposed to weathering.

Conditions Assessment

JBC conducted a field survey and documentation of biological soiling apparent on the exterior wood siding. This survey was executed visually from the ground and the second story roof deck. Conditions were noted on elevation drawings (see Appendix B).

The exterior siding at Gropius House has significant biological growth. This growth was identified microscopically as *aspergillus*, a very ubiquitous and resilient genus of mold fungi. Records of past treatments indicate that the substrate was "pre-treated" with a mixture containing linseed oil, a medium known to support mold growth. However, in cross-sectioned samples, no mold hyphae were observed penetrating the coatings on the siding. The mold appears to be growing on nutrients in the paint and on organic wind-borne debris (such as pollen) deposited on the coated surface. The soiling is most prevalent on the east end of the north elevation and across the south and west elevations. All of these areas receive tree shade.

While unsightly, the biological growth appears to have no serious adverse effect on the wood substrate. However, the high moisture levels supporting mold growth have led to deterioration of the siding in the most exposed areas.

Cleaning Tests: Mold Removal and Control

JBC tested eight mold removal and control products on areas of wooden siding exhibiting severe biological soiling. Test patches were applied in two locations including, the east elevation of the detached garage and the west elevation of the second story roof deck. All products tested were effective in initially removing visible traces of soiling. While none of the products were completely effective in preventing recolonization of treated areas after ten months of exposure, D/2 Biological Solution and sodium hypochlorite test patches exhibited the least regrowth. JBC recommends removing biological soiling from the siding on an annual basis with D/2.

INTRODUCTION

The services of Jablonski Building Conservation, Inc. (JBC) were retained by Historic New England (HNE) to identify materials and analyze conservation issues related to the exterior wood siding at the Gropius House in Lincoln, Massachusetts, in order to determine how to treat and monitor the material over time. Conservators Mary Jablonski and Edward G. FitzGerald from JBC visited the site October 28-30, 2015, to collect samples and perform an assessment of the existing conditions and cleaning tests. Second and third site visits were conducted April 19-20 and May 31-June 1, 2016, to inspect cleaning test patches. Results and recommendations are presented below.

I. HISTORY AND DESCRIPTION

The Gropius House is clad in V-groove vertical wooden siding, believed to be an intentional reference by Gropius to traditional New England building materials. Paint research conducted in 1995 indicates that the siding has always been painted white (with the exception of gray and pink accent walls) and that the earliest finish was a traditional linseed oil-based paint pigmented with white lead. This research also identified the presence of mold spores between paint layers and a fungicide containing pentachlorophenol applied on top of the fourth generation of paint on the siding.[1] The fungicide corresponds to an invoice, dated 1960 and billed to Gropius, for the purchase of the product Retardol. Pentachlorophenol is the main ingredient in Retardol. This information suggests that Gropius himself had had to contend with biological growth on the siding over 50 years ago.

The problem with biological growth on the siding persisted after HNE took over management of the property in the 1980s. Remedial actions including stripping, treating, and re-painting the siding, and periodically cleaning the siding with fungicides, have only temporarily removed the growth. A partial chronology of activities related to the exterior siding is contained in Appendix A.

[1] Susan L. Buck, "Cross-Section Microscopy Report," (report, SPNEA Conservation Center, April 13, 1995).

II. MATERIALS IDENTIFICATION

Primary accounts indicate that the vertical wooden siding installed on the exterior facades is redwood.[2] JBC removed samples of original siding to confirm the wood species and examine it for signs of deterioration. Wood examination and speciation were conducted using standard microscopy techniques.

A. Sampling

Samples of the wooden siding were removed using a scalpel from a total of three locations on the north and east elevations. Samples were labeled as GH-W-03, 04, and 05. Sampling locations are identified in Figures 1 and 2 below.

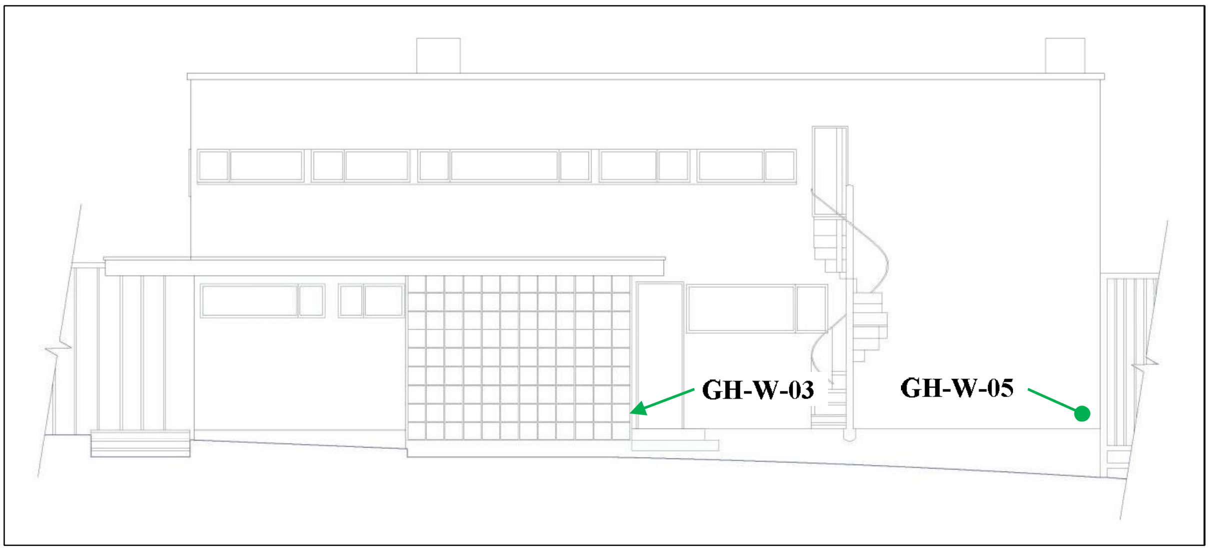


Figure 1. North elevation showing siding sampling locations.

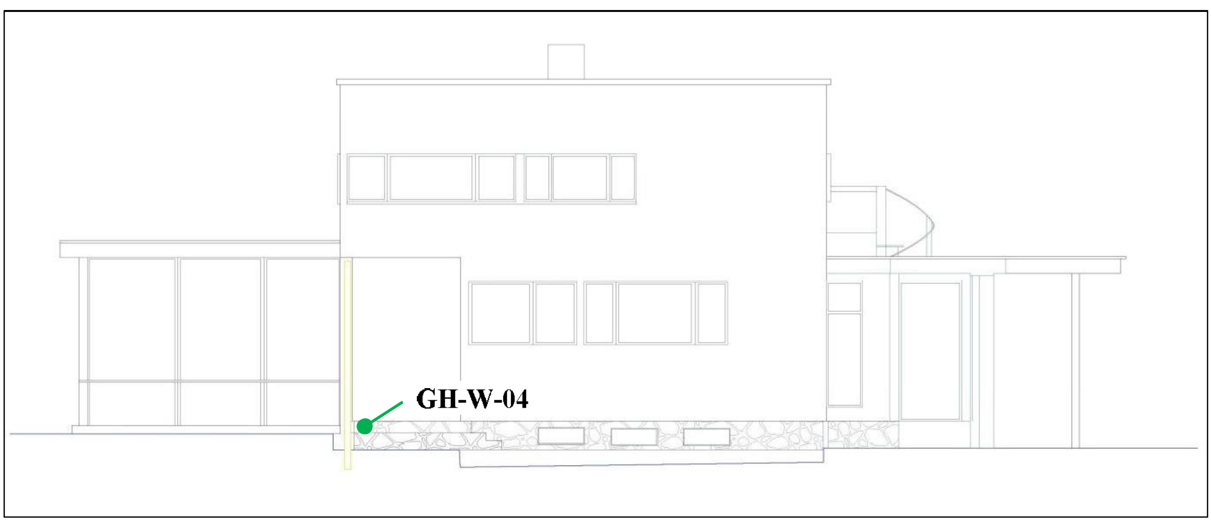


Figure 2. East elevation showing siding sampling location.

[2] Ise Gropius, History of the Gropius House (SPNEA, 1977), 7.

B. Methodology

Samples were prepared for examination by surfacing cross, radial, and tangential surfaces using a razor blade. Samples were then examined microscopically using a Motic Stereo Zoom microscope with 7.5X - 50X magnification. Thin sections were removed by hand from cross, radial, and tangential planes and stained using safranine in aqueous solution to aid in the detection of microscopic features. When necessary, samples were softened in boiling water prior to sectioning. The stained sections were mounted to glass slides using Cargille Meltmount with a refractive index of 1.662 and examined using a Zeiss Axioskop 40 polarizing light microscope.

C. Findings

Due to the weathered condition of the samples, unaided visual examination provided limited information. Under low magnification, all three samples exhibited similar characteristics. Growth rings measuring approximately 0.2-0.5mm and having an abrupt transition from early to late wood were observed in a cross-sectioned hand sample (Figure 3). Early wood tissue is composed primarily of large, easily visible tracheids, arranged in a radial fashion and fairly uniform in diameter. Based on the size of tracheids visible in cross section, the sample is classified as having a coarse texture. Uniseriate and biseriate rays are present but barely visible. Fusiform rays and resin canals are absent. These features are indicative of softwoods, particularly coarse-textured conifers.

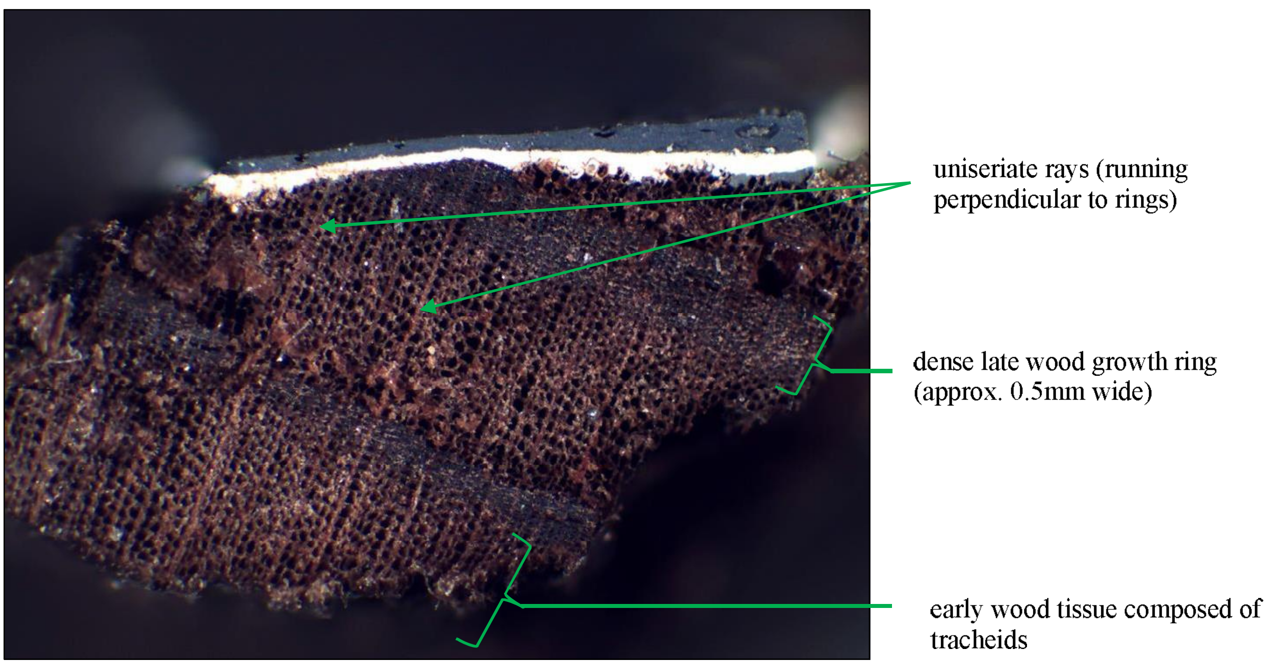


Figure 3. Cross section view of wood sample GH-W-03. (30X)

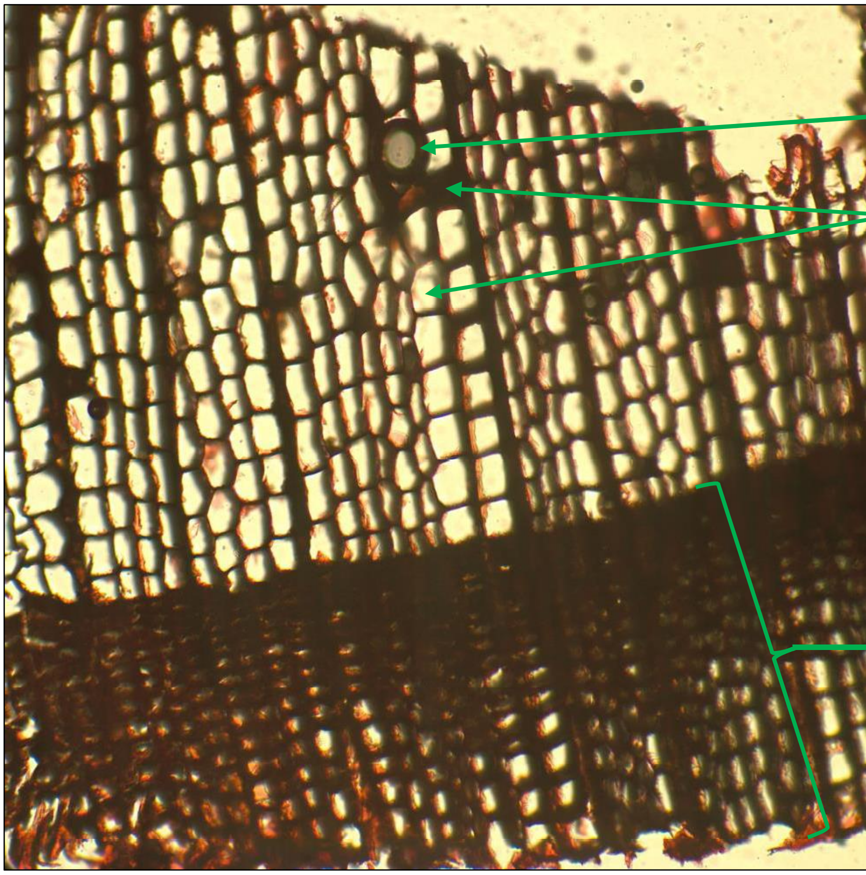


Figure 4. Stained and mounted cross section of wood sample GH-W-03. (100X)

In the stained and mounted cross section, parenchyma cells have a square shape and are occasionally filled-in by extractives (Figure 4). In tangential section, scattered rays are visible (Figure 5). Rays are both uniseriate (i.e. consisting of a single vertical tier of cells) and biseriate. Again, the tissue is lacking resin canals. End walls of longitudinal parenchyma appear smooth, lacking nodules (as seen in baldcypress and incense-cedar) (Figure 6). Spiral thickening (found in only two conifers, Douglas-fir and yew) is absent. However, limited spiral checking, which can result from severe seasoning stresses, was observed. No hyphae, indicative of wood-rotting fungus, were observed in the cell structure of the mounted sample.[3]

In radial section, the walls of longitudinal tracheids exhibit bordered pitting (typically in two rows) and ray tracheids are absent (Figure 7). Cross-field pitting (generally 1-4 pits per field) is large and exhibits prototypical taxodioid form (Figure 8**Error! Reference source not found.**).

[3]Mold spores were observed on the wood surface in sample GH-W-05, taken from the end of a siding board nearest the ground.

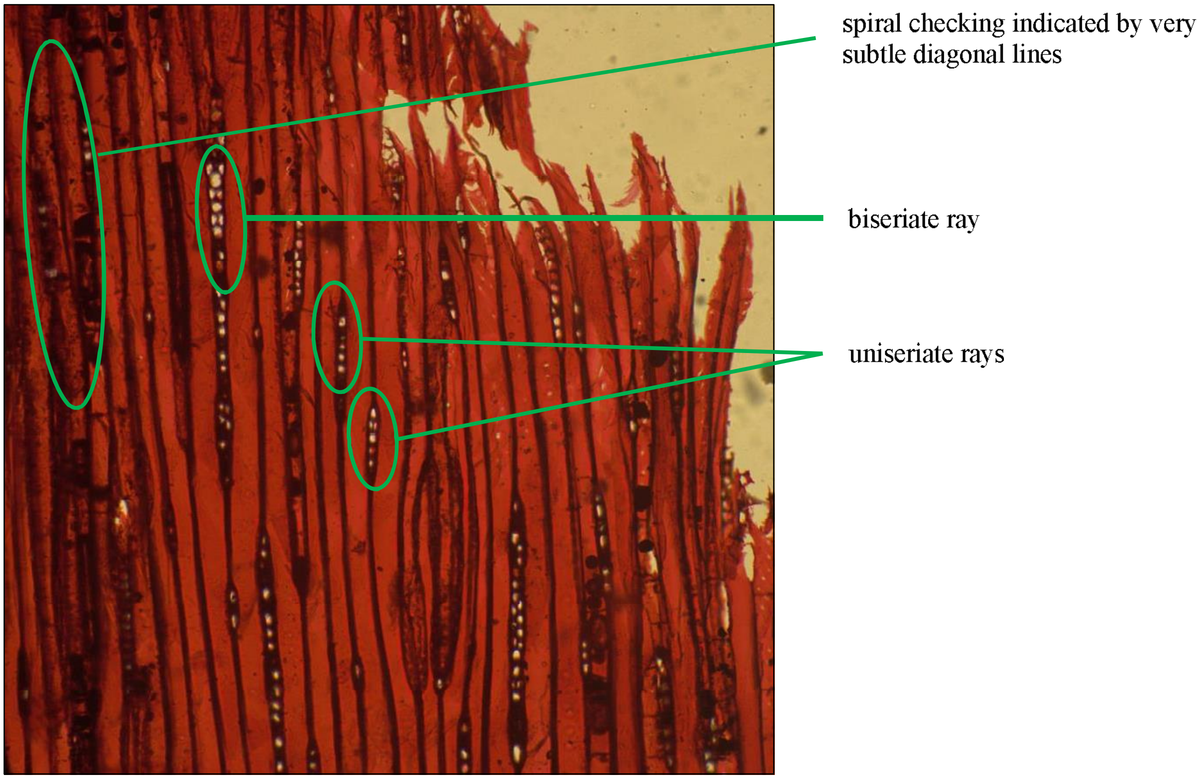


Figure 5. Stained and mounted tangential section of wood sample GH-W-03. (100X)

Figure 6. Stained and mounted tangential section of wood sample GH-W-04. (100X)

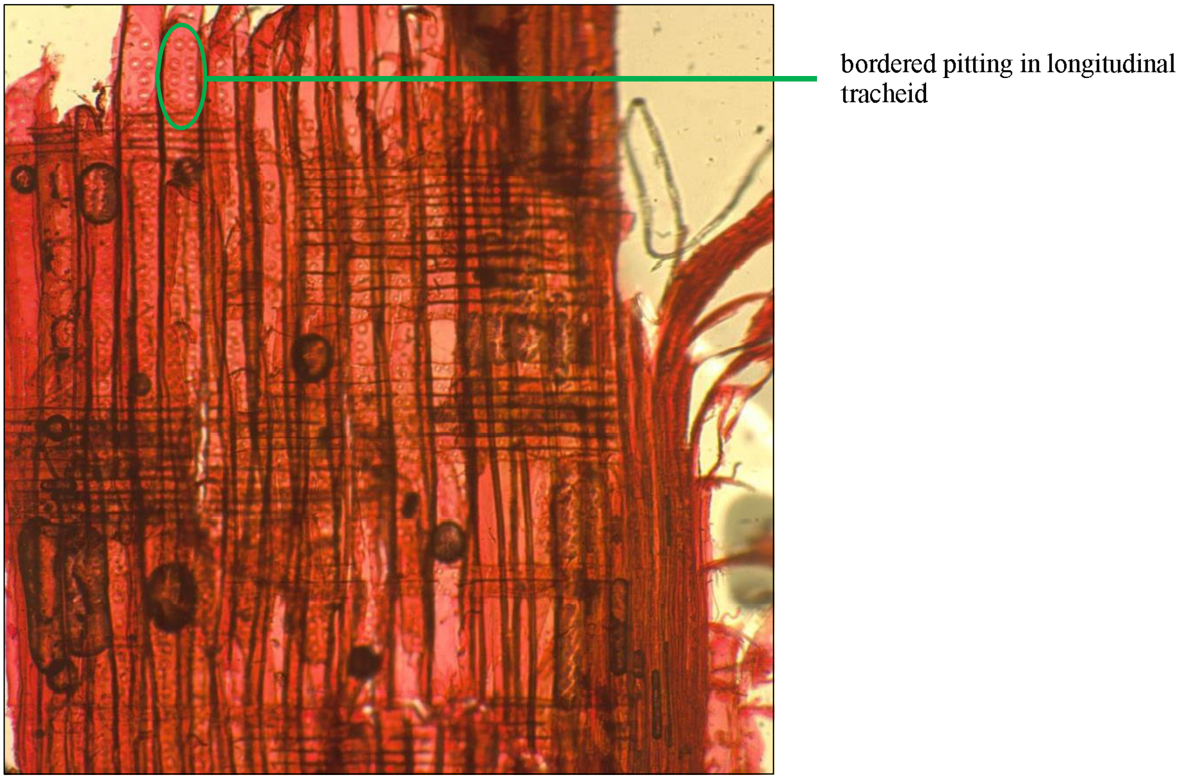


Figure 7. Stained and mounted radial section of wood sample GH-W-03. (100X)

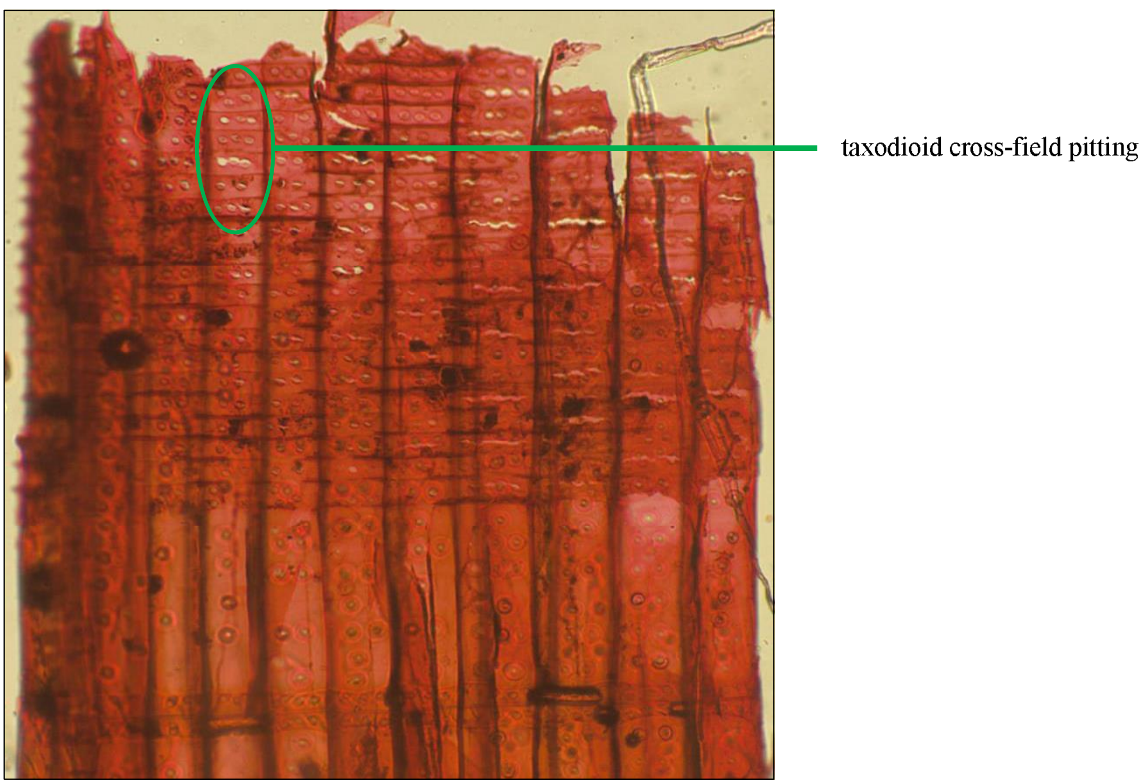


Figure 8. Stained and mounted radial section of wood sample GH-W-05. (100X)

D. Conclusions

Based on microscopic observation, the diagnostic features of the three samples examined are consistent with *sequoia sempervirens*, more commonly known as redwood. The growth rings examined in the unmounted samples clearly identify them as a softwood. The lack of resin canals and fusiform rays exclude species such as pines, Douglas-fir, spruce, and larch. The coarse texture and early to latewood transition suggest bald cypress, incense cedar, redwood, or western red cedar. The presence of biseriate rays eliminates western red cedar. Smooth end walls in longitudinal parenchyma and taxodioid cross-field pitting further distinguish the samples from similar softwood species and confirm them as belonging to redwood. Little in the way of deterioration features were observed outside of a scarcity of extractives filling parenchyma cells (as would be seen in freshly cut wood). However, this condition is consistent with wood that has been exposed to weathering.

III. CONDITIONS ASSESSMENT

A. Methodology

Prior to JBC's site visit, reports and other records of prior assessments and treatments supplied by the client were reviewed. Comprehensive documentation and field survey of the exterior wood siding was executed visually from the ground and the second story roof deck. Conditions were noted on elevation drawings (see Appendix B).

A swab sample was taken from biological growth apparent on the siding of the detached garage structure and sent to an external lab for identification and enumeration of culturable fungi (including speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys). Samples of peeling paint were also removed from the garage for direct examination of the biological growth.

B. Findings

The exterior siding at Gropius House has significant mold growth. This form of biological growth is often misnamed "mildew". However, true mildew, which is a form of mold, typically appears as a white powder and only grows on living plants. The growth appears as soiling in the form of dark spots or gray shading on painted surfaces. Mold on a painted surface is often found in damp or shaded areas, conditions that are conducive to mold growth.

In an effort to understand more about the biological growth, swabs were sent to an external lab for identification and enumeration of culturable fungi. Unfortunately, the results of the external laboratory's swab identification returned negative (i.e. no viable mold detected). This is most likely because the sample was either of a species of algae or was otherwise a fungus that was no longer viable, i.e. was not able to be cultured. Microscopic analysis of paint samples removed from the garage and examined by JBC found the surfaces dotted with mold spores with a network of clearly defined hyphae (Figure 9). The morphological characteristics of this colony appear consistent with the *aspergillus* genus of fungi, exhibiting characteristic globose head shape, hyaline, septate hyphae, and black or dark brown color, and may belong to the species *aspergillus niger* (Figure 10).[4] *A. niger* is a very ubiquitous mold species and lives in nearly all environments. It is also very resilient, being capable of surviving in freezing temperatures and in environments lacking nutrients.

In conversations with HNE staff, concerns were raised regarding the use of a linseed oil-based wood preservative treatment that was applied to the stripped siding prior to repainting. Specifically, the staff questioned whether this could be the cause of the biological growth. While linseed oil would indeed provide nutrients to support mold and other forms of biological growth, the *aspergillus* present on the siding does not appear to penetrate the coating film. A cross-section of the colonized coating sample shown in Figure 9 shows no sign of hyphae penetrating through the layers of paint and into the linseed oil-treated wood substrate (Figure 11). In this case, the mold appears to be growing on nutrients supplied by the paint and from organic wind-borne debris (such as pollen) deposited on the coated surface.

[4] Encyclopedia of Life, "Aspergillus niger," accessed 13 Sept. 2016, http://eol.org/pages/2920814/details

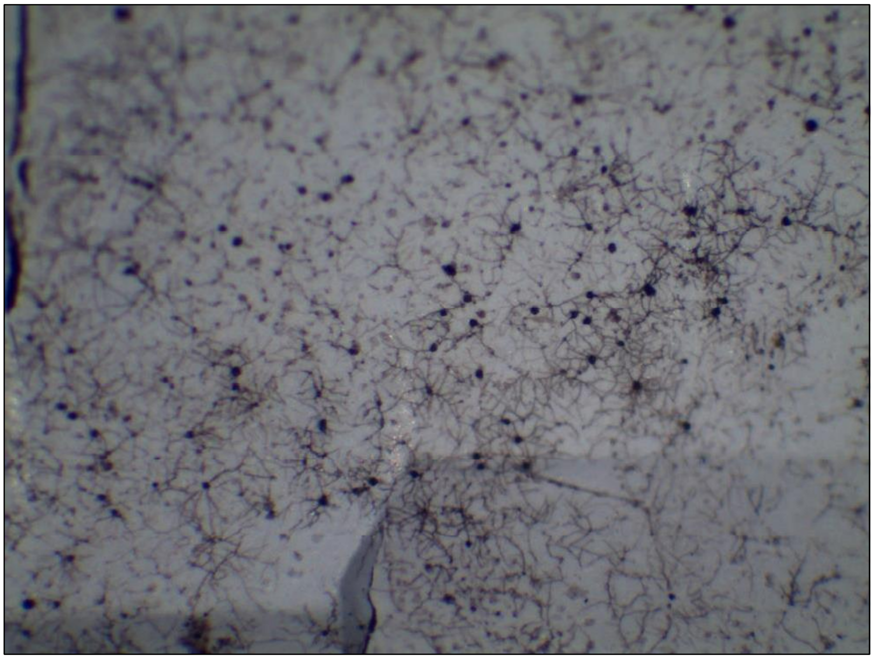


Figure 9. Coated surface of siding showing mold spores and hyphae (40X).

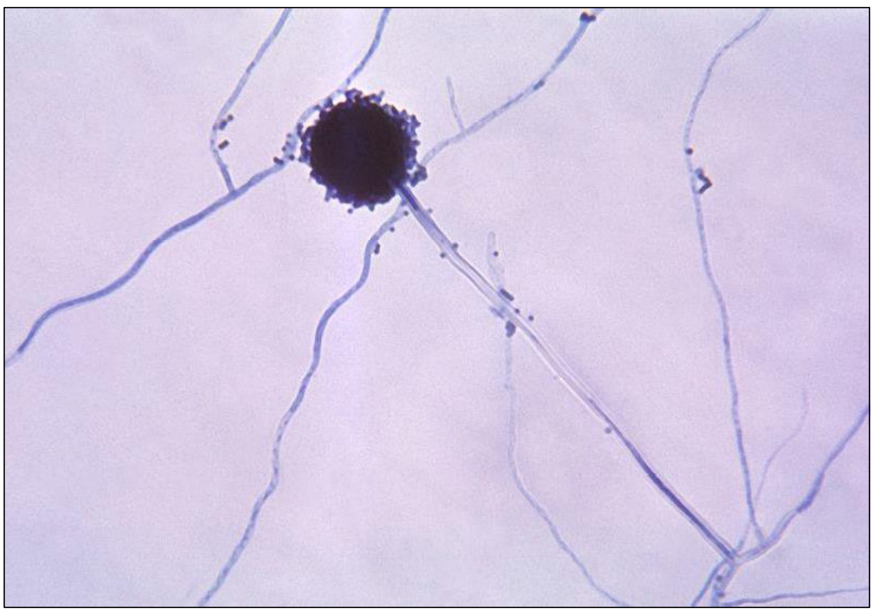


Figure 10. Photomicrograph at high magnification showing typical *aspergillus niger* morphology (Credit: Dr. L.K. Georg|CDC, http://phil.cdc.gov/phil/home.asp).

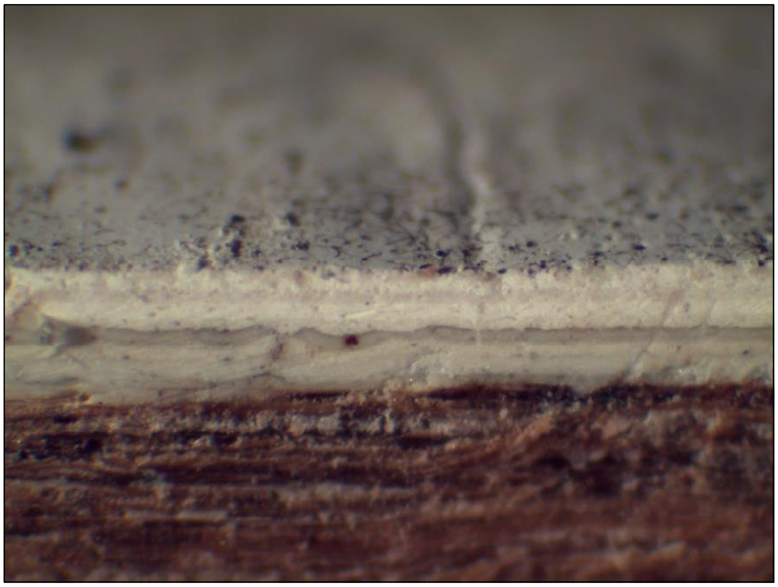


Figure 11. Cross-section through coatings and wood showing mold colony on upper surface and lack of hyphae penetrating coating layers (40X).

Results of the field survey documenting conditions affecting the siding indicates that biological soiling, while present to some degree on all elevations, is concentrated in areas protected by tree shade (see Appendix B). The soiling is most prevalent on the east end of the north elevation and across the south and west elevations. All of these areas receive tree shade.

While unsightly, the biological growth appears to have no serious adverse effect on the wood substrate. However, the high moisture levels supporting mold growth have led to deterioration of the siding in the most exposed areas. This is most evident on the fascia boards on the southwest corner of the building which exhibit signs of coating deterioration.

In several locations, the survey team noted individual siding boards that appeared bright white, apparently unafflicted by mold growth. These “anomaly boards” were likely treated differently than surrounding materials (i.e. have been replaced or refinished using different coatings). A similar phenomenon was observed in the coating applied over nail heads. Discussions with the staff revealed that nail heads were likely treated with a metal primer prior to being top coated with the siding paint. Metal primers often contain zinc oxide that, in addition to inhibiting rust, deters biological growth. It is unclear whether any fungicide is or was present in the coating applied in the most recent complete façade repainting campaign

IV. CLEANING TESTS: MOLD REMOVAL AND CONTROL

A. Methodology

Eight products, two at different concentrations, were selected for testing (see Table 1). Product data sheets are contained in Appendix C. Test patches were applied in two locations chosen by JBC, including the east elevation of the detached garage (Figure 12) and the west elevation of the second story roof deck (Figure 13), in October 2015. Mold was clearly present in both locations. The latter test included a condensed testing matrix with hydrogen peroxide and trisodium phosphate omitted. The test areas were masked, labeled, and photo-documented prior to testing. A baseline pH of the test surface and rinse water available on site was measured at pH 5, indicating a slight acidity. The products were applied as follows:

1. The test area was pre-wet with water spray to limit absorption of the cleaning product and soiling into the substrate;
2. The product was applied using a paint brush and the test area was scrubbed for one minute using a nylon bristle brush. D/2 and Wet & Forget were allowed to dwell for 10 minutes (as per manufacturer recommendation) and were reapplied as necessary to maintain a wet surface during this period.
3. The area was rinsed with water spray for approximately five minutes or until the pH of the rinse water runoff returned to normal (pH 5).

Table 1. Products Tested

Product Name	**Concentration** (in water)
Water	undiluted
D/2 Biological Solution	undiluted
Wet & Forget	undiluted
Vulpex	15%
Hydrogen Peroxide	3% (stock solution)
Hydrogen Peroxide	30%
Sodium Hypochlorite (Clorox Bleach)	5% (stock solution)
Sodium Hypochlorite (Clorox Bleach)	1.25%
Orvus	5%
Trisodium Phosphate (TSP)	1.52%

The test patches were reviewed the following spring during site visits in mid-April and late-May 2016 to determine whether any of the products were effective in preventing recolonization of the siding. However, insufficient time and exposure to optimal biological growth conditions (i.e. warm and humid environment) had elapsed for the test areas to be recolonized. A final determination of long-term effectiveness was made based on photographs of the test areas taken by HNE staff in August 2016, after ten months of exposure.

Figure 12. Cleaning test location on east elevation of the detached garage.

Figure 13. Cleaning test location on west elevation of the second story roof deck.

B. Findings

All products tested were effective in removing visible traces of soiling. Certain products left the surface slightly more alkaline than before testing, indicating the presence of residuals (see Table 2). However, the pH readings were still within an acceptable range. The other major difference between products observed during testing is that some required considerably more scrubbing and effort to be effective. At one extreme, the sodium hypochlorite solutions were effective with little or no scrubbing required while the cleaning test using just water required the most scrubbing to produce a clean surface. "Before and after" photographs of the two cleaning test areas are presented below.

Table 2. pH of Products and Test Area After Rinsing

Product Name (conc.)	**Product pH**	**pH After Rinsing**
Water	5.0	5.0
D/2 Biological Solution	9.5	6.0
Wet & Forget	8.0	4.5
Vulpex	9.0	5.0
Hydrogen Peroxide (3%)	5.0	5.0
Hydrogen Peroxide (30%)	4.0	5.0
Sodium Hypochlorite (1.25%)	12.0	6.0
Sodium Hypochlorite (5%)	>12.0	7.0
Orvus	7.0	5.0
Trisodium Phosphate	12.0	5.0

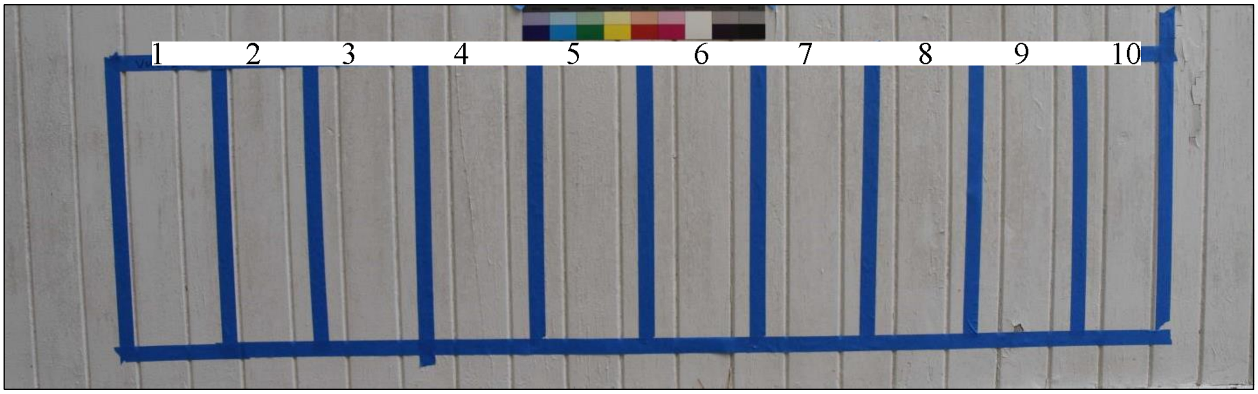


Figure 14. Cleaning test area on east elevation of garage before application. Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

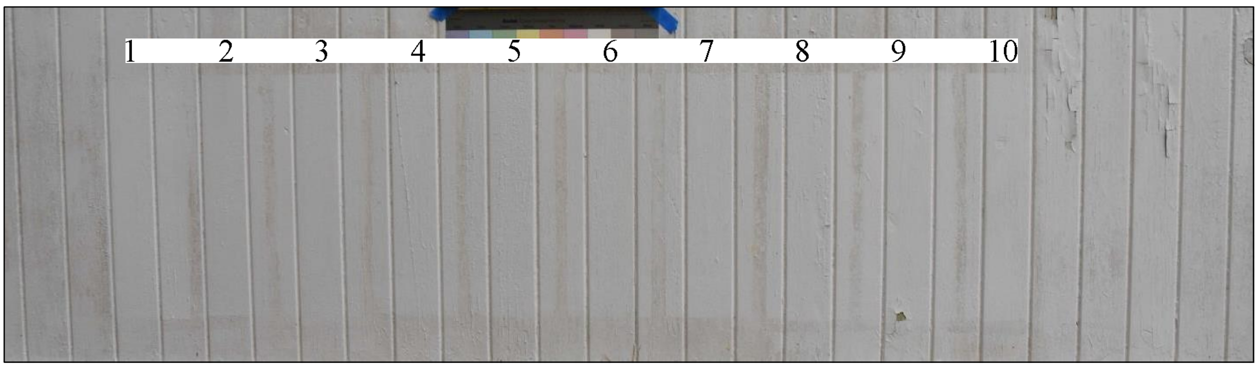


Figure 15. Cleaning test area on east elevation of garage after application. Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

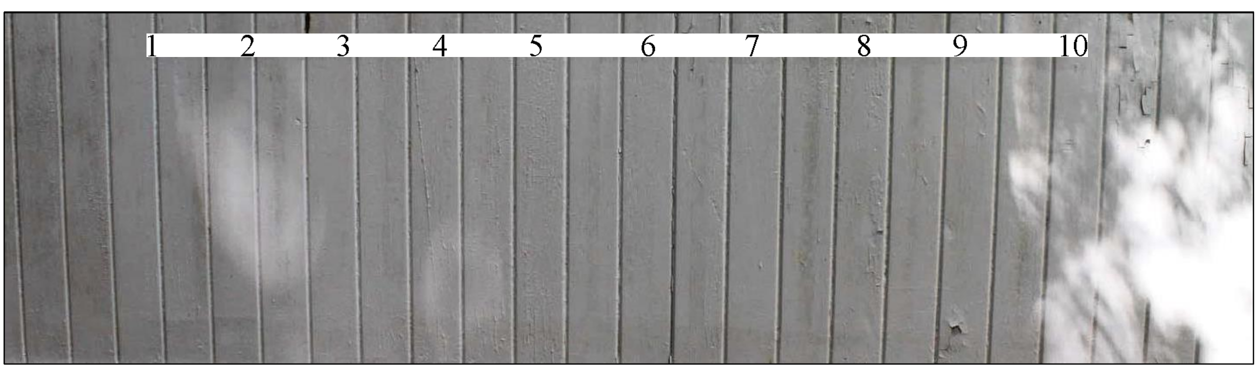


Figure 16. Cleaning test area on east elevation of garage after ten months of exposure (Credit: Colleen Chapin|HNE). Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

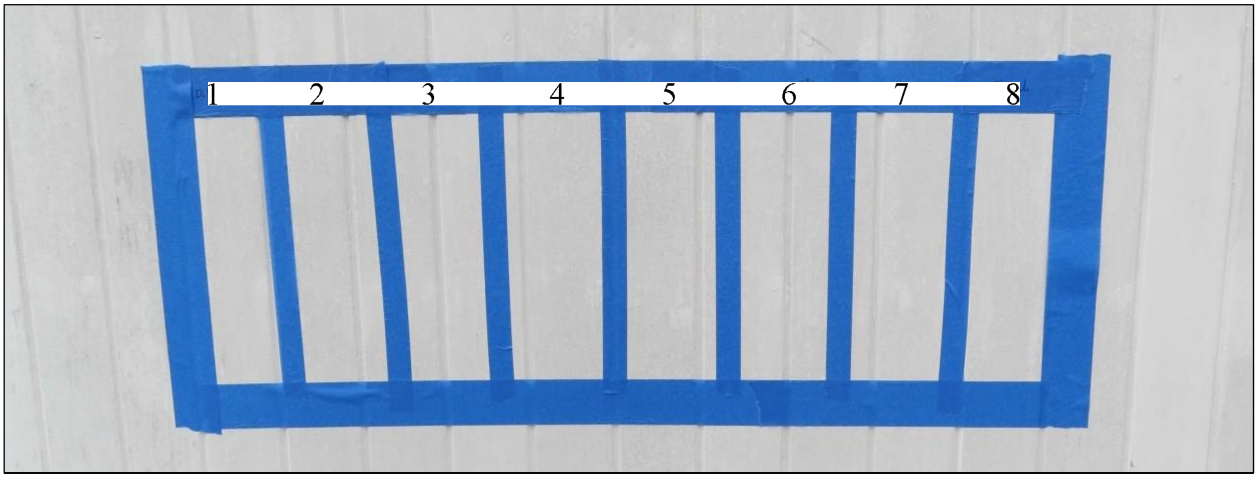


Figure 17. Cleaning test area on west elevation of roof deck before application. Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

Figure 18. Cleaning test area on west elevation of roof deck after application. Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

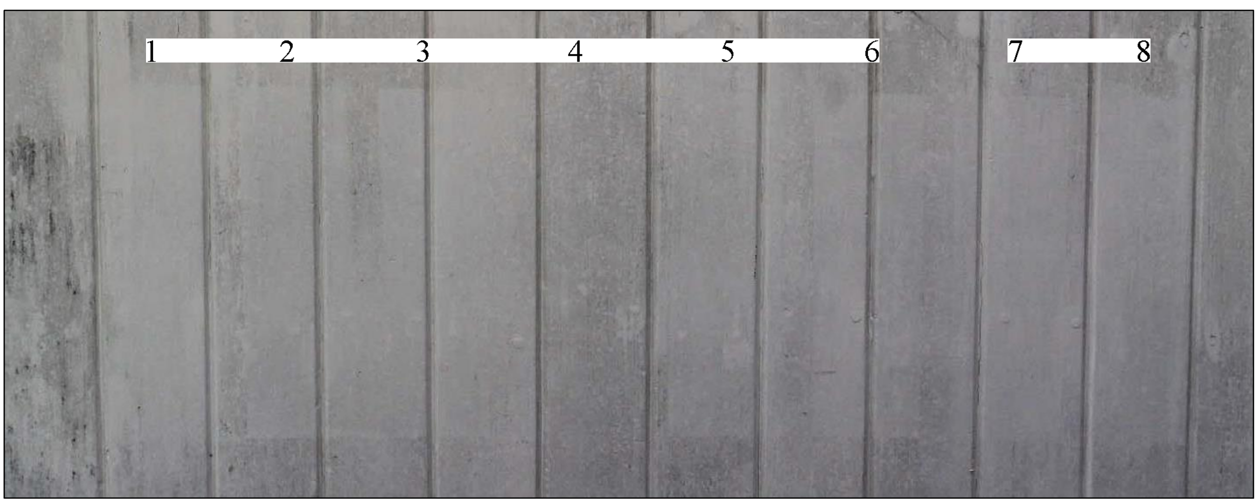


Figure 19. Cleaning test area on west elevation of roof deck after ten months of exposure (Credit: Colleen Chapin|HNE). Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

C. Conclusions

Of the eight products tested, D/2 Biological Solution and both concentrations of sodium hypochlorite were most effective in removing biological soiling and preventing its recurrence. All products, including water, were effective in initially cleaning biological soiling from the test surfaces (see Figure 15 and Figure 18). However, none could completely prevent recolonization of the siding. Areas treated with 3% hydrogen peroxide, trisodium phosphate, water, Wet & Forget, and Vulpex exhibited the least long-term preventative effect. Areas treated with 30% hydrogen peroxide and Orvus had some long-term effect. The difference between areas treated with 30% hydrogen peroxide and Orvus and the best-performing areas treated with D/2 and sodium hypochlorite is slight.

V. TREATMENT RECOMMENDATIONS

Based on the results of the cleaning tests, JBC recommends cleaning the siding with D/2 Biological Solution.[5] Diluted sodium hypochlorite (bleach) would also be effective and is easier to procure. However, this cleaner and the runoff from its use can kill vegetation and damage masonry and so, it should only be used in contained areas such as the porches on the house.

Scrubbing affected surfaces during treatment is an important step. Testing showed that even plain water can be effective in removing biological soiling if the surface is agitated with a stiff brush. JBC contends that, despite some manufacturer's claims, scrubbing is essential to allow biological cleaning agents to penetrate the cell walls of biological growth and thoroughly remove soiling from pores and crevices in the substrate that can later become attachment points or even food for recolonizing organisms.

Removal of biological growth will likely be necessary on a yearly basis. Cleaning tests showed that none of the products tested is completely effective in preventing recolonization of treated areas. As the current coating on the siding is exposed to additional weathering, the surface will likely become rougher and microscopic cracks will develop as the coating shrinks and loses elasticity. Rough and cracked coatings hold moisture longer and provide attachment points for windborne debris and biological growth, making them more susceptible to soiling than fresh coatings. Yearly cleaning and maintenance of the coating can prolong its useful life and minimize the severity of reoccurring biological growth.

Areas exhibiting cracked or peeling paint should be cleaned with D/2, rinsed, sanded (and scraped if coating has detached), and recoated. JBC recommends selecting a coating containing both a mildewstatic pigment, such as zinc oxide, and a mildewcide additive to prevent biological growth. Coatings continuing titanium dioxide should be avoided as this pigment has very little inhibiting effect on biological growth. Aftermarket mildewcide paint additives (e.g. Krud Kutter MC-2, Zinsser Add-2, etc.) should also be avoided as research has shown that these products can be difficult to evenly disperse within the liquid coating, may affect the physical performance of the coating, and typically have a short-lived effect.[6] It should also be noted that coatings that have a rougher surface texture, such as a flat or eggshell sheen, are more susceptible to biological soiling than glossier coatings such as 100% acrylic semi-gloss and high-gloss latex paints. Low grade coatings should be avoided as these often contain fillers or thickeners that may become food for biological growth.

[5] D/2 Biological Solution is available from a number of suppliers. Visit http://d2bio.com/distributors for a list of suppliers.

[6] Steve Bussjaeger, et al., "Mildew and Mildew Control for Wood Surfaces," *Journal of Coatings Technology* 71, no. 890 (March 1999): 67-69, accessed 13 Sept. 2016, t http://www.fpl.fs.fed.us/documnts/pdf1999/bussj99a.pdf

APPENDIX A
Siding Maintenance Chronology

Gropius House

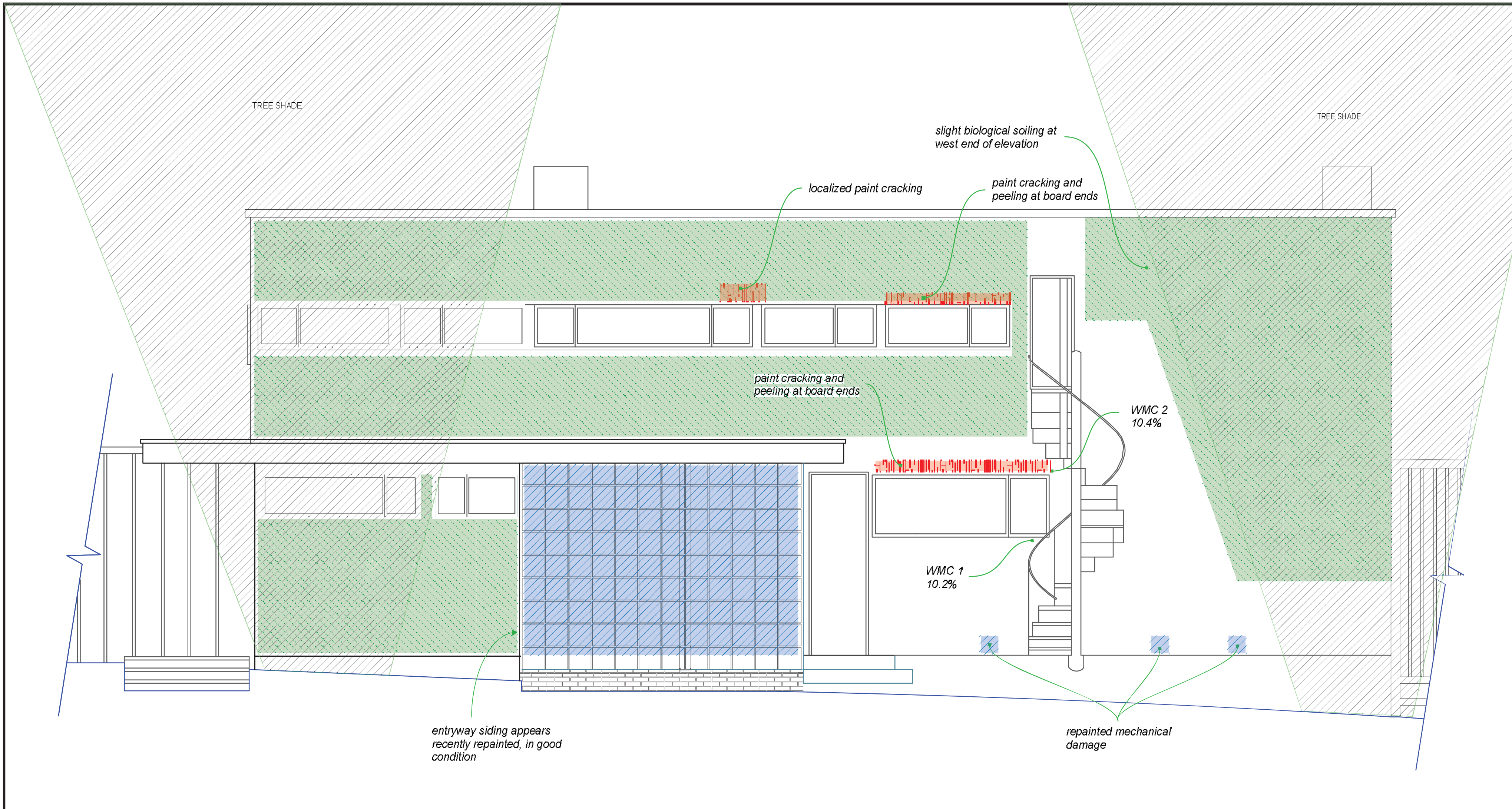
Exterior Siding Maintenance Chronology

Sept. 1938	Construction complete. Exterior likely painted using linseed-oil based paint.
[1960]	Retardol (pentachlorophenol) fungicide purchased by Gropius and likely applied to siding. (Invoice from The Paint Pot.)
1979	Gropius House donated to SPNEA.
Sept. 22, 1982	"Prep exterior, scrape, sand, wash mildew, apply 1 coat exterior oil primer, apply 1 coat exterior oil gloss - Pratt & Lambert paint. Includes siding, cornice, windows, doors, decks, railings, stairs, etc." (P.O. to Richard Dupont, Lennox, MA, $5400.)
1983	SPNEA assumes full responsibility for the property.
Feb. 27, 1986	"Preliminary paint study of the Gropius House to investigate color chronology and type, interior exterior." (P.O. to SPNEA Conservation Center, $1050.)
Feb. 27, 1986	"Prepare and paint exterior of house." (P.O. to Peter Connolly, Waltham, MA, $4200.)
June 30, 1986	"Prep and paint garage." (P.O. to Peter Connolly, $350.)
April 13, 1995	Analysis of exterior paint samples identifies early finishes, mold between paint layers and pentachlorophenol fungicide. ("Cross Section Microscopy Report.")
1996	East elevation and parts of north elevation stripped using methylene chloride-based product and repainted using two coats of alkyd primer and two finish coats of acrylic paint. ("Paint Crew Project Report.")
Sept. 2000	South and west elevation siding removed to workshop, then stripped and repainted. "All paint layers were removed by chemical materials [methylene chloride]. All surfaces were washed, and mildecide [sic.] was applied…. An application of two coats of alkyd primer was applied… followed by an application of two coats of acrylic finish coatings." May have also applied wood "consolidant" containing boiled linseed oil and mildewcide additive. ("Paint Crew Project Report: Gropius House Exterior siding, trim," 10/03/2000 and "Work Completion Report," 09/18/2000.) Paint crew notes mold on most surfaces of the north and east elevations and treats these surfaces with Greenshield-2000 (quarternary ammonium

	solution) followed by "a solution of clorox, Housewash mildecide [sic.]" (possibly sodium hypochlorite solution; unable to identify "Housewash" product, may be homemade solution with TSP and Clorox bleach).
May 2007	Exterior of house and garage cleaned using D/2 Biological Solution (quarternary ammonium solution). May not have been correctly applied. Biological growth reoccurs within a month. (Exterior Cleaning Completion Report, 01/16/2007.)

APPENDIX B
Condition Drawings

Gropius House



SIDING CONDITIONS

- BIOLOGICAL SOILING
- COATING FAILURE
- REPAIRED/REPAINTED
- TREE SHADE

SIDING SURVEY

NORTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE	SHEET
OCT. 28-30, 2015	1 OF 4

SIDING CONDITIONS

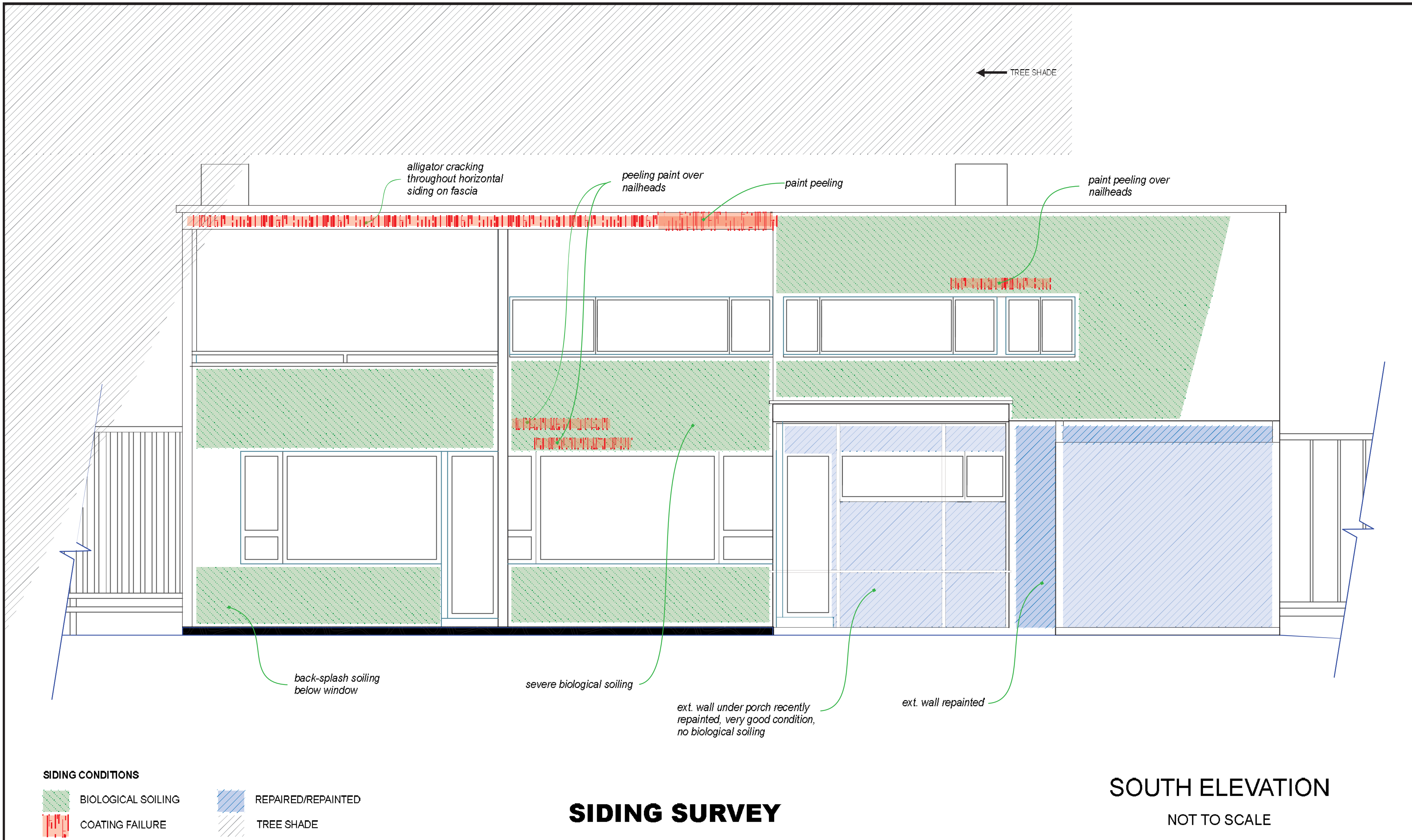
- BIOLOGICAL SOILING
- COATING FAILURE
- REPAIRED/REPAINTED
- TREE SHADE

SIDING SURVEY

EAST ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC. ARCHITECTURAL CONSERVATORS	GROPIUS HOUSE LINCOLN, MASSACHUSETTS	NOT FOR CONSTRUCTION	SURVEY DATE OCT. 28-30, 2015	SHEET 2 OF 4



SIDING SURVEY

SOUTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

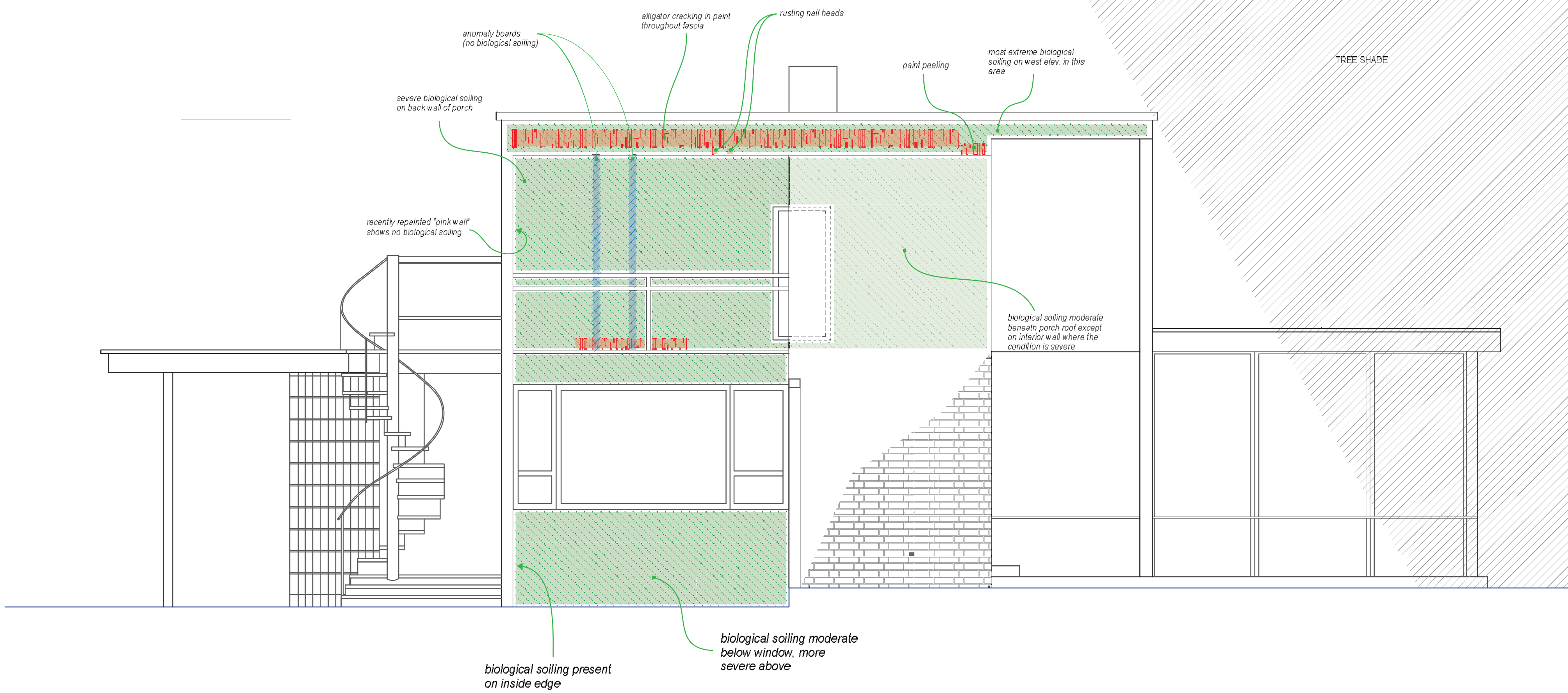
GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
3 OF 4



SIDING CONDITIONS

BIOLOGICAL SOILING

COATING FAILURE

REPAIRED/REPAINTED

SIDING SURVEY

WEST ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
4 OF 4

APPENDIX C
Product Data

Gropius House

D/2 Biological Solution

Discover the D/2 difference!

D/2 Biological Solution is a biodegradable, easy to use liquid that removes stains from mold, algae, mildew, lichens and air pollutants. It is effective on marble, granite, limestone, brownstone, travertine, masonry, terra cotta, concrete, stucco, wood, and other architectural surfaces including monuments, sculpture and headstones. A contact time of only 10 to 15 minutes followed by scrubbing with a soft nylon or natural bristle brush will loosen most biological and air pollutant staining.

D/2 Biological Solution is effective for removing harmful biological and air pollutant staining from many building materials including masonry, marble, granite, limestone, brownstone, travertine, terra cotta, concrete, stucco, wood, canvas and vinyl & aluminum siding.

Features and Benefits

- **Fast acting**: 10 to 15 minutes contact time for great results.
- **Biodegradable**
- **Contains no acids, salts, or chlorine**
- **pH neutral**
- **Will not etch metals or glass**
- **Safer to use around plantings**
- **Is not a hazardous material and requires no special handling or protection**
- **Use full strength, no in-field mixing required**
- **Shelf life of 5 years**

Application Procedures

Always do a spot test sample before proceeding with project. D/2 works best when air and surface temperatures are 45°F or above. Use D/2 undiluted for best results. In the event of excessive plant exposure, rinse all plants and water in all planted ground areas.

Immediate Result Method

1. Apply D/2 Biological Solution with a brush, roller, hand pump sprayer (garden style pump sprayer) or low pressure power sprayer.
2. Allow undiluted D/2 to remain on the surface 10-15 minutes.
3. Apply additional D/2 as necessary to maintain a wet surface.
4. Scrub with soft nylon or natural bristle brush. **DO NOT USE METAL BRUSH.**
5. Lightly mist with water and continue scrubbing.
6. Rinse thoroughly with clean, potable water.

No Scrub/No Rinse Method

1. Apply D/2 Biological Solution with a brush or pump sprayer to a dry surface. Do not pre-wet the surface.
2. Allow to dry. Repeat if there are heavy biological stains.

D/2 works with the elements and results occur within one week to one month depending on severity of growth and weather conditions. The surface will become cleaner over time as the subsurface biological stains release.

Safety Information

D/2 Biological Solution is non-mutagenic, and contains no carcinogenic compounds as defined by NTP, IARC, or OSHA. It is considered essentially non-toxic by swallowing, as it has an oral LD50 of 2.0 g/kg of body weight. No special ventilation is required during use.

Packaging and Coverage

D/2 Biological Solution is available in 1 gallon and 5 gallon containers, and 55 gallon drums. The area that can be treated with one gallon of D/2 will vary considerably as a function of the nature and extent of biological deposits, as well as the physical characteristics of the surface. Typical coverage to remove medium deposits will vary from 250 to 350 square feet per gallon.

Technical Data

Physical Form . . . . . Transparent, low viscosity liquid

Color . . . . Almost colorless

pH 9.5

Specific Gravity 1.01g/cc

Solubility in Water . . . . Complete

Vapor Pressure . . . . 25 mm Hg @ 20°C

Notice: The information contained herein is based on our own research and the research of others, and it is provided solely as a service to help users. It is believed to be accurate to the best of our knowledge. However, no guarantee of its accuracy can be made, and it is not intended to serve as the basis for determining this product's suitability in any particular situation. For this reason, purchasers are responsible to make their own tests and assume all risks associated with using this product.

10/2012

D/2 Biological Solutions, Inc. | PO Box 3746, Westport, MA 02790 | (917) 693-7441 | d2bio.com

SAFETY DATA SHEET
D/2 Biological Solution

1. Product and Company Identification

Product Code: 00400

Product Name: D/2 Biological Solution

Company Name: D/2 Biological Solution, Inc.
PO Box 3746
Westport, MA 02790

Phone Number: (917)693-7441

Web site address: d2bio.com

Emergency Contact: Chem-Tel (800)255-3924

Recommended Use: Removal of stains from mold, algae, mildew, lichen and air pollutants. Effective on marble, granite, limestone, travertine, brownstone, masonry, stucco, wood, canvas and other architectural surfaces.

Intended Use: For sale to, use and storage by service persons only.

Additional Information: Additional Product Codes: 00401, 00402

2. Hazards Identification

Skin Corrosion/Irritation, Category 3
Serious Eye Damage/Eye Irritation, Category 2B
Acute Toxicity: Oral, Category 4

GHS Signal Word: **Warning**

GHS Hazard Phrases:
Causes mild skin irritation.
Causes eye irritation.
Harmful if swallowed.

GHS Precaution Phrases:
Do not eat, drink or smoke when using this product.
Keep out of reach of children.

GHS Response Phrases:
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Rinse mouth.
If swallowed: Call a Poison Center or doctor if you feel unwell.
If on skin (or in hair): Wash with plenty of soap and water.

GHS Storage and Disposal Phrases:
Store in cool dry place at room temperature away from direct sunlight.
Dispose of contents and container according to the local, city, state and federal regulations.

Potential Health Effects (Acute and Chronic): Chronic: Effects may be delayed.

Inhalation: May be harmful if inhaled. Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Inhalation of dust may cause respiratory tract irritation. Can produce delayed pulmonary edema. Causes irritation of the mucous membrane and upper respiratory tract.

Skin Contact: May be harmful if absorbed through the skin. Causes skin irritation.

Eye Contact: Causes eye irritation. May cause chemical conjunctivitis.

Ingestion: May be harmful if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.

3. Composition/Information on Ingredients

CAS #	Chemical Name	Concentration
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	Proprietary
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	Proprietary
7396-58-9	Didecylamine, N-methyl-	Proprietary

4. First Aid Measures

Emergency and First Aid Procedures:

In Case of Inhalation: Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid.

In Case of Skin Contact: Wash off with soap and plenty of water. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

In Case of Eye Contact: Rinse thoroughly with plenty of water for at least 15 minutes. Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Consult a physician.

In Case of Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water. Consult a physician.

Signs and Symptoms Of Exposure: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Note to Physician: Show this safety data sheet to the doctor in attendance. Move out of dangerous area. Treat symptomatically and supportively.

5. Fire Fighting Measures

N/A

Flash Pt: NE

Explosive Limits: LEL: N/A UEL: N/A

Autoignition Pt: NE

Suitable Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or alcohol-resistant foam. Use agent most appropriate to extinguish fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Fire Fighting Instructions: Wear self contained breathing apparatus for fire fighting if necessary. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.

Flammable Properties and Hazards: No data available.

6. Accidental Release Measures

Steps To Be Taken In Case Material Is Spilled:

Personal precautions.
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.
Environmental precautions.
Do not let product enter drains.

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions.

7. Handling and Storage

Precautions To Be Taken in Handling:

Handle in accordance to good industrial safety practice and hygiene.
Keep container tightly closed in a dry and well-ventilated place. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from moisture.

Precautions To Be Taken in Storing:

Keep container tightly closed in a dry, well ventilated place away from incompatible substances (Oxidizing Agents and Chlorinated Compounds). Keep out of reach of children.

8. Exposure Controls/Personal Protection

Exposure Guidelines exposure limits

This product, as supplied, does not contain any hazardous materials with occupational established by the specific region regulatory bodies.

Engineering Controls

Eyewash station and shower.

General Hygiene

Handle in accordance with good industrial safety and hygiene standards. Wash hands before break and at end of the day. Do not smoke.

Eye & Face Protection

Wear safety goggles with side protection conforming to EN 166.

Skin & Body Protection

Wear protective gloves and clothing.

Respiratory Protection

If irritation is experienced or exposure limits are exceeded use a respirator that complies with appropriate government standards such as NIOSH (US) or CEN (EU).

9. Physical and Chemical Properties

Physical States:	[ ] Gas [X] Liquid [ ] Solid
Appearance and Odor:	Colorless liquid with herbal odor.
Melting Point:	NE
Boiling Point:	> 212.00 F
Freezing Point:	16 F
Decomposition Temperature:	NE
Autoignition Pt:	NE
Flash Pt:	NE
Explosive Limits:	LEL: N/A UEL: N/A
Specific Gravity (Water = 1):	1.020
Density:	8.50 LB/GA
Bulk density:	NE
Vapor Pressure (vs. Air or mm Hg):	NE
Vapor Density (vs. Air = 1):	> 1
Evaporation Rate:	NE
Solubility in Water:	100%
Saturated Vapor Concentration:	NE
Viscosity:	NP
pH:	9.0 - 10.0
Percent Volatile:	No data.
VOC / Volume:	0.0000 G/L
Particle Size:	NE
Heat Value:	NE
Corrosion Rate:	NE

10. Stability and Reactivity

Stability:	Unstable [ ] Stable [X]
Conditions To Avoid - Instability:	No data available. Incompatible materials.
Incompatibility - Materials To Avoid:	Strong oxidizing agents, Strong acids, Strong bases, Ammonia, magnesium, Sodium, calcium salts.
Hazardous Decomposition Or Byproducts:	Thermal decomposition can lead to irritating and toxic fumes and gases
Possibility of Hazardous Reactions:	Will occur [ ] Will not occur [X]
Conditions To Avoid - Hazardous Reactions:	None.

11. Toxicological Information

Toxicological Information:

Acute toxicity. No data available.
Respiratory or skin sensitization: Germ cell mutagenicity. Reproductive toxicity - no data available.
Specific target organ toxicity -single exposure (Globally Harmonized System)
Specific target organ toxicity -repeated exposure (Globally Harmonized System)
Aspiration hazard. Epidemiology: No information found.
Teratogenicity: No information available. Reproductive Effects: Mutagenicity:
Neurotoxicity:

Irritation or Corrosion:

CAS# 68439-46-3:
Acute toxicity, LD50, Oral, Rat, 1378. MG/KG.
Results:
Vascular:Measurement of regional blood flow.
Biochemical:Enzyme inhibition, induction, or change in blood or tissue levels: Dehydrogenases.
Biochemical: Metabolism (Intermediary): Lipids including transport.
- Journal of the American College of Toxicology., Mary Ann Liebert, Inc., New York, NY, Vol/p/yr: 10(4),427, 1991

CAS# 7320-34-5:
Acute toxicity, LD50, Skin, Species: Rabbit, 4640. MG/KG.
Results:
Paternal Effects: Testes, epididymis, sperm duct.
- National Technical Information Service, Vol/p/yr: OTS0571153,

No data available.

Carcinogenicity/Other Information:

Carcinogenicity.
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. CAS# 7320-34-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Carcinogenicity:

NTP? No IARC Monographs? No OSHA Regulated? No

12. Ecological Information

No data available.

Results of PBT and vPvB assessment:

CAS# 68439-46-3:
LC50, Fathead Minnow (Pimephales promelas), 11000. UG/L, 96 H, Mortality, Water temperature: 22.00 C C.
Results:
Morphological changes.
- Acute Toxicity and Structure-Activity Relationships of Nine Alcohol Ethoxylate Surfactants to Fathead Minnow and Daphnia magna, Wong, D.C.L., P.B. Dorn, and E.Y. Chai, 1997

Persistence and Degradability:

No data available.

Bioaccumulative Potential: No data available

Mobility in Soil: No data available.

13. Disposal Considerations

Waste Disposal Method: Product.
Observe all federal, state, and local environmental regulations.
Do not reuse container.

14. Transport Information

LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Not regulated as a hazardous material.
DOT Hazard Class:
UN/NA Number:

LAND TRANSPORT (Canadian TDG):

TDG Shipping Name: Not Regulated.

MARINE TRANSPORT (IMDG/IMO):

IMDG/IMO Shipping Name: Not Regulated.

AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Not Regulated.

15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Chemical Name	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	No	No	No
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	No	No	No
7396-58-9	Didecylamine, N-methyl-	No	No	No

CAS #	Chemical Name	Other US EPA or State Lists
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	CA PROP.65: No; CA TAC, Title 8: No
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	CA PROP.65: No; CA TAC, Title 8: No
7396-58-9	Didecylamine, N-methyl-	CA PROP.65: No; CA TAC, Title 8: No

U.S. Federal Regulations

SARA 302, 304, 313	Superfund Amendment and Reauthorization Act of 1986	In compiiance
CA PROP. 65	California Proposition 65	In compliance
CWA	Clean Water Act	In compliance
CERCLA	Comprehensive Environmental Response and Compensation Act	In compliance

International Regulations

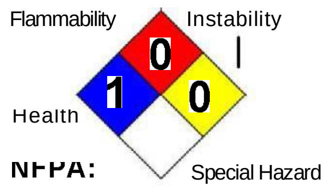
TSCA	U.S. Toxic Substance Control Act Section 8(b) Inventory	In compliance
DSL/NDSL	Canadian Domestic Substance List/Non Domestic Substance List	In compliance

16. Other Information

Hazard Rating System:

HMIS:

HEALTH	1
FLAMMABILITY	0
PHYSICAL	0
PPE	B



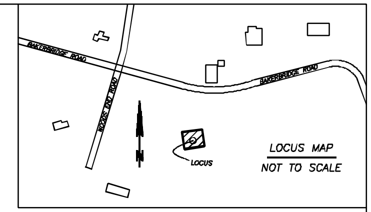
Revision Date: 05/01/2015

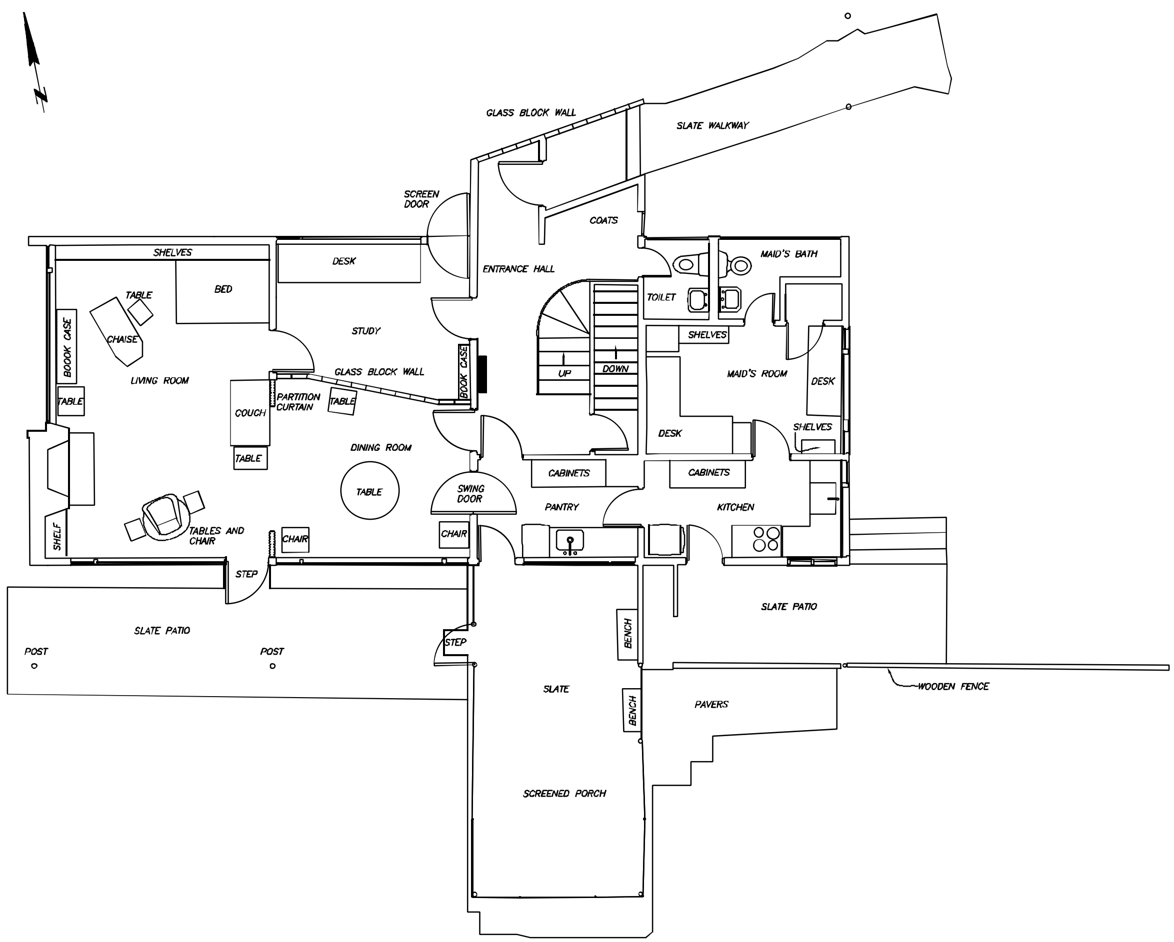
Additional Information About This Product: No data available.

Company Policy or Disclaimer: The manufacturer believes the data set forth are accurate and makes no warranty with respects thereto and disclaims all liability for reliance thereon. Such data are offered solely for consideration, investigation and verification. Also, the data set forth is for the concentrated finished product. All lab samples are for experimental purposes only and used at the customers discretion.

Additional Resources 03

Existing Conditions Plans, 2016
Feldman Land Surveyors





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

FIRST FLOOR PLAN
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

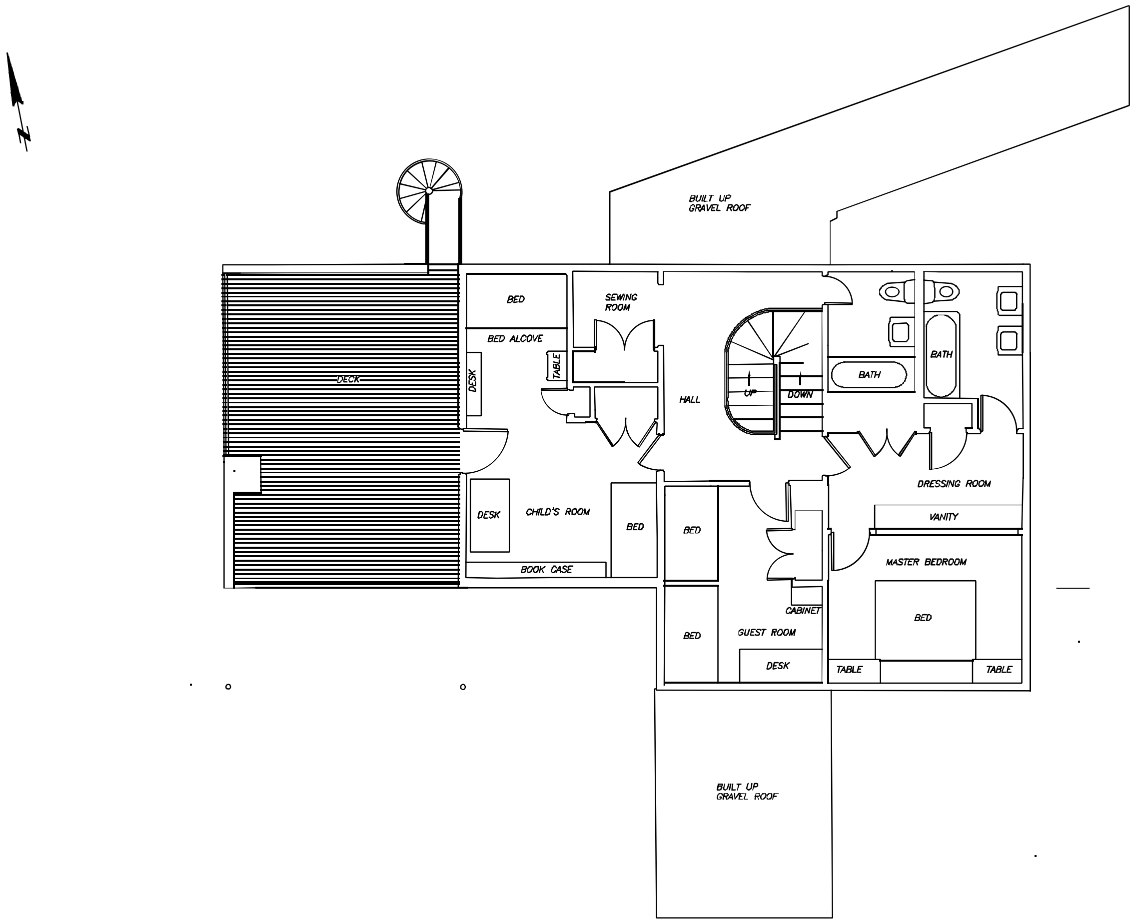
FELDMAN LAND SURVEYORS

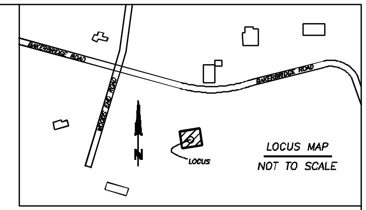
4 0 2 4 8 16

SCALE: 1"=4'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 1
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\MAH\2015 Preservation Planning\Scanning\DWG Resubmit 3-07-16\14789 — Gropius 1st Floor





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

SECOND FLOOR PLAN
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

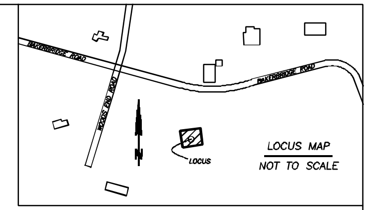
FELDMAN LAND SURVEYORS

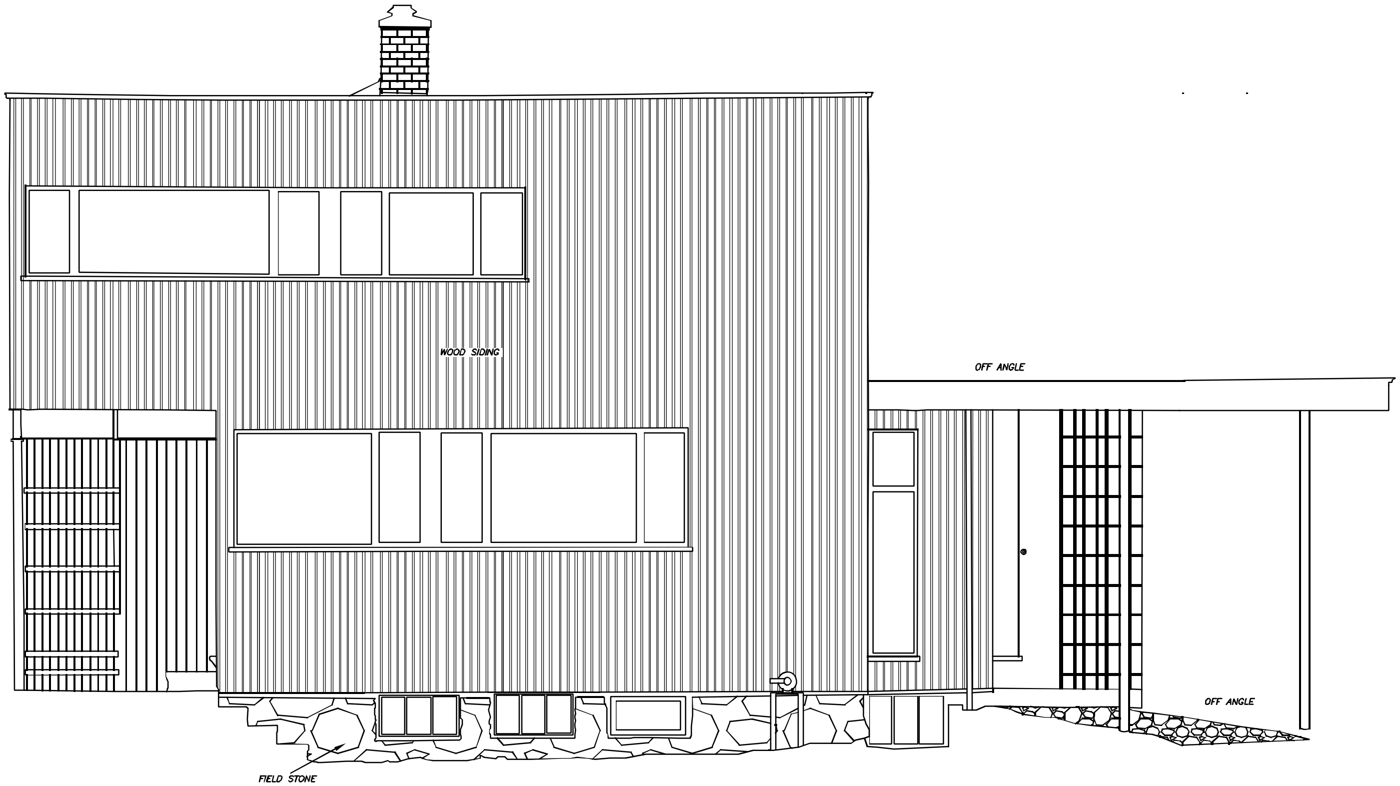
4 0 2 4 8 16

SCALE: 1"=4'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 1
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\MAI\2015 Preservation Planning\Scanning\DWG Received 3-27-15\14789 - Gropius 2nd Fl





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING EAST EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
PHONE: (617)357-9740
www.feldmansurveyors.com

AUGUST 18, 2015

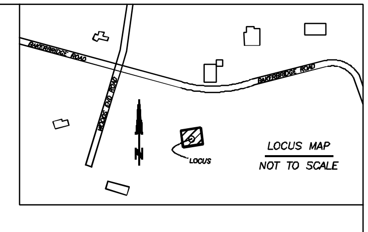
FELDMAN LAND SURVEYORS

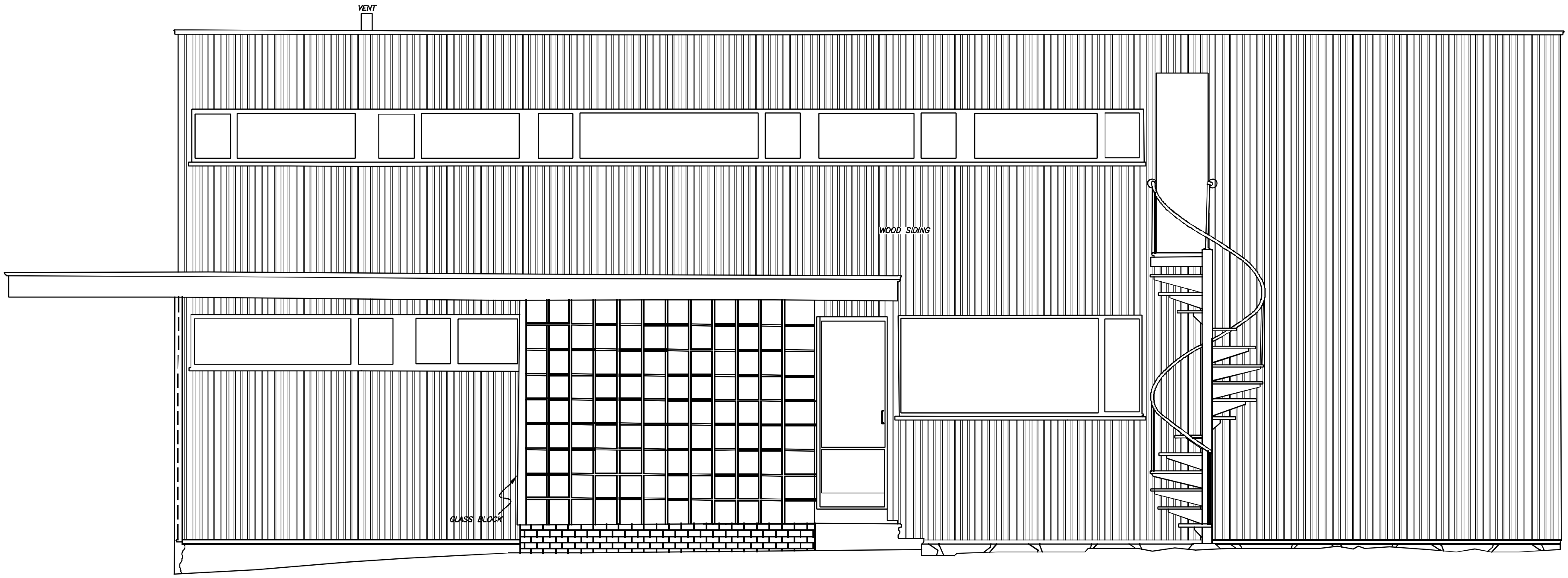
2 0 2 4 8

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 3 OF 4
CALC JTC	CADD JTC	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRC Gropius\MAV\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius East





NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING NORTH EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

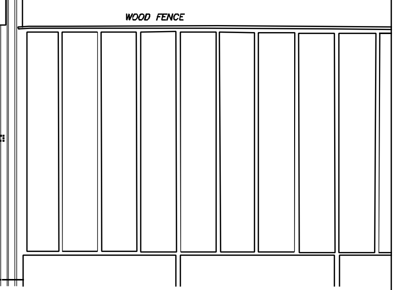
FELDMAN LAND SURVEYORS

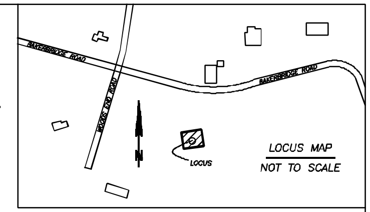
2 0 1 2 4 8

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\M&U\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius North Ext Elev-5-





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC® NEW ENGLAND

Defining the past. Shaping the future.

PLAN SHOWING SOUTH EXTERIOR ELEVATION

GROPIUS HOUSE

68 BAKER BRIDGE ROAD

LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
PHONE: (617)357-9740
www.feldmansurveyors.com

AUGUST 18, 2015

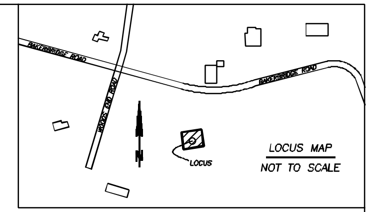
FELDMAN LAND SURVEYORS

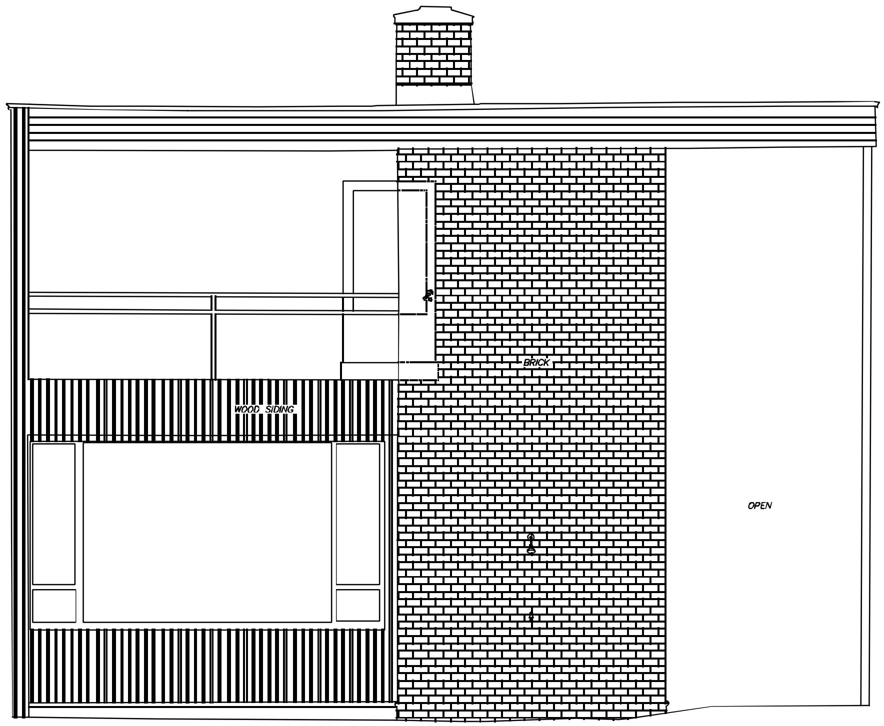
2 0 1 2 4 8

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 2 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\Wall\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius South Ext file





NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING WEST EXTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

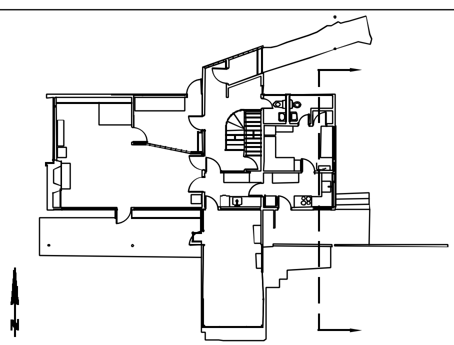
FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 4 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

NOTES:

1) ALL LINE WORK EXTRACTED FROM LASER SCAN DATA.



KEYPLAN
NOT TO SCALE

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING EAST INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

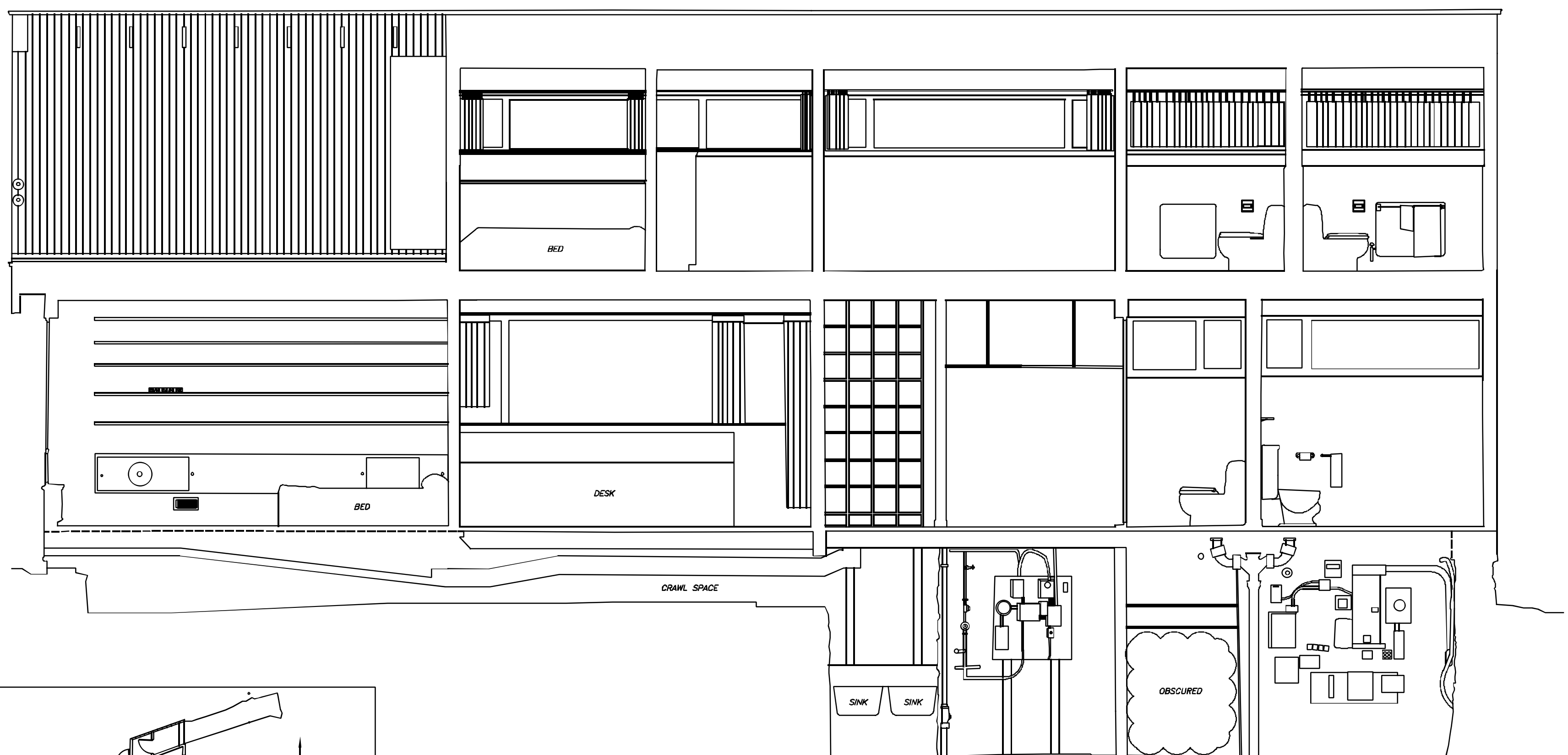
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

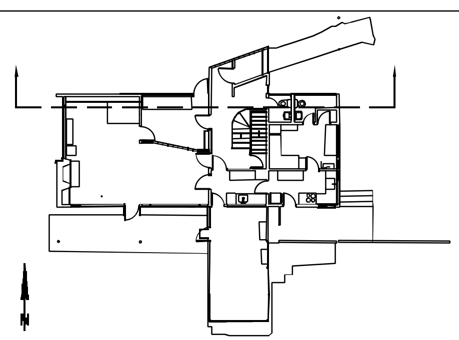
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 3 OF 4
CALC JTG	CADD	FIELD CHECKED	CRD FILE	JOB NO. 14789





KEYPLAN
NOT TO SCALE

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING NORTH INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

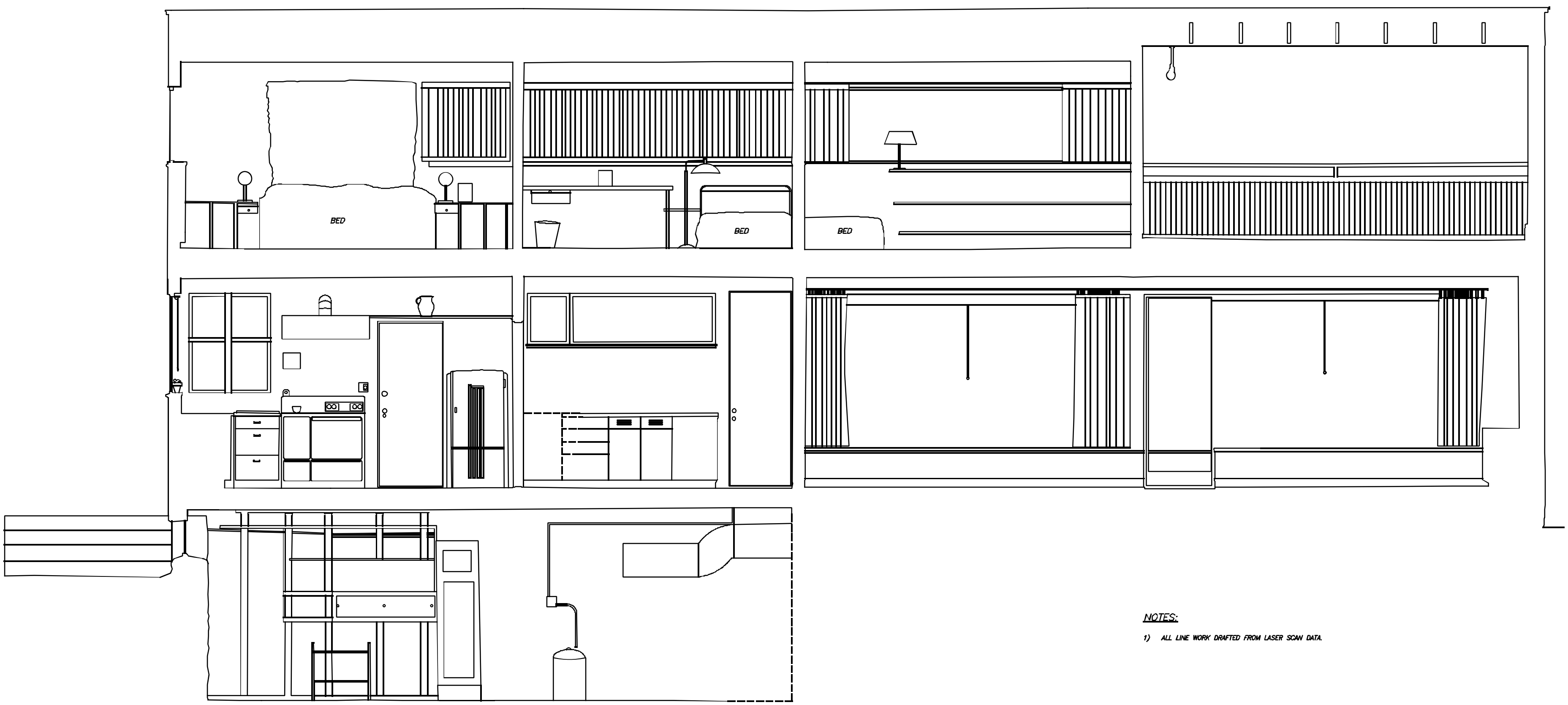
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN
LAND
SURVEYORS

SCALE: 1"=2'

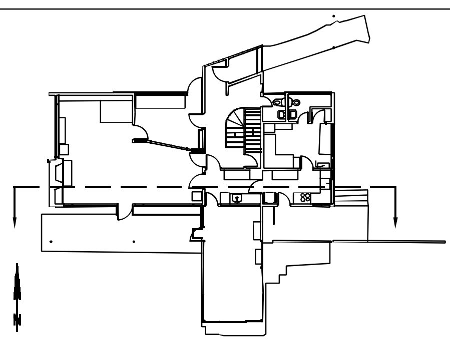
RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 1 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: F:\Properties\GRO Gropius\MAK\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius Interior Elevation



NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.



KEYPLAN
NOT TO SCALE

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING SOUTH INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

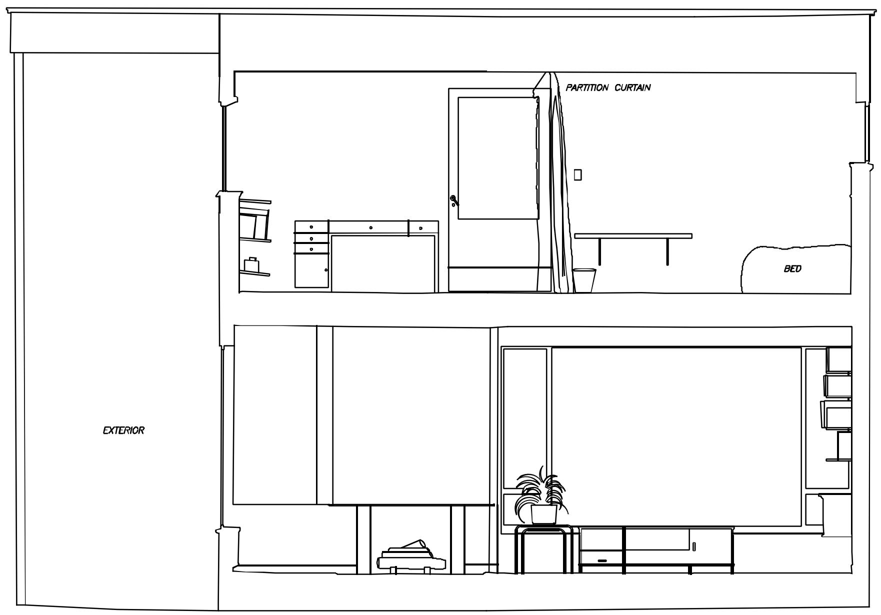
FELDMAN LAND SURVEYORS

2 0 1 2 4 8

SCALE: 1"=2'

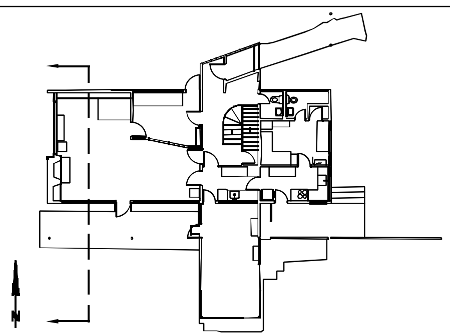
RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 2 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\MSU\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 — Gropius Interior Elevation



NOTES:

1) ALL LINE WORK DRAFTED FROM LASER SCAN DATA.



KEYPLAN
NOT TO SCALE

HISTORIC® NEW ENGLAND
Defining the past. Shaping the future.

PLAN SHOWING WEST INTERIOR ELEVATION
GROPIUS HOUSE
68 BAKER BRIDGE ROAD
LINCOLN, MASS

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

AUGUST 18, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

SCALE: 1"=2'

RESEARCH	FIELD CHIEF DF	PROJ MGR SMW	APPROVED	SHEET NO. 4 OF 4
CALC JTG	CADD JTG	FIELD CHECKED	CRD FILE	JOB NO. 14789

FILENAME: P:\Properties\GRO Gropius\M&U\2015 Preservation Planning\Scanning\DWG Resubmit 5-27-16\14789 - Gropius Interior Elevatic

Additional Resources 09

Conservation Report for Glass Block, Acoustic Plaster and Exterior Siding
Jablonski Building Conservation, 2016

CONSERVATION PLAN: ARCHITECTURAL GLASS AND ACCOUSTICAL PLASTER

GROPIUS HOUSE
LINCOLN, MA

Prepared for:
Historic New England
Lyman Estate
185 Lyman St.
Waltham, MA 02452

Prepared by:
Jablonski Building Conservation, Inc.
40 West 27th Street, Suite 1201
New York, NY 10001

October 5, 2016

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Jablonski Building Conservation, Inc. (JBC) was retained to assess the condition of and develop a treatment plan for the exterior architectural glass and to conduct cleaning tests on the acoustical plaster at the Gropius House in Lincoln, Massachusetts.

Architectural Glass: Materials Identification

Three decorative types of glass were identified at the Gropius House, including glass block and two types of flat, architectural pattern glass. A review of historical manufacturers' product literature allowed for positive identification of the glazing materials. Fluted glass used on the north elevation is "Louvrex" manufactured by the Libbey-Owens-Ford Glass Company of Toledo, Ohio. Ribbed glass used on the south elevation is most likely another Libbey-Owens-Ford product called simply, "ribbed". Glass block used on the north elevation matches the description of a product identified as "Insulux" pattern number 407, manufactured by the Owens-Illinois Glass Company of Muncie, Indiana.

Architectural Glass: Assessment & Treatment

A survey and assessment of exterior architectural glass at the Gropius House was performed to determine its current condition. This work encompassed materials present on the north, east, and south exterior elevations of the building, including pattern flat glass and glass block. Conditions were noted on elevation drawings (see Appendix A). JBC investigated the cause of deterioration occurring at the exterior glass block wall. This entailed a structural assessment (Appendix B), performed in consultation with a structural engineer, and analysis of the mortar used in the block wall assembly (Appendix C).

The survey of pattern glass ("Louvrex" and "ribbed") found breakage on all three elevations where the material is present. The majority of these breaks are typical, linear stress-related cracks most likely due to corrosion of the steel window sashes. Cracks in the glass block units are due to corrosion of the steel channel which frames the vertical ends of the wall.

There are several treatment options for deteriorated pattern glass and glass block. While repair is preferred, replacement, either with similar modern materials or salvaged historic materials, will likely be necessary.

Acoustical Plaster: Materials Analysis

The acoustical plaster present on the walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways is identified as a product called "stucoustic", manufactured by the California Stucco Products Company. The material is a two-coat lime-based plaster containing cellulose, pumice, and crushed marble. Evidence suggests that the plaster's texture was achieved through a spray-applied dash finish that was "knocked down" using a broad float or similar tool. No asbestos and no evidence of air-entraining admixtures were detected. The plaster does contain sulfates, nitrates, and possibly chloride salts. No evidence of an original surface coating was found.

Acoustical Plaster: Cleaning Tests and Treatment

JBC tested the effectiveness of nine latex-based poultice-type cleaners in removing soling and stains present on the acoustical plaster. Some of these products left the substrate slightly discolored. Tests employing gentle abrasive means were ineffective. Additional tests explored the viability of coating the plaster using limewash to mask soiling and stains. This treatment provided the best results.

INTRODUCTION

The services of Jablonski Building Conservation, Inc. (JBC) were retained by Historic New England (HNE) to assess the condition of and develop a treatment plan for the exterior architectural glass and to conduct cleaning tests on the acoustical plaster at the Gropius House in Lincoln, Massachusetts. Conservators Mary Jablonski and Edward G. FitzGerald from JBC visited the site October 28-30, 2015, to perform an assessment of the existing conditions and execute the cleaning tests. They were joined by structural engineer Elizabeth Acly with Cirrus Structural Engineering. HNE was represented by Colleen Chapin, Senior Preservation Manager. Second and third site visits were conducted April 19-20 and May 31-June 1, 2016, to perform additional testing on the plaster. Results and recommendations are presented below.

I. HISTORY AND DESCRIPTION OF MATERIALS

In the design of his home, Walter Gropius primarily made use of standard materials available through architectural trade catalogs. These materials were selected for reasons of economy, but also because Gropius wanted to demonstrate that readily available industrial products could be used to create elegant modern design solutions.[1] The use of readily available products is evidenced in the glazing and acoustical plaster materials selected for the house.

A. Pattern Glass

Two types of architectural pattern glass were used in the window openings of the Gropius House. Pattern glass is present in steel-framed windows on the north, east, and south elevations of the house. The monolithic (single-thickness) panes are set in a traditional (i.e. oil and whiting) glazing compound.

On the north elevation, fenestration is arranged in a horizontal band composed of fixed panes of textured, bevel-fluted[2] glass alternating with casement sash, allowing light into the half-bathroom located off of the front entry hall and into the maid's bathroom. The 1-inch wide fluted pattern is arranged horizontally, accentuating the linear band-like form of the windows. Fluted glass is also used in an adjacent window on the east elevation on the east wall of the coat closet ell located off of the front entry hall. This window consists of a fixed vertical sash with an upper, operable casement sash. The fluting pattern of the glass runs vertically in this application, matching the vertical orientation of the window. Narrow windows glazed with view-obscuring pattern glass were likely chosen in these locations to provide privacy while still allowing diffuse light into interior spaces.

On the south elevation, beneath the screened-in porch, ribbed glass is present in a window consisting of a large horizontal fixed sash and a smaller adjacent casement sash, allowing diffuse light into the pantry. As with the fluted glass on the north elevation, the ribbed pattern of this south window is oriented horizontally. Each rib measures 1/8-inches wide and the glass thickness measures 3/16-inches. The glass surface has been given a frosted finish texture (on the interior, ribbed side), making the glass opaque.

After Historic New England assumed responsibility for the property in the 1980s, some of the metal window sashes at the Gropius House were removed and restored, one elevation at a time, over several years.[3] While treatment reports from this work mention damage to the clear, flat glass in the living room window on the south elevation, no report

---

[1] Ise Gropius, *History of the Gropius House* (SPNEA, 1977), 7.

[2] The fluted pattern is beveled or facetted in profile rather than having the rounded concavities typically associated with the word *fluted.* The fluted side of the glass (i.e. opposite the flat side) has a mottled surface texture similar to hammered glass.

[3] For a description of window deterioration and installation detail issues, see Jeanmarie Dani, "The Walter Gropius Residence, Lincoln, Massachusetts: Construction History and Restoration Issues," (MS thesis, Columbia University: 1995), 49-50.

of damage to or treatment of any of the pattern glass has been found.[4] Discussions with site staff suggest that only the sashes containing flat glass were removed and that those containing pattern glass were left and treated in situ.[5]

B. Glass Block

Glass block is used to enclose the west end of a flat roofed marquee at the main entrance on the north elevation of the Gropius House. This glass block wall continues into the front entry ell, fenestrating the interior entry hall. The individual blocks were cast with a fluted pattern that runs parallel on both faces and, on the front entry wall, they were laid with this pattern alternating in direction (flutes running horizontal or vertical) with each course. The wall serves not only to shield the entry from weather (and prying eyes) and illuminate the interior, it contributes to the design aesthetic of the house, imparting a sense of volume without the solidity conveyed by traditional masonry and providing detail through the intrinsic elegance of materials rather than applied ornament. The same glass block is also used to form a partition wall between the study and the dining room, echoing the exterior wall and allowing light to penetrate the north-south axis of the house.

Two memos written in 1996 report deterioration in the condition of the exterior glass block wall on the north elevation. Apparently cracks in certain blocks, which had been present for some time before the memos were written, were progressively worsening. In one memo, the author surmises that water that had filled the inner cavity of a block during the summer months had frozen in the winter, causing more cracks to appear.[6] In the other memo, a diagram shows the location of the cracks affecting four separate blocks.[7]

C. Acoustical Plaster

The walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways are all covered with a textured sound-absorbing plaster made by the California Stucco Products Company.[8] The same company also supplied the stucco used on the ceilings of the back porch, entry canopy and the roof deck.[9] According to Ise Gropius, the material was spray-applied directly over a rough coat of plaster and the installation was supervised by "the chemist-owner of the

---

[4] Bruce Blanchard, "Work Completion Report," Sept. 18, 2000 (HNE Collection).
[5] FitzGerald discussion with Colleen Chapin, Senior Preservation Manager, Historic New England, April 20, 2016.
[6] Peter [*unknown*], memorandum to Linda [Willett] re. Gropius House glass block, Feb. 1, 1996 (HNE Collection).
[7] Annabel Hanson, memorandum to Linda Willett re. damage to glass block wall, July 17, 1996 (HNE Collection).
[8] Gropius, *History of the Gropius House*, 11-12.
[9] Walter Gropius, letter to California Stucco Products of New England, Inc., July 11, 1955 (HNE Collection).

producing plant."[10] In her 1997 materials evaluation for the house, Susan Buck determined that the plaster appears to have been coated with a thin layer of white paint on top of which she noted a layer of soiling.[11] Evidently, this soiling had been noted before. A list entitled "House Repairs" dated November 23, 1945, includes, "Have ceilings and wall of living room and study washed."[12]

By the 1980s, the plaster had apparently developed a "shabby" appearance due to soiling.[13] The house was originally heated by an oil-fired system and, in the living room, the Gropius family made use of the wood-burning fireplace—both of which generated soot that may have contributed to the discolored appearance of the plaster. Members of the Gropius family also smoked indoors.

After Historic New England assumed responsibility for the property, several attempts to improve the appearance of the acoustical plaster were made.[14] At the time, HNE staff were cautious that any cleaning system to be used would not bleach pigments in the plaster and would not require an excessive amount of water which might damage the porous material.[15] Records indicate that the following cleaning products or processes were tested or used including a steam cleaning process using a vacuum pick-up, a PROSOCO product called "Sure-Klean T534 Concentrated Alkaline Cleaning Compound", a product called "Acoustic-Clean" containing chlorine bleach, and a product called "Ceil Clean Ceiling Solution and Activator".[16]The extent and results of the tests and/or any full-scale cleaning treatments is unknown for all of the aforementioned except Ceil Clean.

Ceil Clean was used to treat the acoustical plaster in 1986.[17] This proprietary product included a solution containing a caustic detergent, chelating agent, solvent, and surfactant, and an "activator" consisting of an inorganic water-soluble oxidizing agent (likely ammonium persulfate).[18] The first component of this was designed to dissolve and redistribute soiling to create an even appearance while the second component, the

---

[10] Gropius, *History of the Gropius House*, 11-12.
[11] Susan L. Buck, "A Material Evaluation of the Gropius House: Planning to Preserve a Modern Masterpiece," *APT Bulletin* 28, no. 4 (1997): 29-35. Note that this is not the full report and only makes brief mention of a suspected coating on the plaster: "There appears to be only one, thin, white paint layer on the acoustic plaster in the living room and dining room; it is not possible to determine whether this is the original paint." (p. 33) JBC did not receive a copy of Buck's full report. For a complete materials analysis of the plaster, including more discussion regarding the presence of a coating, see Section IV.
[12] Document entitled "House Repairs," November 23, 1945 (HNE Collection).
[13] "Gropius House Completion Report," [1987] (HNE Collection).
[14] In addition to cleaning, HNE treatments included "replacement of defective areas of the specialty acoustical and gypsum plaster work". Document entitled "Development Project Completion Report Submitted to the Massachusetts Historical Commission June 1986," 2 (HNE Collection).
[15] Ibid.
[16] Ibid. [unsigned], memorandum to Rob re. Gropius, Sept. 15, 1987(HNE Collection). Andy Ladygo, memorandum to Peggy re. Rob's meeting with Siliono, Dec. 23, 1987 (HNE Collection).
[17] P.O. to New England Ceiling Masters, Needham, MA, May 24, 1986 (HNE Collection).
[18] "Ceil Clean Ceiling Solution and Activator," material safety data sheet [1980] (HNE Collection). Note patent number listed under "formula" on MSDS. Jeffrey J. King, "Inorganic Persulfate Cleaning Solution for Acoustic Materials," U.A. Patent 4,377,489, filed March 16, 1981, issued March 22, 1983.

activator, was intended to bleach away residual staining. Ceil Clean was designed to be spray-applied and left to dry in place, not to physically remove soiling.

The Ceil Clean treatment proved somewhat successful. However, water stains, leeching lime/cement, and the most severe soiling were not removed by this process.[19]Follow-up cleaning tests were performed using bleach solutions and abrasives with no improvement in results.

In 2002, HNE made another attempt to improve the appearance of the plaster.[20] This effort appears to have focused on orange-colored stain present on the plaster above the window in the dining room. Swab applications of alcohol and a solution of alcohol and water were ineffective. Ammonia and an ammonia and water solution proved effective in lifting some of the staining onto the swab. However, these also seemed to make the color of the stain appear more vibrant. Watercolors were dotted over the stain in order to reduce its visual appearance and further treatment tests using poultices, detergents, and a wider range of solvents were recommended.

[19] "Gropius House Completion Report."
[20] L. Murdoch, *untitled* [plaster cleaning report] July 2002 (HNE Collection).

II. ARCHITECTURAL GLASS: MATERIALS IDENTIFICATION

Historical research was conducted to identify the manufacturer(s) of historic architectural glass at the Gropius House. The scope of this research is limited to the architectural pattern glass and glass block present on the exterior. The purpose of this research is to document character-defining materials and generate information to aid in sourcing appropriate replacement materials.

A. Methodology

To aid in materials identification, descriptive attributes of the pattern flat glass and glass block were recorded during a field survey. Information provided by HNE related to the history of the house was also reviewed. Identification of glass materials was carried out through research of historical manufacturers' product literature dating to the period of design and construction.

B. Materials Identification

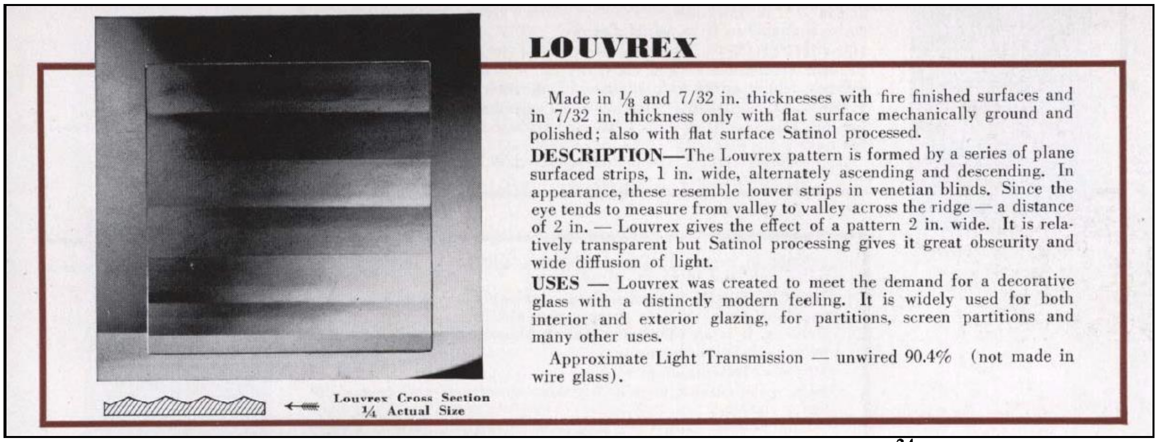
Three decorative types of glass were identified at the Gropius House, including glass block and two types of flat, patterned architectural glass. A review of historical manufacturers' product literature allowed for positive identification of the glazing materials.

1. Pattern Glass

Bevel-fluted glass used on the north elevation matches the description of a product identified as "Louvrex," manufactured by the Libbey-Owens-Ford Glass Company of Toledo, Ohio (Figure 1).[21] The product first appeared in the company's 1938 catalog where it was described as "a new figured glass especially developed for use in modern architecture."[22] In addition to the pattern, the mottled surface texture of the glass matches the description of a finishing process known as "Satinol" that was a standard option available on Louvrex and other pattern glass models manufactured by a Libbey-Owens-Ford subsidiary, the Blue Ridge Glass Corporation, located in Kingsport, Tennessee. While early construction specifications suggest that Gropius intended to use other glazing products in the sashes where Louvrex was installed, they also show that he was familiar with the products of Libbey-Owens-Ford and its Blue Ridge subsidiary.[23] The disparity between the specifications and as-built conditions coupled with the fact that Louvrex did not appear in the manufacturer's literature until 1938, the very year that the house was under construction, suggest that Gropius either made a late change to a cutting-edge material or that the glass was replaced at a later time. However, every other indication suggests that the glass is original to the house.

---

[21] "Libbey-Owens-Ford Glass" in *Sweet's Catalog File* 1938, Sec. 17-25 (New York: F.W. Dodge Corp., 1938), 18/3.
[22] Ibid.
[23] Walter Gropius and Marcel Breuer Associated Architects, "Specification of Labor and Materials for the Residence of Mrs. James J. Storrow, Lincoln, Massachusetts" (HNE Collection), Sect. 14: Glazing, 48.


LOUVREX

Made in 1/8 and 7/32 in. thicknesses with fire finished surfaces and in 7/32 in. thickness only with flat surface mechanically ground and polished; also with flat surface Satinol processed.

DESCRIPTION—The Louvrex pattern is formed by a series of plane surfaced strips, 1 in. wide, alternately ascending and descending. In appearance, these resemble louver strips in venetian blinds. Since the eye tends to measure from valley to valley across the ridge — a distance of 2 in. — Louvrex gives the effect of a pattern 2 in. wide. It is relatively transparent but Satinol processing gives it great obscurity and wide diffusion of light.

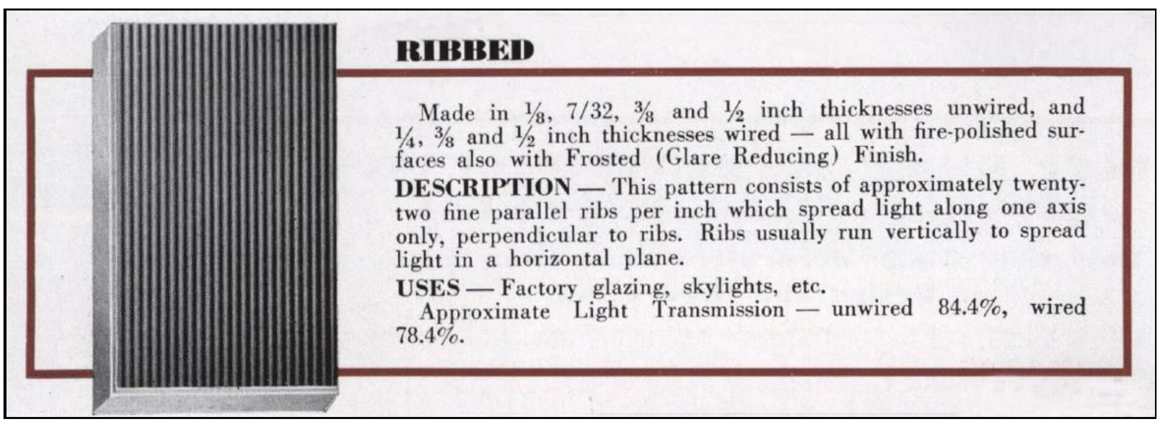
USES — Louvrex was created to meet the demand for a decorative glass with a distinctly modern feeling. It is widely used for both interior and exterior glazing, for partitions, screen partitions and many other uses.

Approximate Light Transmission — unwired 90.4% (not made in wire glass).

Louvrex Cross Section
1/4 Actual Size

Figure 1. "Louvrex" fluted glass from 1941 Libbey-Owens-Ford trade catalog.[24]

Ribbed glass used on the south elevation's pantry window also matches the description of a Libbey-Owens-Ford product called simply, "Ribbed" (Figure 2).[25] This product was available as early as 1933.[26] The glass has been manufactured with a frosted or etched finish texture which was available as a standard option from the manufacturer. Early construction specifications indicate that Gropius originally intended to use another ribbed glass called "Skytex" in his design.[27] Both Skytex and Ribbed glass were manufactured by Libbey-Owens-Ford's Blue Ridge subsidiary, however, Skytex had a much coarser appearance with eight ribs per inch versus Ribbed which had twenty-two.[28] Interestingly, the manufacturer's product literature recommended these particular types of glass be used in industrial applications including factory glazing and skylights, an aesthetic that was very much in keeping with Gropius' design philosophy.


RIBBED

Made in 1/8, 7/32, 3/8 and 1/2 inch thicknesses unwired, and 1/4, 3/8 and 1/2 inch thicknesses wired — all with fire-polished surfaces also with Frosted (Glare Reducing) Finish.

DESCRIPTION — This pattern consists of approximately twenty-two fine parallel ribs per inch which spread light along one axis only, perpendicular to ribs. Ribs usually run vertically to spread light in a horizontal plane.

USES — Factory glazing, skylights, etc.

Approximate Light Transmission — unwired 84.4%, wired 78.4%.

Figure 2. Ribbed glass from 1941 Libbey-Owens-Ford trade catalog.

24 *Libbey Owens Ford Quality Flat Glass Products* (Toledo, OH: Libbey Owens Ford Glass Company, 1941), 1, available online at https://archive.org/details/1941CatalogLibbeyOwensFordQualityFlatGlassProducts (accessed 11/10/2015).
25 Ibid.
26 *Flat glass: Flat drawn window glass, polished plate glass, safety glass, figured and wire glass* (Toledo, OH: Libbey Owens Ford Glass Company, 1933), available online at https://archive.org/details/SweetsArchitecturalCatalog1933Vol.C00011 (accessed 11/10/2015).
27 Gropius and Breuer Architects, "Specification of Labor and Materials" (HNE Collection), Sect. 14: Glazing, 48.
28 *Libbey Owens Ford Quality Flat Glass Products*, 13.

Both types of pattern glass found at the Gropius House were produced using the roll method of forming glass sheets. In this process, molten glass is passed through a pair of metal forming rolls, one of which is embossed with a pattern that is imprinted on the glass as the sheet is formed. The resulting sheet is smooth on one side and patterned on the other.

2. Glass Block

Glass block used on the north elevation matches the description of a product identified as "Insulux" pattern number 407, manufactured by the Owens-Illinois Glass Company of Muncie, Indiana.[29] This was later verified through original construction documents provided by HNE.[30] First introduced in 1935, the Owens-Illinois Insulux blocks used at the Gropius House were some of the earliest glass blocks produced on a commercial scale in the United States and represented the "cutting edge" in building materials of the time period.[31] Characteristic features of this glass block include its size (11-3/4 x 11-3/4 x 3-7/8 inches), ridges located on the side of the block and, particularly, the number (11) and parallel configuration of the molded flutes on two faces of the block (Figure 3 and Figure 4). These features help distinguish this glass block from other similar products manufactured during the same time period, such as the Pittsburgh-Corning Corporation's "Argus" pattern block introduced in 1938.

Hollow glass blocks are manufactured as two separate halves that are pressed together while the glass is still molten, and annealed. Patterns, such as the fluting found in the blocks at the Gropius House, are molded into the inner face of each of the halves before they are joined. During the process, air is evacuated from the inner cavity to create a partial vacuum that improves insulating performance and prevents condensation from forming inside the block.[32] Once annealed, the edges of the blocks are coated in a material that improves their bond with mortar. The blocks are then set in a Portland cement mortar, with expansion joints at jambs and heads and metal joint reinforcement in horizontal mortar joints crossing larger spans (Figure 5).

[29] *Owens-Illinois Insulux Glass Blocks* (Muncie, IN: Owens-Illinois Glass Company, 1942), 10.
[30] Gropius and Breuer Architects, "Specification of Labor and Materials" (HNE Collection), Sect. 3: Masonry, 15.
[31] Elizabeth Fagan, "Building Walls of Light: The Development of Glass Block and Its Influence on American Architecture in the 1930s" (Master's thesis, Columbia University, 2015).
[32] Early glass blocks were also manufactured as separate halves. However, the two halves were joined using a metallic seal that was susceptible to failure.

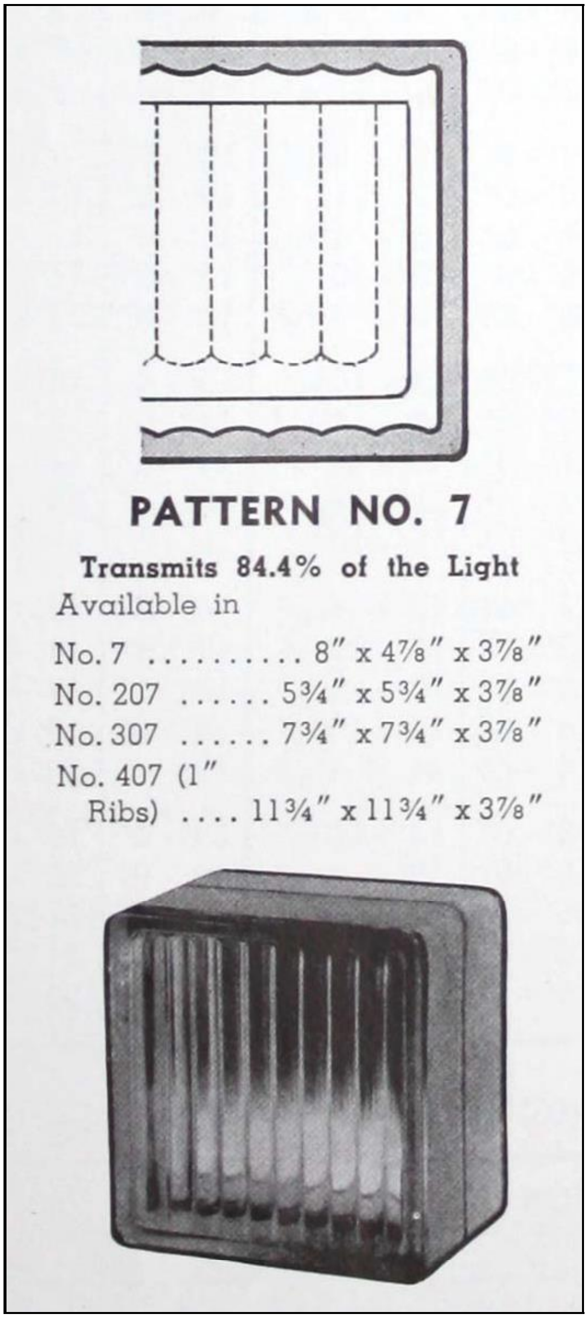


Figure 3. Insulux pattern no. 7 details from 1942 Owens-Illinois trade catalog.

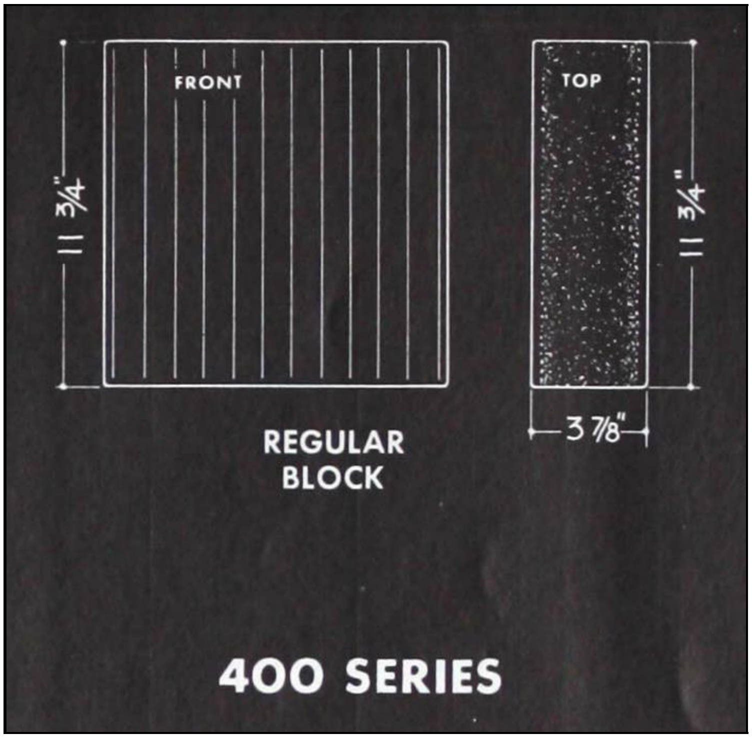


Figure 4. 400 Series Insulux block dimensions from 1942 Owens-Illinois trade catalog.

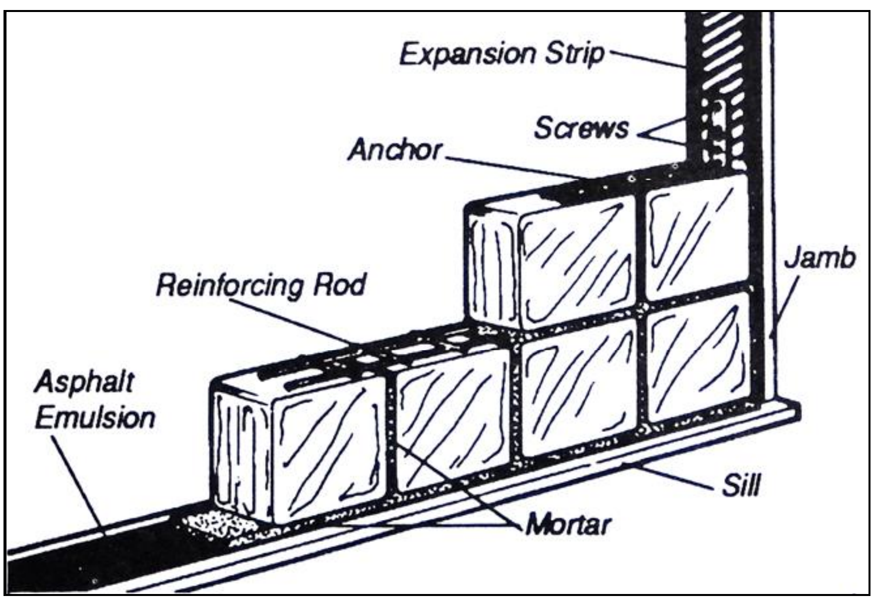


Figure 5. Typical glass block wall construction details showing positioning of metal joint reinforcement rod. (Credit: Eagle-i Inspections, Inc.)

III. ARCHITECTURAL GLASS: ASSESSMENT & TREATMENT

A survey and assessment of exterior architectural glass at the Gropius House was performed to determine its current condition. This work encompassed the pattern flat glass and glass block present on the north, east, and south exterior elevations of the building. Non-pattern exterior plate glass and glass present in interior partitions are not addressed.

A. Methodology

Prior to JBC's site visit, reports and other records of prior assessments and treatments supplied by the client were reviewed. Comprehensive documentation and field survey of the exterior architectural glass was executed visually from the ground and by ladder. Conditions were noted on elevation drawings (see Appendix A). Windows are referred to by numbers taken from drawings supplied by HNE relating to window restoration work conducted in the 1980s and 90s. Individual glass block units in the entryway wall were assigned alpha-numeric identifiers according to their position in the wall (see Appendix A for identification schema). Descriptive attributes of the pattern flat glass and glass block were recorded to aid in materials identification and to assist in sourcing replacement materials.

In addition to assessing and documenting the condition of glass at the Gropius House, JBC was asked to investigate the cause of deterioration occurring at the glass block wall. This work entailed a structural assessment (Appendix B), performed in consultation with a structural engineer, and analysis of the mortar used in the block wall assembly (Appendix C).

Following assessment of conditions, JBC undertook an extensive search in an attempt to locate "in-kind" replacement materials for deteriorated glass. Findings from this exercise are presented in the Treatment Recommendations below.

B. Condition Assessment

Condition drawings showing the location and nature of damage to the architectural glass are contained in Appendix A.

1. Pattern Glass

The survey of pattern glass found breakage on all three elevations. The majority of these breaks are typical, linear stress-related cracks most likely due to corrosion of the metal sashes. Stress cracks are most common in annealed or heat-strengthened glass, like that used at the Gropius House. Stress cracks typically emanate from the edge of a pane and traverse the flat plane of the glass until terminating at another edge or crack, thereby releasing the tension that initiated the cracking.

Deteriorated conditions observed at each window are presented below.

Window 102 (South Elevation)
Glazing in the fixed (westernmost) sash of this window exhibits severe cracking. Multiple cracks traverse the ribbed glass. A hole in the lower portion of the glass that was likely caused by an impact has been covered over by a clear film (probably packing tape). In addition to impact-related damage, the extent of the cracking suggests that stress on the glazing may have caused or contributed to further cracking. Glazing in the adjacent, operable sash is intact and in good condition.

Figure 6. Stress/impact related damage in fixed-pane of Window 102.

Window 109 (East Elevation)
Glazing in the lower sash of this window exhibits extensive stress cracking. Several cracks culminate in an area of “oyster” shaped, conchoidal surface loss occurring along the bottom edge of the pane. Glazing in the small upper sash is intact and in good condition.

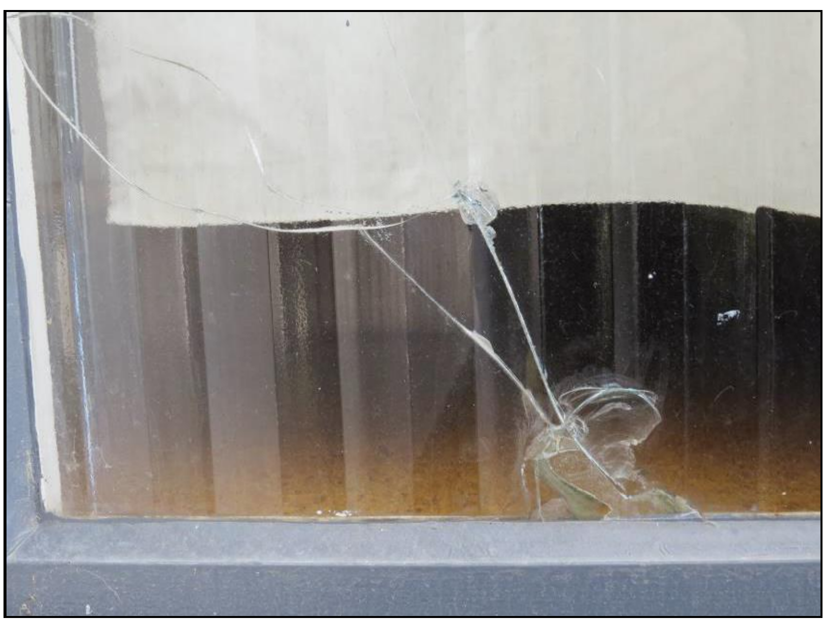


Figure 7. Stress cracks and "oyster" shaped loss in lower sash of Window 109.

Window 110 (North Elevation)
Glazing in the fixed (westernmost) sash of this window exhibits a single stress crack in the upper east corner. Glazing in the smaller adjacent operable sash is intact and in good condition.

Figure 8. A single stress crack seen in Window 110.

Window 111 (North Elevation)
Glazing in the fixed (easternmost) sash of this window exhibits a single, vertical stress crack. Glazing in the adjacent, operable sash is intact and in good condition.

Figure 9. A single stress crack seen in Window 111.

2. Glass Block

Cracks and spalls were observed in 14 glass block units on both the north and south sides of the entryway wall (see Appendix A). The most significant damage is concentrated in the second and third courses of the wall. The glass has largely remained tight and intact adjacent to the cracks in all but one location on the north side where substantial loss has occurred.-Deteriorated conditions are noted below. All other blocks not mentioned here are in good condition.

Blocks D2, G11, H3, H11, and J11 all exhibit a minor spall in one corner edge on their north (exterior) -facing side (Figure 10). Similar damage was observed on the south (interior) -facing side of Blocks E2, E3, and F2. In some blocks, these spalls are slightly displaced. Cracking is present on the north side of Block G1 and on both sides of Blocks G7, H2, H5, H7, and H8 (Figure 11). The most severe damage was observed in Block H2, which exhibits extensive cracking and is missing a large section on its north side (Figure 12).

Figure 10. Typical corner spalls in glass block units.


Figure 11. Typical cracks in glass block units.


Figure 12. Block H2 exhibiting extensive cracks, losses, and exposed corroding metal joint reinforcement.

A review of documentation of cracks in the block wall prepared in 1996 indicates that the condition of the blocks has progressively deteriorated over time, with cracks increasing in size and propagating in number (see Figure 13 and Figure 14). This indicates that the deterioration is active and will continue to worsen if not corrected.

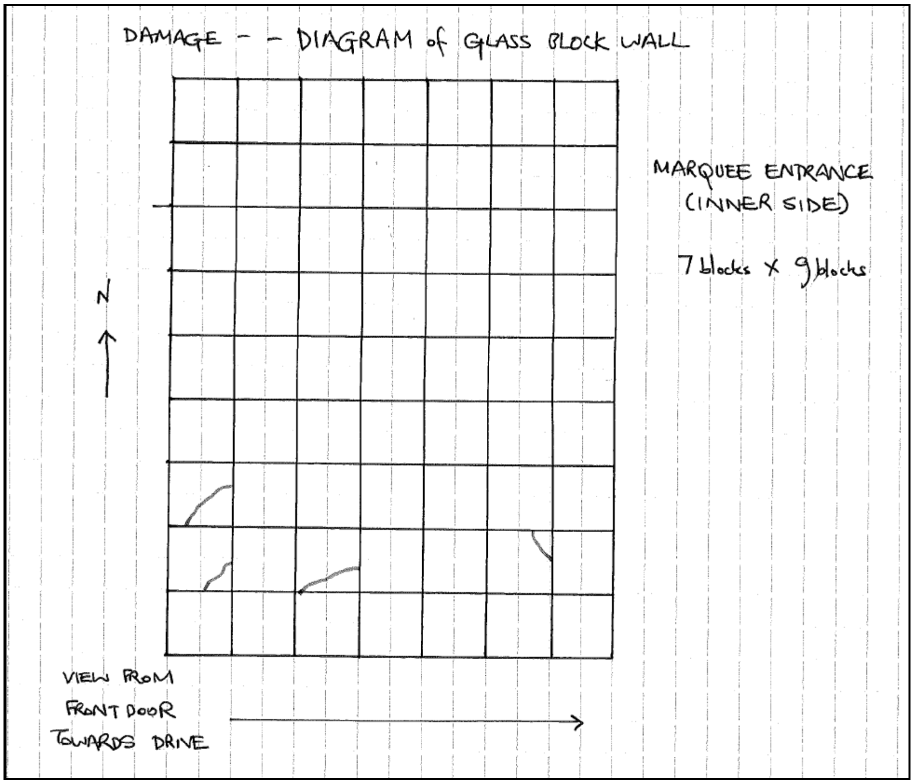


Figure 13. Diagram of cracks in the glass block wall (looking north) from 1996 memo (HNE Collection).

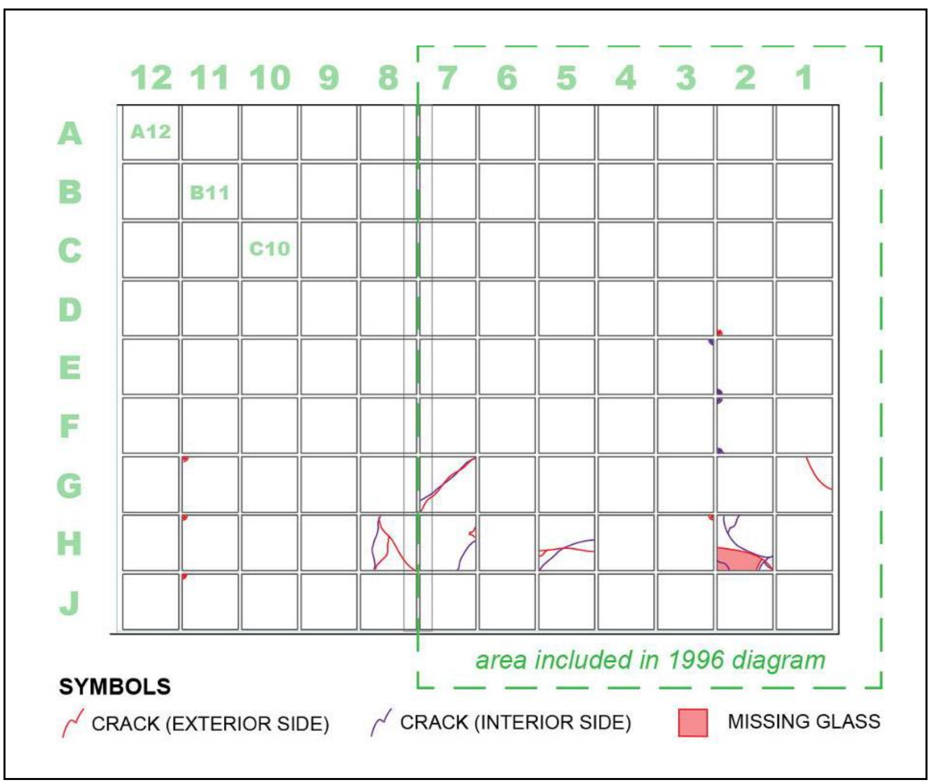


Figure 14. Current condition of glass block wall (interior elevation looking north), with location of 1996 condition diagram noted.

Cracks in the glass block units are likely caused by shear stress created by corrosion of the steel channel which frames the vertical ends of the wall (see Engineer's Report in Appendix B). The generally horizontal direction of the cracks forms a pattern consistent with a local horizontal shear stress. Stress-related cracks are exacerbated as moisture intrudes into the crack and expands in freezing conditions. As a crack grows in size, it will allow moisture to further infiltrate and fill the inner cavity of a block where freezing temperatures place further stress on the already compromised material (see Figure 23).

Figure 15. The lower portion of a Block H2 (second course from bottom, 2nd block from left) has broken away as a result of stress cracking exaccerbated by freezing moisture. Note the displacement of the metal channel (left of glass block) caused by corrosion.

Analysis of the glass block pointing mortar indicates that it is a Type N mortar (see Petrographic Analysis in Appendix C), a moderately hard mortar type consistent with the block manufacturer's installation recommendations (both historically and today).[33] Since both the glass and mortar are both brittle materials, expansion joints are crucial details to accommodate movement and relieve localized stress forces. The only designed accommodation to relieve stress in the wall is the cork padding added where the ends of the block wall abut the steel channel.

Steel reinforcement bar in the block wall mortar joints exhibits corrosion where deterioration of the block has exposed the steel to air and moisture. Corrosion of embedded steel in cementitious materials is, in most cases, prevented by the inherent alkalinity of the cement. The high pH of the cement permits the formation of only a thin

[33] *Owens-Illinois,* 12.

oxide layer on the steel which prevents metal atoms from dissolving. This passive film does not actually stop corrosion; it reduces the corrosion rate to an insignificant level. When this film is breached, the passive protection stops and oxidation accelerates.

The steel reinforcement in the block wall appears to be in stable condition (with exceptions as noted). However, if deterioration of this material were permitted to occur unchecked, rust jacking combined with minimal accommodation for expansion would likely lead to widespread cracking and spalling in the glass blocks. Care should be taken to maintain the integrity of the mortar joints to prevent corrosion of the reinforcing bar.

For further discussion of deterioration of the block wall, see the engineer's report contained in Appendix B.

C. Treatment Recommendations

Best practices in historic preservation advocate the retention and repair of original materials. For 20th century built heritage, conventional wisdom must be reconsidered in the context of the Modernist aesthetic and designer's intent. In modern buildings, the material itself often serves as ornament, with designers carefully choosing their material palette to express the true nature of the materials and structural systems employed. Deterioration of materials in this context conflicts with modern design principles that favor clean, unbroken lines. Even when the option to repair historic fabric is available, the most appropriate solution may be to preserve Modernism's ideals rather than material originality.

The philosophical challenges of preserving Modernism are apparent in decisions regarding the treatment of the exterior glass at Gropius House. In this case, one could argue that preserving the designer's intent necessitates replacement of deteriorated materials. However, in-kind replacement materials are very difficult to source (see Materials Sourcing above). From a pragmatic perspective, the glass must be treated to protect the structure from the elements and prevent damage to adjacent materials. Yet, cracked and spalled exterior pattern glass is not easily repaired and repairs would have an unknown service life.

Taking the challenges into consideration, JBC has outlined treatment options for each of the three types of glass below.

1. Pattern Glass

Attempts should be made to repair and retain the historic glass *in situ*. However, repairs are unlikely to produce the desired aesthetic results and may not adequately address corrosion of the sashes which is causing the damage. Replacement, which will unfortunately result in the loss of historic materials (especially if full elevations are replaced for consistency), is likely necessary to improve aesthetics and address the cause of deterioration.

Treatment A – Repair

There are two conceivable options for repair: repair in-place or repair off-site.

Option 1 – Repair In-place

Attempt repair in-place with epoxy injected into cracks and used to fill voids.[34]

This option has the advantage of being the least invasive and has the lowest initial cost. However, it also has several disadvantages: it does not address the corrosion of the steel sashes that contributes to the glass deterioration; it does not allow access to broken edges which should be thoroughly cleaned before being rejoined; it will be difficult to form the epoxy to the fluted or ribbed profile of the glass; the repair will likely be visible.

Option 2 – Repair Off-site

Remove glass from steel sashes, rejoin glass and replace in sashes. Treat corrosion in sashes by removing paint and rust back to bare metal before priming and coating with a corrosion inhibiting coating system.

This option has advantages over Option 1 in that it will permit access to the glazing channel to treat corrosion occurring in the sashes. Broken glass edges are also accessible for cleaning and rejoining. Unfortunately, repairs will likely remain visible and more breaks may occur while the glass is being removed.

Treatment B – Replacement

Remove broken glass from sashes and retain a sample for archival purposes. Treat corrosion in sashes by removing paint and rust back to bare metal before priming and coating with a corrosion inhibiting coating system. Two options for replacement exist:

Option 1 – Replace with Matching Material

Replace original glass with identical modern or salvaged material. Identical modern materials are not available. However, a very close match for the ribbed glass is available in Bendheim's JBCO-162, "ribbed" product (Figure 16).[35] The pattern and thickness dimensions of this product are nearly identical to the original. However, it is not available with an etched finish (as found on the original) from the manufacturer. This can be reproduced with acid etching or sandblasting, services available at some glass shops. The color of the glass may vary slightly from the original, but the effect can be mitigated if the glass in the adjacent, operable sash is also replaced.

[34] Recommended Products: Cracks may be injection-filled with HXTAL NYL-1, a low viscosity epoxy adhesive. Larger chips, spalls, etc., may be filled with a high viscosity epoxy resin such as Delta Kit, Inc.'s Plate Glass Repair Resin (Delta Kit also stocks injection equipment, polishing paste, and other supplies).

[35] JBCO-162, "ribbed" glass is manufactured by and available from Bendheim Ltd., 61 Willett St. Passaic, NJ 07055, (800) 606-7621, http://www.bendheim.com/

Figure 16. Sample of Bendheim's JBCO-162, "ribbed" glass compared to original glass in Window 102 (south elevation).

After an extensive search, no close-matching modern replacement (mass-produced or custom) for the Louvrex glass on the north elevation was found. See Option 2 below.

Option 2 – Replace with Similar Material
Replace deteriorated glass with a material that approximates the character defining features of the original. This option applies especially to the Louvrex glass. If no salvage material can be procured, replacement may proceed using a fluted glass that has a different profile but maintains the effect of the original. One such material is the 1-inch "fluted" glass manufactured by Gray Glass.[36] While this glass lacks the same pattern width, profile shape, and textured surface, it conveys a linear character that is similar to the original Louvrex. Note that, in order to maintain continuity of appearance, undamaged glass in adjacent sashes would have to be replaced.

[36] Manufactured by and available from Gray Glass Company, 217-44 98th Avenue, Queens Village, NY 11429, (718) 217-2943, http://www.grayglass.net/

Figure 17. Samples of replacement glass compared to original Louvrex glass in Window 109 (east elevation). Samples (left to right): AGC "Flutes" Clear Pattern, AGC "Textured Flutex", Gray Glass "1-inch Fluted", Bendheim's JBCO-35.

Figure 18. Samples of replacement glass compared to original Louvrex glass in Window 110 (north elevation). Samples (left to right): AGC "Flutes" Clear Pattern, AGC "Textured Flutex", Gray Glass "1-inch Fluted", Bendheim's JBCO-35.

2. Glass Block

The assembly details of the glass block wall should be address in conjunction with treatment prescribed for the glass block units to address the cause of deterioration. The steel channel at the wall ends should be removed and replaced with a non-corroding metal of similar or matching dimensions. Caulking should be replaced with a butyl-rubber expansion joint seal. Where exposed, corroded metal reinforcement in the glass block wall mortar joints should be wire brushed to remove loose corrosion product, followed by treatment with a rust converter to stabilize the metal.[37] The joint reinforcement should then be coated with a two coats of a zinc oxide rust-inhibiting enamel primer.[38] Two treatments and several options for preserving the glass block units are available:

Treatment A – Repair

Repair cracks and small chips, spalls, or voids in-place using epoxy.[39] Note that this treatment will cannot be used to correct large material losses as found in Block H2. This treatment option has a number of other disadvantages: epoxy repairs in glass typically require access to both sides of the surface being treated and it is not possible to access the interior of the block units without removing them from the wall and cutting them in half; it will not be possible to clean the broken edges of the blocks to ensure they are properly rejoined; repair in-place will not provide access and opportunity to treat corrosion on rebar.

Treatment B – Replacement

Replacement will likely be required for glass blocks that have been compromised by cracks or material losses. These include Blocks G1, G7, H2, H5, H7, and H8 (6 units total). Blocks exhibiting minor corner spalls (e.g. Block D2) may remain as-is (this type of damage is unlikely to spread if left untreated). Unfortunately, the particular model of Insulux block used at the Gropius House is rare. In order to match and not detract from the appearance of the existing block, salvage or new old stock replacements are necessary. This is particularly important because the replacements will be placed adjacent to original materials and any variation in color or pattern will be easily distinguishable. An extensive search of salvage suppliers and other sources was largely unsuccessful.[40] However, salvaged Owens-Illinois blocks of a very similar pattern (no. 402 or 416) with fluting oriented in opposite directions on either face have been donated to HNE and were also located by JBC on the online auction site eBay.

---

[37] Recommended Product: Rust-oleum Stops Rust Rust Reformer (see Appendix E for product information).

[38] Recommended Product: Rust-oleum 7400 System Heavy Duty Rust Inhibitive Primer (see Appendix E for product information). Note: While epoxies area a popular coating for rebar and other metallic reinforcement, they should not be used unless all surfaces can be coated to form a continuous barrier.

[39] See Footnote 34 for products.

[40] One potential supplier reported occasionally having the correct salvaged blocks in stock: Glass Blocks Unlimited, P.O. Box 206, 225 Helman Ln, Cotati, CA 94931, (800) 992-9938

Leaving blocks with cracks and substantial losses as-found is not recommended. These blocks will likely continue to deteriorate and, over time, may compromise the steel reinforcing bar located within the mortar joints, leading to rust jacking and more widespread deterioration.

Individual blocks may be replaced by first cutting the mortar joints using an angle grinder fitted with a masonry blade. Care should be taken to avoid damage to adjacent blocks in good condition and, if possible, cutting into embedded metal reinforcement. Once the joints have been cut, remaining mortar may be removed using a hammer and masonry chisel (power tools are not recommended for this work as they may damage adjacent blocks). The damaged block and all debris should be removed from the opening. Sound mortar (i.e. mortar that is well attached) may be left in-place if removal may cause damage to adjacent blocks. Metal reinforcement, where present, should be treated as described above. Replacement block should be installed using a Type N mortar that matches the original in appearance and joint profile.

Option 1 – Replace with In-kind or Similar Material
Replace either with identical block (preferred) if available or, replace with similar, unmodified block (no. 402 or 416).

Option 2 – Customized Replacement
Custom fabricate replacements by cutting blocks with similar but perpendicular flutes (i.e. Insulux no. 402 or 416) in half and rejoin them, with the flutes oriented correctly, using an adhesive. Blocks of a similar vintage to those found at Gropius House but, with the fluting pattern crossed, are more readily available as salvage or new-old stock than the parallel-fluted block. Conversations with glass block experts at Glass Blocks Unlimited in Cotati, California, indicate that this may be a viable method. While they were unaware of anyone else reconfiguring a block in this manner, they regularly cut blocks using a tile saw and reassemble the pieces using a silicone adhesive to form mitered corners. This option is somewhat experimental and the durability of the silicone adhesive in such an assembly is unknown. However, the option offers the distinct advantage of closely matching the color and appearance of the original material.

Blocks should be cut using a tile saw or, preferably, a water jet. The halves should be thoroughly cleaned and dried in an oven before being assembled with a high-quality exterior grade clear RTV (room temperature vulcanization) silicone or non-yellowing epoxy (such as HXTAL NYL-1). Both adhesive sealants have good adhesion to glass and resist deterioration in alkaline environments (e.g. cementitious mortar). Allow sealant to fully cure as per manufacturer recommendations before installing block.

Option 3 – Custom Manufactured Replacement
Custom manufacture new block to match the originals. The number of blocks needed to conduct repairs is insufficient to meet manufacturers' minimum quantities (in the thousands) for custom remanufacturing. However, Owens-Corning, the modern day successor to Owens-Illinois, occasionally remanufactures limited quantities of old designs like that found at Gropius House once a sufficient number of orders has

accumulated to justify the cost. This process may take several years, will be expensive and, although the block would be made by its original manufacturer, the color of the glass will be different than that of the original.

IV. ACCOUSTICAL PLASTER: MATERIALS ANALYSIS

The acoustical plaster present on the interior of Gropius House exhibits soiling most likely as a result of tobacco and wood smoke, water leaks, and general atmospheric pollution. JBC was asked to develop recommendations for the treatment of the white-colored acoustical plaster located in the dining room, living room, and study. Pink-colored acoustical plaster located in the first and second floor hallways was not included. In order to facilitate this work and to better understand the constituent components of the plaster, JBC conducted a materials analysis.

A. Methodology

Two samples of acoustical plaster were removed by JBC conservators, one from behind an HVAC grill located on the north wall of the living room and one from an area already damaged by deterioration located directly above the exterior doorway to the study.

A clean, unsoiled surface of the plaster was matched to a color standard of the Munsell Color System and a commercial paint color system (Benjamin Moore, Pittsburgh Paints, Sherwin-Williams) under natural light.

The plaster matrix and fibers extracted from this matrix were examined by JBC visually and aided by stereo and polarized light microscopes. A portion of the samples was subjected to chemical spot tests used to help determine the material's composition. Plaster samples were also sent to external laboratories for petrographic analysis and secondary, certified confirmation of JBC's finding that the material does not contain asbestos. Copies of the external laboratories' petrographic and asbestos analysis reports are contained in Appendix D. A review of historical literature, patents, and recent research related to composition of acoustical plaster was also conducted.

B. Description

The walls and ceilings of the living room, dining room, and study as well as the ceilings of the first and second floor hallways are all covered with a textured sound-absorbing plaster made and installed by the California Stucco Products Company. Research of historical manufacturer's product literature shows that the material was called "Stucoustic" (see Figure 21, p. 30).[41]

C. Findings

The acoustical plaster is a soft and moderately friable material with a textured surface created by the presence of large (approximately 2mm in diameter), aspherical air voids (Figure 19). In cross-section, the material exhibits two coats, a darker colored scratch coat and a lighter finish coat that measures approximately 2mm thick (Figure 20). The finish coat is considerably more porous than the scratch coat, having a sponge-like

[41] *Sweet's Catalog File* 1936, Sec. 10-14 (New York: F.W. Dodge Corp., 1936), 13/27, available online at https://archive.org/details/Sweets1936final_201507 (accessed 2/11/2016).

texture. Based on microscopic analysis, the plaster has a lime-based binder with aggregate composed of a medium-grained pumice and minor crushed marble constituent. Fibers present in the finish coat were extracted from the matrix and have been identified as cellulose. No asbestos was found. No evidence of foaming or air-entraining agents was detected. However, chemical analysis is required to positively detect and identify any admixtures. Chemical spot tests confirm the presence of iron and water-soluble salts (sulfates and nitrates), but do not indicate the quantities present. Petrographic analysis confirms the presence of sulfates and also identifies secondary deposits of a mineral optically consistent with chloride salts.

Figure 19. Close-up of plaster in living room showing typical surface texture.

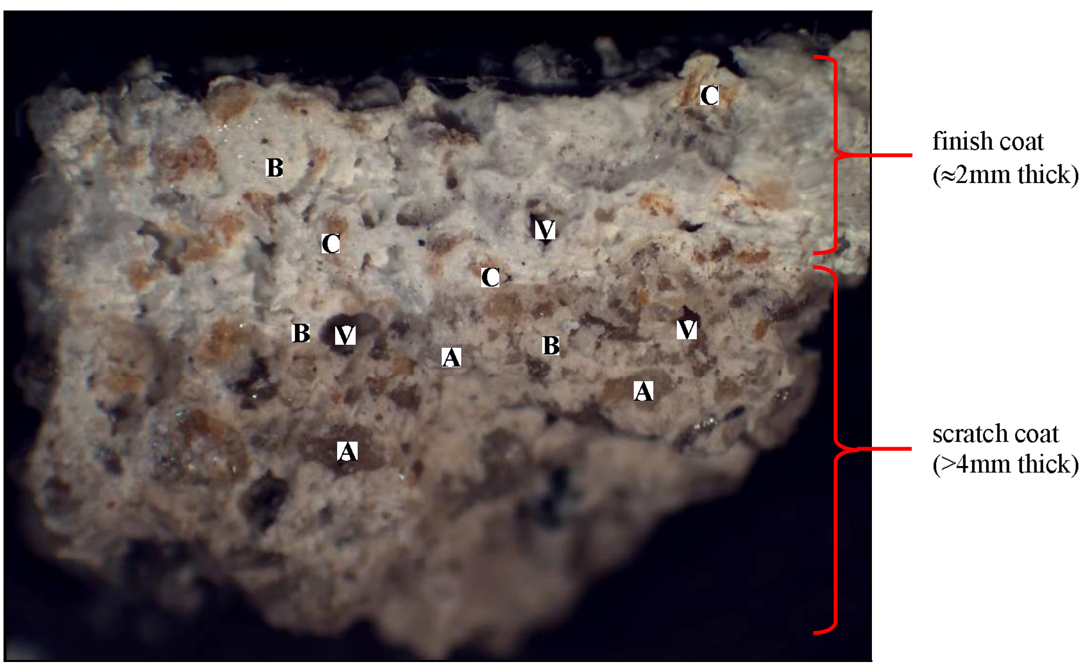


Figure 20. Cross-section of acoustic plaster with aggregate (A), binder paste (B), cellulose (C), air voids (V) and coats denoted (15X).

The outer surface of the plaster is white in color (Munsell N 9.5), similar to Pittsburg Paints PPG 1006-1 "Gypsum" color.[42] Petrographic analysis identified sparse remnants of a thin lime paste coating the surface of the finish coat. While this paste could be an applied lime-based finish, its sparse presence suggests that it is either laitance brought to the surface while the material was being worked or a precipitate of the binder component and not an intentional coating. Indeed, a 1939 magazine article reports that the plaster was installed without a coating.[43] No other evidence of coatings was found except in limited areas previously conserved by in-painting with water colors.[44] [45]

The method of producing the plaster's textured finish can be discerned from historical accounts and materials analysis. According to the 1977 history of the house written by Ise Gropius, the material was spray-applied directly over a rough coat of plaster.[46] Petrographic analysis determined that the material lacks an air-entraining admixture as is often found in historic acoustical plaster. This evidence suggests that the plaster's textured finish was achieved through a spray-applied dash finish that was "knocked down" using a broad float or similar tool.

[42] Colors were matched to the surface of plaster in an areas that exhibited less soiling.
[43] Beulah Brown Anthony, "The Massachusetts Home of Dr. and Mrs. Walter Gropius," *American Home* (July 1939): 21, 54-57.
[44] In her 1997 materials analysis, Susan Buck found a "thin, white paint layer" coating the plaster in the living room (Buck, "A Material Evaluation," 33). JBC found no evidence of this coating in the samples examined. Buck may have misidentified the lime paste found on the surface of the samples examined by JBC and Highbridge.
[45] Though outside the scope of this project, visual examination of the plaster located on the ceilings of the hallways indicates that the matrix of this material was pigmented (i.e. not painted) to achieve its pink color.
[46] Gropius, *History of the Gropius House*, 11-12.

13
27

CALIFORNIA STUCCO PRODUCTS COMPANY

169 Waverly Street
CAMBRIDGE, MASS.

122 East 42nd Street
NEW YORK, N. Y.

Acoustical Plasters
Stucoustic, Type A.D.
and
Stucoustic, Type A.C.F.

Other Products
Exterior Cement Stucco, Interior Colored Plasters, Caenstone, Travertine, Colored Floor Finish.

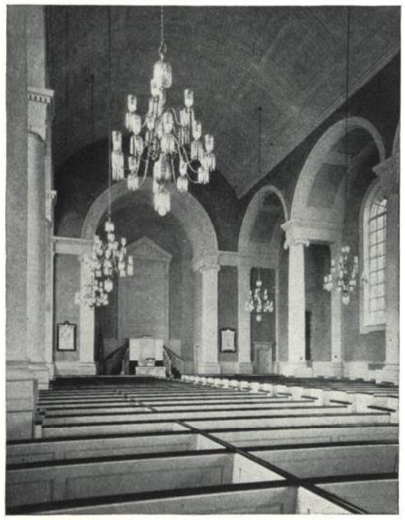
STUCOUSTIC (TYPE A.D.)—AN ACOUSTICAL PLASTER
For Economical Sound Absorption and Sound Control
Low Cost—Integral Colors—Architectural Adaptability

Description

Stucoustic was developed to obtain an acoustical plaster that the skilled artisan could readily apply, that would be economical to the owner, and truly permanent, and that would fit accurately into the design of the architect and the acoustical expert. It is unique among acoustical plasters.

Stucoustic can be finished with a steel trowel to a smooth, sanitary, high light-reflecting surface without impairing its remarkable sound-absorbing capacity. It can be furnished white or colored to any desired shade.

With this finish, all particles of aggregate are completely embedded in the body of the plaster, the surface is comparatively smooth, sanitary, high light reflective. It requires less paint for re-decoration and therefore, painting does not appreciably reduce the sound-absorption. Stucoustic can also be floated, stippled, textured, antiqued, or finished in other ways as desired.



All Souls Church, New York, N. Y.
Stucoustic ceilings and walls
Hobart Upjohn, Architect

Application and Painting

Application—Regular plasterers apply Stucoustic. It is mixed to the consistency of ordinary mortar and applied to a brown coat of gypsum, portland cement, or lime plaster. One plasterer will normally apply from 8 to 10 sq. yds. of ½-in. Stucoustic per hour.

Painting—Water-mixed paints, sprayed on, are recommended. Test data of Stucoustic spray painted with five coats of water mixed paint shows a reduction of 2% of sound absorption. Painting instructions furnished on request.

Specifications for Stucoustic, Type A.D. Acoustical Plaster

"Areas to receive acoustical plaster shall be given a scratch and brown coat in the ordinary manner. The surface of the brown coat shall be scored or cross scratched for bond and allowed to dry thoroughly before the application of the acoustical plaster."

Note: Where Stucoustic is subjected to high humidity or periodic wetting, no gypsum shall be used in base coats. Use plaster base coats consisting of equal parts by weight of portland cement and hydrated lime and two parts of sand.

Note: Where Stucoustic is applied directly to metal lath, use ⅛ in. rib lath weighing not less than 2.75 lbs. or equal, apply Stucoustic scratch coat the same as ordinary gypsum scratch and allow it to dry thoroughly.

"Stucoustic Plaster shall be applied to the dry base coat without sprinkling or otherwise reducing the suction in coats, about ¼-in. thick, to a total thickness of Stucoustic of ½-in. (or ¾-in. as desired). The surface shall be finished as directed by the architect and all mixing and application of Stucoustic shall be done in accordance with the instructions of the California Stucco Products Company and under the direction of their representative."

52

SOUND ABSORPTION TEST DATA

Results of tests made by Bureau of Standards as listed below. All samples were applied to gypsum base coat plaster and steel trowel finished.

Stucoustic Type	Thickness, in.	Coefficient of Sound Absorption				
		128	256	512	1024	2048
A.D.	½	.14	.16	.49	.59	.61
A.D.	¾	.18	.36	.65	.65	.62
A.C.F.	⅞	.17	.35	.76	.78	.71

A Few Stucoustic Jobs and Their Architects

First National Bank of New York, New York; *Walker & Gillette*
Harvard Club, Boston; *William T. Aldrich*
Union Club, New York; *Delano & Aldrich*
Trumbull College, Yale University; *James Gamble Rogers*
Christian Science Pub. House, Boston; *Chester Lindsey Churchill*
White House, Washington, D. C.; *Eric Gugler*
Harvard Congregational Church, Brookline; *Allen & Collins*
Academy of Medicine, New York; *York & Sawyer*
Melrose High School, Melrose, Mass.; *J. Wm. Beal & Sons*

Service

Our Service Department will supply complete specifications on request, and a supervisor will be sent to each job to advise as to the proper installation of Stucoustic Acoustical Plaster and preparation of the base coat.

Figure 21. "Stucoustic" acoustical plaster product description from 1936 *Sweet's Catalog File.*

V. ACCOUSTICAL PLASTER: CLEANING TESTS AND TREATMENT

Several different treatments were devised and tested for improving the appearance of the stained and soiled acoustical plaster (Figure 22). Due to the hygroscopic nature of the acoustical plaster, it was determined that "wet" cleaning methods and materials should be avoided if possible. JBC's prior experience in cleaning similar acoustical plaster materials suggested that latex poultices would likely be effective and so nine commercially available latex poultices were tested. Dry cleaning tests were also performed using a gentle abrasive rubber sponge and a tacky rubber putty. Following limited success in the cleaning tests, additional tests were conducted using limewash to mask soiling on the plaster. Materials and methods were tested in situ. Methodology, results, and recommendations are reported below.

Figure 22. Typical soiling and staining observed on the plaster ceiling of the living room.

A. Methodology

1. Latex Poultice Tests

Nine latex-based poultice-type products were selected for testing (see Table 1). These products are supplied by their manufacturers in the form of a one or two-part paste that, following application, dries to form a firm, elastic material. Product data sheets are contained in Appendix E. A location for the application of test patches was selected by JBC in consultation with HNE staff (see Figure 23). The western-most window return on the bay of windows fenestrating the living room along the south elevation was selected because the area is normally concealed behind a curtain. The test area was photo-documented and masked before the products were applied.

Table 1. Latex Poultice Products Tested

Manufacturer (abbreviation)	Product	pH	Additives
American Building Restoration Products (ABR)	Type A	11-12	[Ammonia, unk.]*
	Type AM	11-12	[Ammonia, unk.]*
	Type B	11-12	[Ammonia, unk.]*
	Type C	11-12	[Ammonia, unk.]*
Arte Mundit (AM)	Type I	[unk.]	Ammonia
	Type II	9-11 (Comp. A)	Ammonia, Chelating Agent, Solvent
	Type III	9-11 (Comp. A)	Ammonia, Chelating Agent, Solvent
	Eco	9-10	[none]
PROSOCO	MasonRE Latex 20	10.4	Ammonia, Chelating Agent

The products were applied by brush and allowed to dry for a period of 24 hours. A fan was set up to circulate air across the test area to facilitate drying. Once each product felt sufficiently dry to the touch, it was gently removed by peeling the poultice material away from the plaster surface. Visual observations were recorded. Colorimetry measurements were taken to help determine the extent of change in the surfaces color of the plaster.

After the first round of colorimetry was complete, the test area was gently sponged with water (using the least amount of water necessary for the task) to remove any remaining residues and neutralize the surface. The pH of each test patch was measured and sponging was repeated until the surface returned to its normal pH (pH 9, slightly alkaline). The test area was then allowed to dry before final colorimetry measurements and photographs were taken.

* Active ingredients are not disclosed by this product's manufacturer (ABR). The product is believed to contain an aqueas ammonia solution based on the product's odor and a patent filed by ABR. John Tadych, "Rubber masking compound and methods of use," U.S. Patent Application US20050164024 A1, filed Jan. 22, 2004.

Figure 23. Location of cleaning test patches (marked in blue tape) on window return in living room.

2. Abrasive Cleaning Tests

Two gentle abrasive cleaning tests were conducted on soiled plaster on the west alcove wall in the upper southwest corner of the living room (Figure 24). The two products tested included Groom/Stick, manufactured by Picreator Enterprises Ltd. (located in the UK), and Absorene's Dry Cleaning Sponge (also known as "soot sponge"). Groom/Stick is a kneadable, pH-neutral natural rubber product used to trap soiling and lift it from the surface. The product was kneaded into a ball and pressed repeatedly into the surface of the acoustic plaster. The cleaning sponge is made of a non-toxic vulcanized rubber. This product was gently rubbed across the soiled plaster. Both products and treated plaster were then examined to determine whether any soiling had been removed.

Figure 24. Location of abrasive cleaning tests (red arrow) on west living room wall.

3. Coating Tests

Following limited success experienced in the cleaning tests, JBC sought to develop a coating that would mask soiling on the plaster, be compatible with the substrate, and be reversible should future re-treatment be necessary. In a 1936 advertisement for Stucoustic, the manufacturer recommends spray application of "water-mixed" (water-based) paints should a coating or color change be desired (Figure 21). While a diluted water-based latex paint would be compatible with the material, it would be difficult and damaging to reverse and would most likely "read" as a coating rather than the surface of an uncoated plaster. Instead, limewash was selected for the coating tests because it is both compatible with the lime plaster substrate and reversible should future re-treatment be desired. Five test patches of limewash were applied below the latex poultice tests adjacent to the south window in the living room (Figure 25).

Four variations of limewash were prepared using Graymont's Niagara Mature Lime Putty and Type S Dolomitic Hydrated Lime (sold as a dry hydrate) using the following proportions:

- 1:5 Lime Putty : Water
- 1:5 Lime Putty : Acrylic Solution
- 3:8 Type S Lime : Water
- 3:8 Type S Lime : Acrylic Solution

Two variations were prepared using an acrylic additive in order to prevent the chalking that is often observed in limewash. An aqueous acrylic solution was prepared using Acryl 60, a masonry additive, diluted 1:10 with water. Each of the limewash preparations was mixed on a magnetic stir plate for approximately five minutes and then strained through a #30 sieve to remove any large lime particles.

Figure 25. Location of limewash test patches (outlined in red) on window return in living room.

Brush and spray application methods and one and two-coat applications were tested. The surface was first pre-wetted with water and dabbed dry with a paper towel to control capillary uptake into the substrate and pre-mature drying of the limewash. In the brush application, the wash was applied using a china bristle brush and then lightly sponged and dry-brushed to work-in and evenly distribute the lime particles. The surface was then lightly misted with water to promote carbonation and consolidation of the wash 15 to 20 minutes after application, when the surface appeared dry. A second coat was applied to the lower half of each test patch two hours after the initial application. After 24 hours, the treated surfaces were checked for chalking by wiping them with a black-colored cloth and examining the cloth for limewash residue.

After the brushed-on test patches had sufficiently dried and were evaluated, the acrylic-modified Type S preparation was selected for the spray application test. The substrate was pre-wetted as before. A light limewash spray was then applied in two, perpendicular passes to ensure even coating using a hand-pumped spray atomizer. The wash was allowed to set until the surface felt dry and turned opaque (15-20 minutes) and then lightly misted with water as before. This test patch was in the direct path of sun light and had to be covered with a damp paper towel to slow evaporation and ensure proper carbonation. After 24 hours, the surface was checked for chalking as described above.

Following initial limewash tests, a second round of testing was conducted using pigmented limewash and varied proportions of lime to attempt to match the color of the plaster. These variations were prepared in JBC’s laboratory to match the reference color of the plaster recorded in the field (PPG 1006-1 “Gypsum”) using light-stable, natural “earth” pigments dispersed using a stir plate. Lime plaster samples were cast and coated with the pigmented washes and compared with the acoustic plaster on site. One pigmented wash was selected and applied to a test patch located to the north and adjacent to the living room fireplace (Figure 26).

Figure 26. Location of pigmented limewash test patch (outlined in blue tape) adjacent to living room fireplace.

B. Findings – Latex Poultice Tests

Nearly all of the latex poultice products caused a yellow discoloration of the plaster.[47] The most yellowing occurred in the test patch treated with ABR Type C. No yellowing was observed in only one test patch: that treated with MasonRE Latex 20. This product successfully lightened the substrate but was difficult to remove and caused very minor detachment of some friable plaster. The cleaning effect of the other products was difficult to ascertain because of the discoloration. Observations from each test patch are included below.

American Building Restoration Products (ABR)

Type A: Substrate appeared slightly yellow after treatment.

Figure 27. ABR Type A test patch, post-treatment.

[47] The yellowing observed on treated plaster surfaces is unusual. In JBC's experience, the same treatments applied to similar plaster materials did not have this effect. The manufacturers of these products report the same experience. Regardless of past experience, it is apparent that, barring any change in the formulation of the products, some constituent specific to the acoustical plaster used at the Gropius House must have reacted to a component in the poultice.

An exact cause of the yellowing could not be determined. One plausible theory is that the yellowing is due to oxidation of ferrous metallic particles present in the plaster matrix. Chelating agents, present in some of the products tested, are intended to bond to metal ions so that they can be extracted from the substrate. It may be that the chelators and metallic particles were drawn to the surface of the plaster, where they readily oxidized due to moisture in the poultice materials, but were not completely removed when the poultice was lifted away. If this were the case, re-treating the area might successfully decrease or eliminate any discoloring. However, additional treatments could serve to exacerbate the yellowing. Attempts to recreate the yellowing on plaster samples prepared with iron filings in JBC's laboratory were unsuccessful. The yellowing may alternatively be related to wood fiber present in the plaster matrix.

Type AM: Substrate appeared slightly yellow after treatment. The poultice material felt "stiffer" than others tested. However, this did not appear to have an effect on the substrate (i.e. no excess material removed).

Figure 28. ABR Type AM test patch, post-treatment.

Type B: Substrate appeared slightly yellow after treatment.

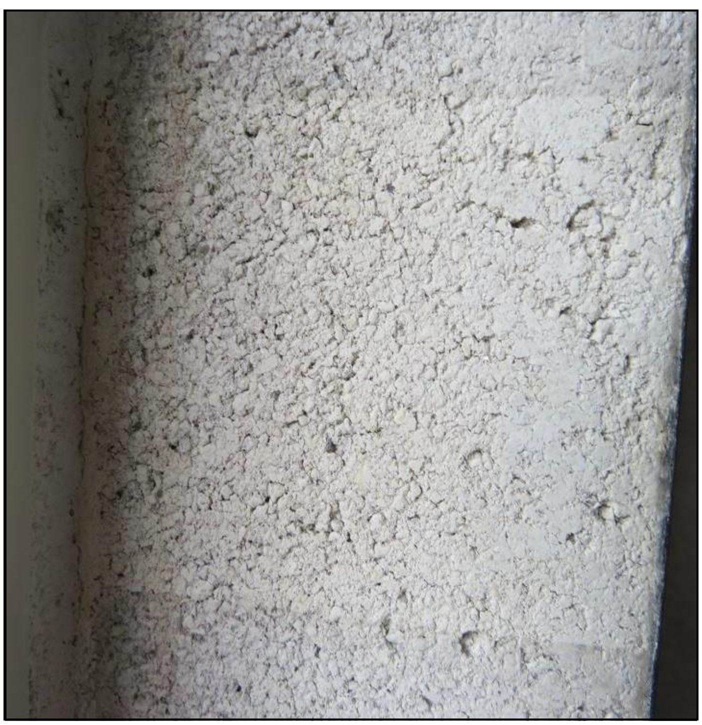


Figure 29. ABR Type B test patch, post-treatment.

Type C: Substrate appeared very yellow after treatment (this appears to have yellowed the worst of the products tested).

Figure 30. ABR Type C test patch, post-treatment.

Arte Mundit (AM)

Type I: Substrate appeared slightly yellow after treatment.

Figure 31. AM Type I test patch, post-treatment.

Type II: Substrate appeared slightly yellow after treatment.

Figure 32. AM Type II test patch, post-treatment.

Type III: Substrate appeared very yellow after treatment.

Figure 33. AM Type III test patch, post-treatment.

Eco: Substrate appeared slightly yellow after treatment.

Figure 34. AM Eco test patch, post-treatment.

PROSOCO

MasonRE Latex 20: This poultice was difficult to remove (the most difficult of any of the products tested). Strong adhesion to the plaster substrate provided both favorable and unfavorable results. While the poultice was very effective in trapping and lifting soiling from the surface, a small portion of the substrate was also removed. Yellowing of the substrate, as seen with other products tested, was not observed.

Figure 35. MasonRE test patch, post-treatment.

Figure 36. Poultice test area, post treatment (product names positioned next to test patch location).

1. Colorimetry

The primary goal of the cleaning tests was to try to return the plaster to a more consistent "white" appearance. Color change can be difficult to perceive, especially when the material has a rough texture or is located in area with limited light. In order to more accurately measure color change in the acoustical plaster, colorimetry measurements taken during and after treatment using a Konica Minolta Chroma Meter CR-440 colorimeter. Measurements were recorded in the in CIE L*a*b* color space. Due to the irregular surface of the plaster, an average of three measurements was taken for each test patch. Color difference (ΔE^*_{ab}) was computed against a constant control (untreated area) for all values (L*a*b*) using the CIE1976 formula. A difference in lightness (ΔL^*) was computed using the formula, $\Delta L^*=L^*_2 - L^*_1$.

In the table below, L* corresponds to the measured lightness value, where L* 0 = black and L* 100 = diffuse white. Higher ΔL^* values indicate a lighter surface (than the control). ΔE^*_{ab} indicates overall color change (from the control), where a "just noticeable difference" (JND) corresponds to $\Delta E^*_{ab} \approx 2.3$ (i.e. values ≥ 2.3 are perceptible to the human eye).

Table 2. Color Difference

	Post-Poultice			**Post-Sponge**		
Product	L*	ΔL^*	ΔE^*_{ab}	L*	ΔL^*	ΔE^*_{ab}
Control	71.70	0.05	0.07	71.60	-0.05	0.07
Type A	75.37	3.73	5.55	74.85	3.20	4.58
Type AM	71.01	-0.63	4.36	71.38	-0.27	4.05
Type B	73.23	1.58	1.93	76.00	4.36	6.03
Type C	72.44	0.79	5.77	75.21	3.56	5.55
Type I	74.63	2.99	3.76	73.97	2.32	2.97
Type II	74.41	2.77	6.24	74.60	2.95	6.02
Type III	74.48	2.83	7.22	73.96	2.31	6.30
Eco	75.01	3.36	4.80	76.10	4.46	5.88
MasonRE	71.95	0.31	1.36	74.68	3.03	3.75

Unfortunately, the colorimetry data proved less than useful due to the irregular surface texture and reflectivity of the plaster substrate and discoloration of the test patches caused by the products tested.

C. Findings – Abrasive Cleaning Tests

Both of the abrasive products tested were very easy to use. The surface of Groom/Stick grew noticeably darker with use, indicating that the product successfully lifted soiling from the surface (Figure 37). This product also picked up small friable pieces of the plaster. Following treatment, the test patch cleaned with Groom/Stick appeared no cleaner than before (Figure 38). A similar result was observed with the Dry Cleaning Sponge. While the surface of the sponge appeared soiled after use, the cleaning effect on the plaster was indistinguishable (Figure 37). The Dry Cleaning Sponge did not appear to remove any friable plaster fragments.

Figure 37. Groom/Stick after use. Note darker color of used product (center) compared to unused product in packagaing (left). Also note white plaster fragments embedded in used product.

Figure 38. Abrasive cleaning test area with Groom/Stick patch (above) and Dry Cleaning Sponge patch (below) outlined in red.

D. Findings – Coating Tests

Of the four limewash variation tested, the acrylic-modified Type S preparation had the best appearance and working properties. Despite their thin and runny consistency, both modified and un-modified Type S washes provided more opacity than the lime putty preparations. The Type S test patches also exhibited less chalking. The least amount of chalking with each type of lime was observed in the acrylic-modified preparations, confirming the utility of adding a small amount of acrylic. Unfortunately, the brush application method provided undesirable results. With all four variations, the limewash tended to fill the characteristic air voids in the plaster substrate, creating a more homogenous appearance. The second coat provided a more desirable level of opacity but also deposited more lime in the voids. Images of each test patch are included below.

Figure 39. Brushed-on lime putty limewash test patch with one (above) and two (below) coats.

Figure 40. Brushed-on acrylic-modified lime putty limewash test patch with one (above) and two (below) coats.

Figure 41. Brushed-on Type S limewash test patch with one (above) and two (below) coats.

Figure 42. Brushed-on Acrylic-modified Type S limewash test patch with one (above) and two (below) coats.

Based on the results of the brush application tests, the acrylic-modified Type S preparation was selected for a single test patch using the spray application method. This preparation exhibited the least amount of chalking. It also dried more opaque and therefore, would require fewer coats. Further, the lower viscosity of the Type S preparations meant that the selected wash would flow better through the spray nozzle.

Spray application provided excellent results (Figure 43). While the spray inevitably coated the air voids, it didn't fill them as seen with brushing. With only two light passes with the sprayer, the opacity of the finish was excellent and would easily conceal most of the soiling found on the plaster. As before, the acrylic additive performed well and only minimal chalking of the dried finish was observed. Overall, the spray application provided the best results of all the variations tested, creating a very thin coating that effectively masked the soiling while maintaining the appearance of the character defining surface texture of the plaster.

Figure 43. Spray-applied Acrylic-modified Type S limewash test patch.

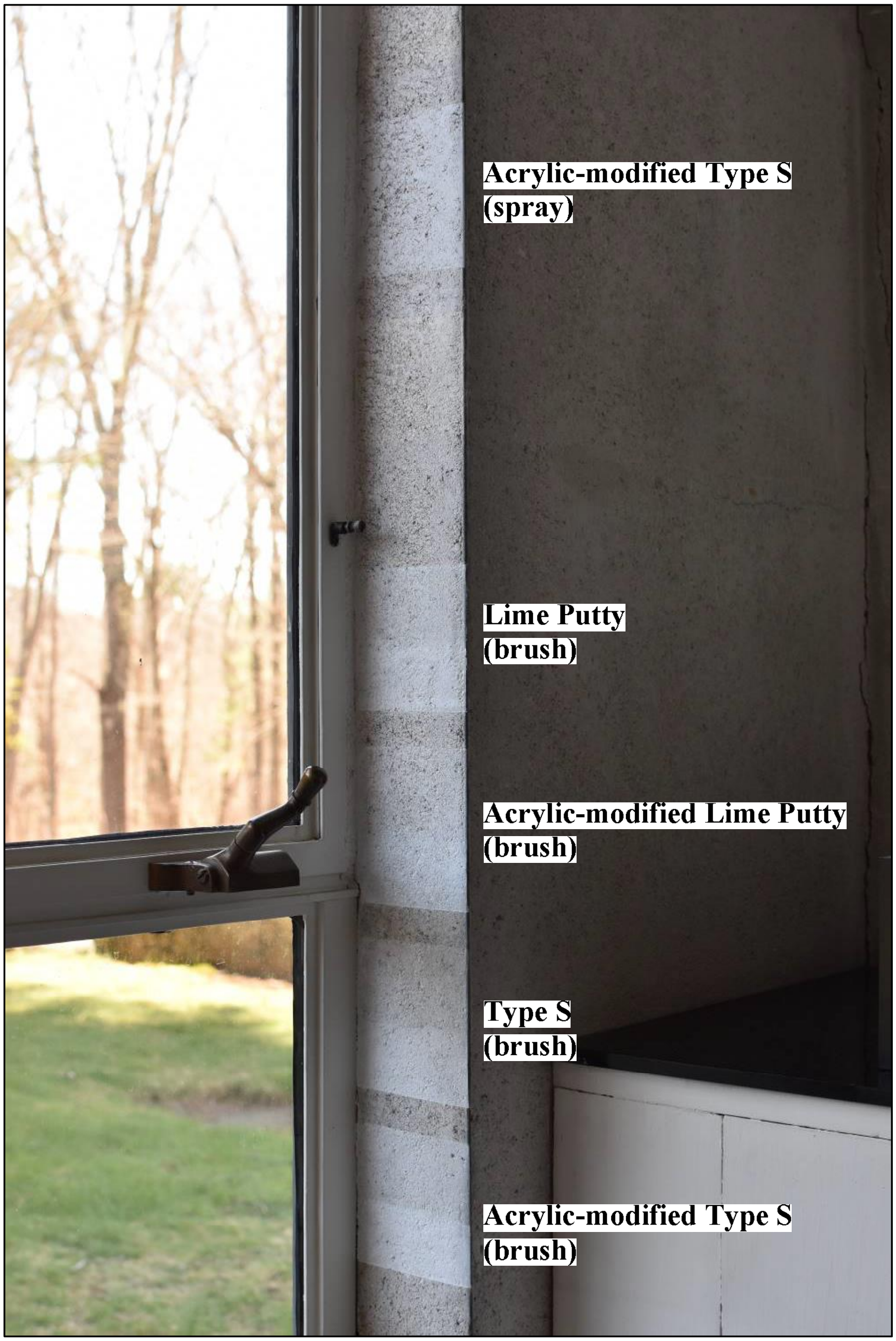


Figure 44. Limewash test area, post treatment, with variations and application methods labeled.

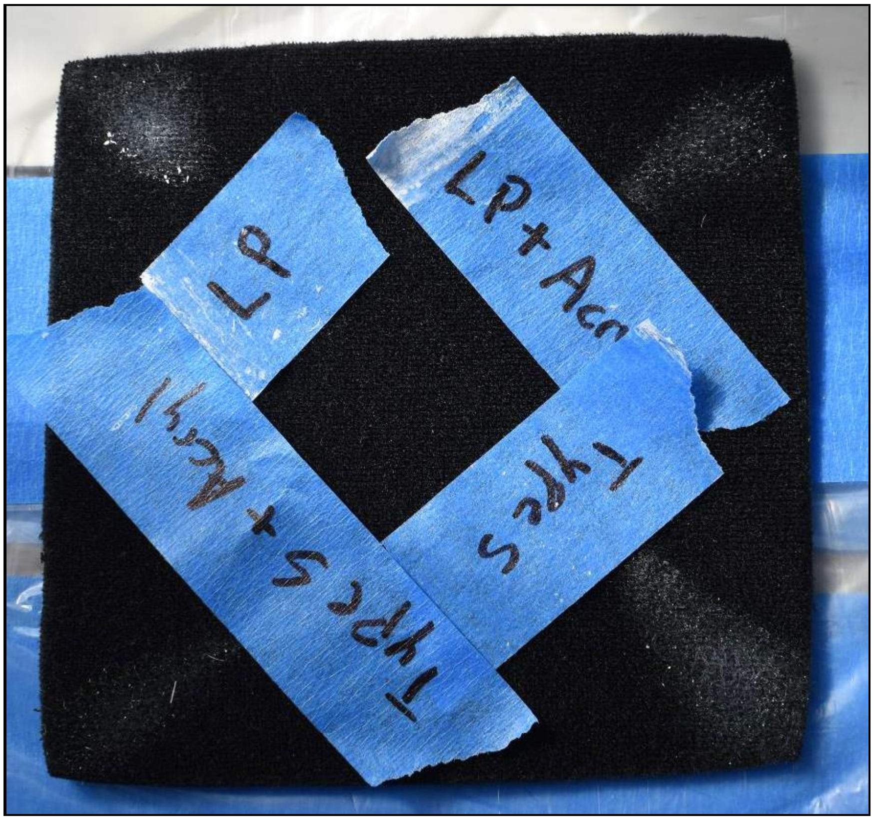


Figure 45. Chalking test cloth with residue from brush applications of (clockwise from top left corner) lime putty, acrylic-modified lime putty, Type S, and acrylic-modified Type S limewash variations.

With the application method and composition of the limewash determined, JBC sought to create a custom tinted wash that would approximate the appearance of unsoiled acoustic plaster. Several pigment combinations were developed in JBC's laboratory to match the reference color of the plaster recorded in the field (PPG 1006-1 "Gypsum"). However, after comparison of samples of each finish with the plaster *in situ,* it was determined that only one of these might provide an appropriate color match (Figure 46). The selected pigmented wash contained 6 parts Type S hydrated lime, 16 parts diluted (1:10) Acryl 60, and 1/128 part light raw umber pigment (manufactured by Rockwood, available from Edison Coatings, stock no. j4605). This was spray-applied (two light coats) to test area adjacent to the fire place in two concentrations: one at full strength and one with twice the amount of limewash to pigment (i.e. 50% less pigment). Both concentrations seemed too white to match the existing plaster. Otherwise, the application verified the validity of the treatment.

Figure 46. Tinted limewash samples (prepared off-site) compared to plaster above living room fireplace mantle (sample at far left selected for test).

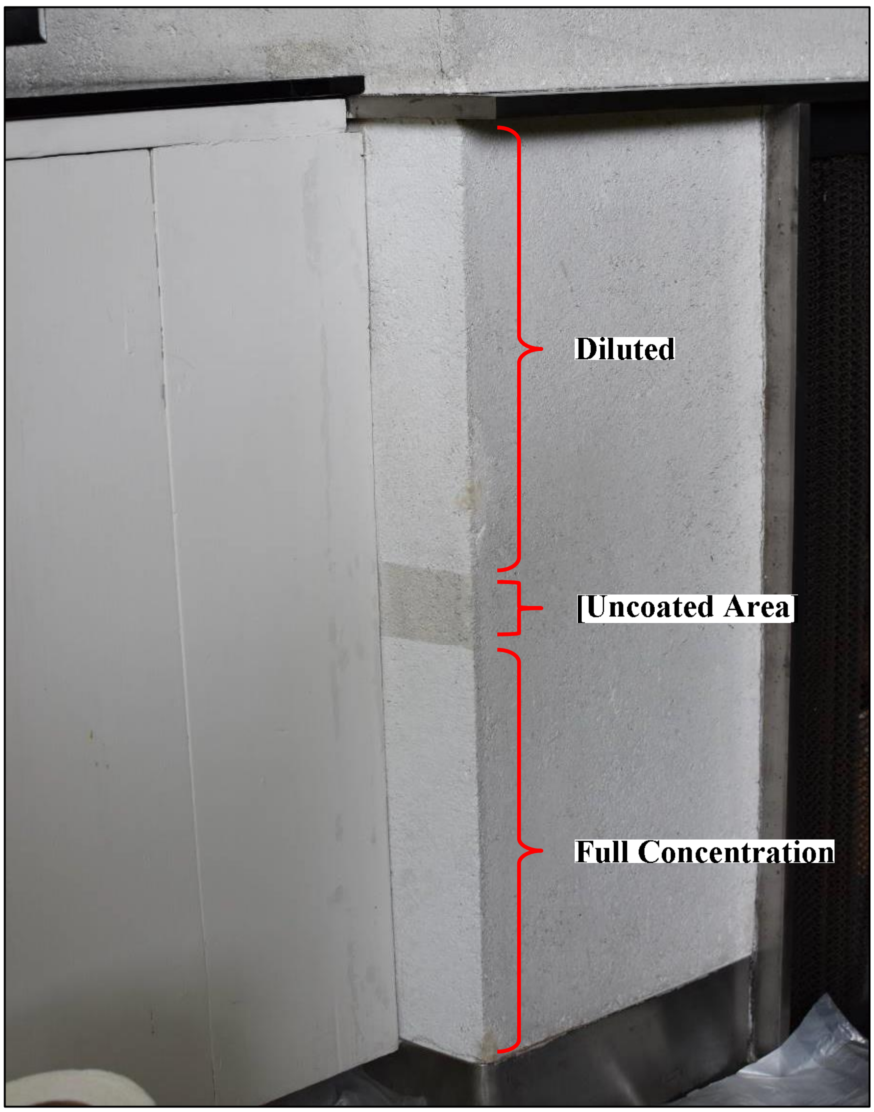


Figure 47. Tinted limewash test area with concentrations labeled.

E. Conclusions

1. Latex Poultice Tests

Most of the poultices tested caused a yellow discoloration of the plaster. The exception to this was MasonRE Latex 20, which removed surface soiling as well as a small amount of friable plaster. Unfortunately, the test area did not include areas of plaster exhibiting water stains or other forms of subsurface staining (these stains are located in more obtrusive areas than the one selected for testing). Therefore, the effect of the latex poultices on this form of staining was not determined.

2. Abrasive Cleaning Tests

Both of the abrasive cleaning products tested removed minor surface soiling. However, neither worked to the same level of effectiveness as the latex poultices. Areas cleaned using abrasives were indistinguishable from soiled areas.

3. Coating Tests

Testing determined that a limewash based on Type S hydrated lime modified with acrylic can be applied to the acoustic plaster with little or no adverse effect to the character defining texture of the material. A diluted acrylic additive successfully mitigated the tendency of limewash to chalk. This makes limewash a more suitable treatment for the house museum where chalking lime could rub off on visitors clothing or historic furnishings. Limewash has an additional advantage in this application in that it can cover water stains and other subsurface stains that may be difficult if not impossible to remove using true cleaning methods.

Attempts to develop an appropriate color tinted limewash were unsuccessful. All of the color variations prepared by JBC appeared too light in comparison with the plaster. This was, in part, due to the indirect method of matching a cleaner area of the plaster to a color reference and developing tinted limewash preparations off-site to match this color rather than directly matching to the plaster *in situ*. Further difficulties arise from the fact that the soiled plaster is not strictly monochrome in appearance, exhibiting many different hues. The “target” color of the original plaster (i.e. the color to be reproduced) is therefore somewhat subjective and should be clearly defined before additional tests or mock-ups are performed.

F. Treatment Recommendations

As a result of testing, JBC recommends that the soiled and stained acoustical plaster located in the living and dining rooms and study be coated with spray-applied limewash. While a less invasive treatment would be to clean the plaster using MasonRE Latex 20, this product is unlikely to produce the desired result. MasonRE Latex 20 was effective in removing some surface soiling but also removed small amounts of plaster. Further, its effectiveness on subsurface staining is unknown.

The limewash should be prepared using a ratio of three parts Type S hydrated lime to eight parts aqueous acrylic solution (Acryl 60 diluted 1:10 with water). The prepared limewash should be thoroughly mixed to ensure adequate dispersion of lime particles and should be passed through a #30 sieve or household strainer to remove any large lime particles.

Pigment may be added to the limewash to more closely approximate the original or "target" color of the plaster. Only natural, light stable pigments should be used. Tinted limewash preparations should be tested in an unobtrusive area on the original plaster as the properties of this material may change the color of the coating.

The plaster should be moistened with water and patted dry before the application of limewash. The limewash should be applied using HVLP spray equipment or similar equipment capable of producing a fine, nebulized mist. The limewash should be regularly stirred or agitated in the sprayer's canister as lime particles can quickly fall out of suspension. Care should be taken to minimize the number of passes, overlap, or coats applied in order to produce thinnest possible coating with the desired opacity. Two coats produced the desired effect in testing, however, additional testing using the same equipment that will be used to execute the full-scale work should conducted to determine the best approach.

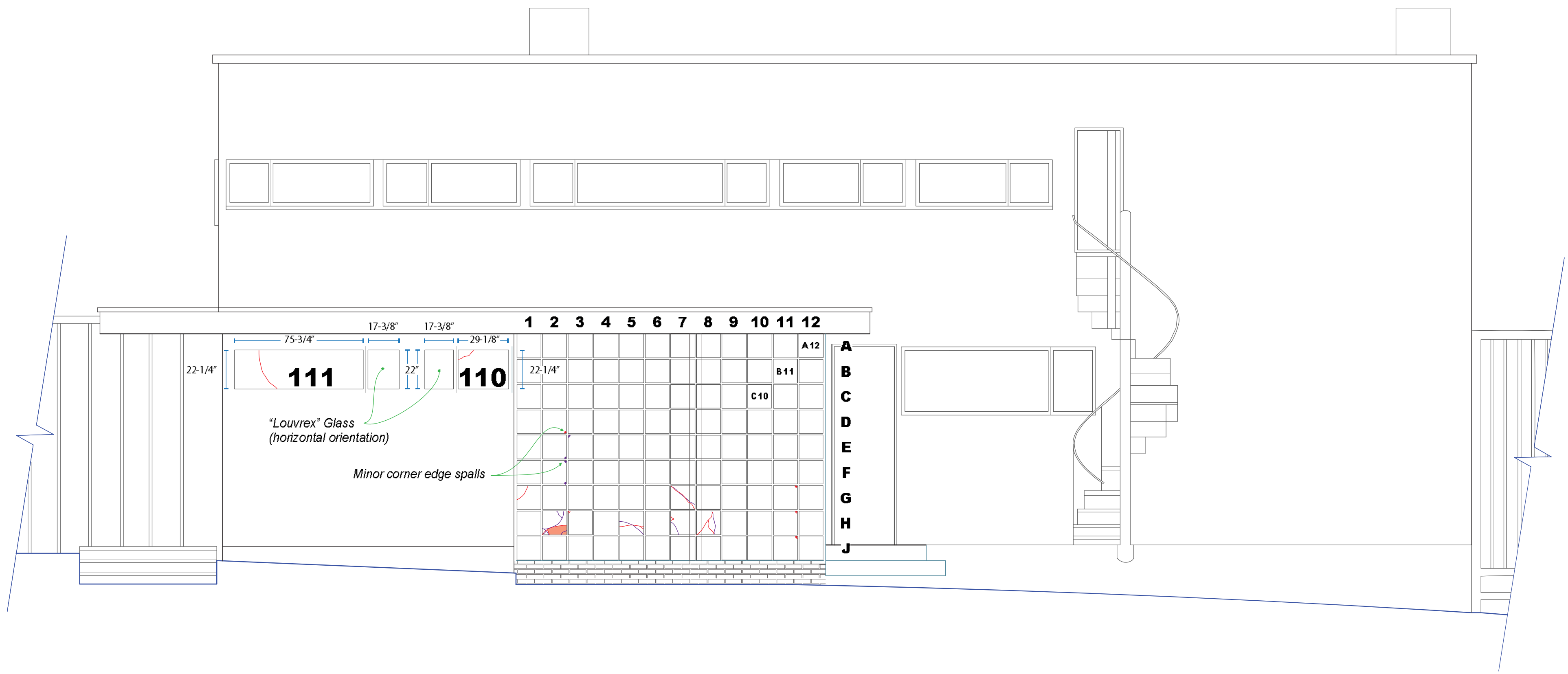
Limewashed surfaces should be protected from direct sunlight or other sources of heat (e.g. forced-air heating) to prevent premature drying. If necessary, periodically mist the limewash with water and/or cover it with a damp cloth while it is curing. Premature drying may cause the limewash to flake-off or chalk.

Limewash test patches should not be over-coated with additional limewash as this will result in an overly-opaque and unsatisfactory appearance. The test patches may be removed by lightly dabbing the surface with a sponge dampened with water. If this does not produce the desired effect, household variety white vinegar may be used instead of water. Care should be taken not to abrade the surface or allow the plaster to become saturated.

Darker colored stains or stains that bleed through the limewash may require spot coating using limewash and a small artist's brush.

APPENDIX A
Condition Drawings: Glass

Gropius House



GLASS CONDITIONS

CRACK

MISSING

CRACK ON REVERSE (INTERIOR-FACING) SIDE (GLASS BLOCK)

GLASS SURVEY

NORTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

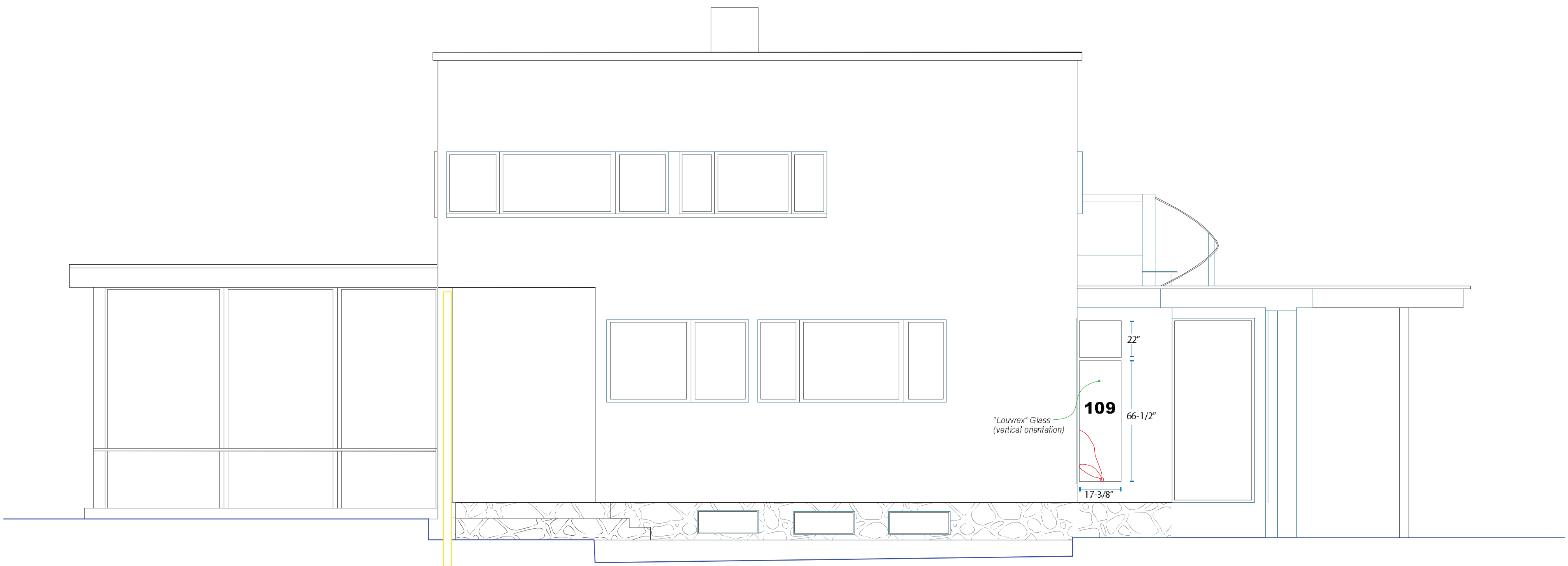
GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
1 OF 3



GLASS CONDITIONS

CRACK

MISSING

GLASS SURVEY

EAST ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE
LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
2 OF 3

GLASS CONDITIONS

- CRACK
- MISSING

GLASS SURVEY

SOUTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC. ARCHITECTURAL CONSERVATORS	GROPIUS HOUSE LINCOLN, MASSACHUSETTS	NOT FOR CONSTRUCTION	SURVEY DATE OCT. 28-30, 2015	SHEET 3 OF 3

APPENDIX B
Structural Assessment of Glass Block Wall

Gropius House

20 November 2015

Mary Jablonski
Jablonski Building Conservation, Inc.
40 West 27th Street #1201
New York, NY 10001

Reference: Gropius House Glass Entry Wall - Conditions Assessment

Dear Mary:

It is a pleasure to present the findings from the Conditions Assessment of the Glass Block Entry Wall at the Walter Gropius House in Lincoln, Massachusetts in the following report.

Executive Summary

We determined the cracking in the glass block wall to be caused by shear stress from the corrosion of the base of the steel channel to the east pushing against the glass. We recommend that the channel and the broken glass block be replaced. Re-caulking the perimeter of wall will prevent additional water infiltration.

Introduction

We visited the Gropius House on 28/October/2015 to survey the condition of the glass block entry wall, assess its integrity and make recommendations for ways to repair it.

For the purposes of this report, the entry wall is considered situated on the north elevation of the house. The south side of the wall faces the entry vestibule, while the north side faces the grounds.

Description

A covered walkway connects the driveway to the main entry of the house. A 7' long vestibule around the steps leading up to the east facing entry door is partially enclosed by the walkway roof above, the wall of the house to the south, and a glass block wall to the north. The glass block wall continues 5' to the west of the entry door to form the north wall of the interior vestibule.

The structure of the covered walkway is concealed above a ceiling and does not appear to rely on the glass block for support.

The glass block entry wall is constructed of 12" by 12" by 4" deep nominal double wall glass blocks. The blocks are mortared together to form a 10' high by 12' long (10 block high by 12 block long) glass wall along the north side of the main entry vestibule. The blocks sit on a single wythe brick foundation wall. Five (5) courses of brick are apparent above grade; the depth below grade is unknown. The bed joints in the glass block portion of the wall are reinforced with double 1/8" wire set into a hard mortar. The outside surface of the glass blocks has a fluted pattern, the direction of which (horizontal and vertical) alternates from course to course.

A 5" structural steel channel section, oriented so that the wall nests between the flanges, frames the east end of the glass wall. A layer of cork board is apparent adjacent to the web of the steel with a vertical mortar joint constructed between the cork and the outer edge of the glass block. The vertical joint between the flanges of the channel and the glass block is filled with a rope backer material and caulking.

The west end of the glass wall forms an outside corner with a board finished (non-glass) wall. A 2" wide steel plate, wrapped in exposed sheet metal to form the corner, encloses the end of the glass. The cork, mortar, rope backer and caulking are similar to the east end.

The top edge of the glass block is concealed by the ceiling of the roof structure. We were not able to view the detail above the ceiling; however the rope backer and caulking joint is similar.

The following photographs provide a general layout of the glass block wall.

Overall layout from the north

Overall layout from the west

Individual Glass Block

Noted Conditions and Recommendations

The following conditions were noted at the site, and are accompanied by our *recommendations.*

---

1. Glass Block Cracking

Condition:

We observed cracking in approximately 8 locations within the 2nd and 3rd courses of the glass block wall, on both the north and south sides. The glass has remained tight and intact adjacent to the cracks in all but one location on the north side (see Wire Reinforcement Surface Corrosion section for photo) where loss occurred. The cracks generally have a horizontal component to their direction, the pattern of which indicates a local horizontal shear stress not present at other elevations of the wall. See next section for probable cause of shear stress.

Recommended Repair:

We recommend that the unit suffering glass loss be replaced. There is no structural reason to require replacement of cracked units whose glass has remained in-tact.

---

2. Corroded Steel Channel Framing East End of Wall

Condition:

Significant corrosion is visible on the web of the channel at the base of the east end of the wall. The likely cause of the corrosion is moisture from snow that is often piled against the channel in the winter. Corrosion from steel expands approximately 10 times its volume, and has done so in this case in a lamellar pattern. It appears that as the corrosion grew on the west side of the web it pushed against the glass block wall introducing a shear stress into the wall. Once contact was established between the corroded web and glass wall, further corrosive expansion pushed the base of the steel channel to the east causing a visible deflection.

Recommended Repair:

Ultimately we recommend that the channel be replaced with a corrosion resistant material; however, in order to do this mindfully the connection at the top of the steel channel above the ceiling must be understood and addressed. Obtaining and studying the structural drawings for the house might give some insight to the detail above the ceiling. Removing a few of the fascia boards along the side of the overhang would allow a direct look at the top of the channel and would likely be required for installation of a new steel channel.

3. Caulking Failure at West End of Wall and Ceiling

Condition:

The caulking has failed leaving the rope backer exposed on all edges of the wall.

Recommended Repair:

The caulking and backer should be replaced with materials compatible with the adjacent surfaces and the environment.

Caulking Failure at West End of Wall and Ceiling, continued

4. Wire Reinforcement Surface Corrosion

Condition:

Minor surface corrosion visible in 1/8" diameter steel wire due to exposure to the elements following glass loss at the failed block.

Recommended Repair:

We recommend that the wire be coated with r and embedded in mortar prior to replacement

It has been a pleasure to perform this conditions assessment. If you have any questions regarding this report, please do not hesitate to contact this office.

Respectfully Yours,

Cirrus Structural Engineering, LLC

Elizabeth Acly, PE
Principal

APPENDIX C
Petrographic Analysis of Glass Block Wall Mortar

Gropius House

HIGHBRIDGE
MATERIALS CONSULTING, INC.

404 Irvington Street
Pleasantville, NY 10570
Phone: (914) 502-0100
Fax: (914) 502-0099
www.highbridgematerials.com

MORTAR ANALYSIS REPORT

Client:	Jablonski Building Conservation, Inc.	**Client ID:**	JABL001
Project:	Gropius House	**Report #:**	SL1000-02
Location:	Lincoln, MA	**Date Received:**	11/16/15
Sample Type:	Acoustical plaster and masonry mortar	**Report Date:**	01/13/16
Delivered by:	Client (E. FitzGerald)	**Petrographer:**	J. Walsh
		Chemist:	H. Hartshorn
		Analyst:	K. Riley
		Page 1 of 13	

Report Summary

- One mortar sample from the Gropius House in Lincoln, MA is examined for this report.
- The examined sample is identified as a cement-lime mixture with a natural sand consisting of granitic, metamorphic, and volcanic components. The binder contains a gray portland cement and a dolomitic dry hydrated lime.
- The proportions of the mix are consistent with a properly sanded Type N formulation (historic Type B). The cement to lime ratio is estimated at 1 : 0.64 while the binder to sand ratio is estimated at 1 : 2.5 by volume.
  The mortar has a gray color except where discolored by carbonation (Munsell code approximately N 5.25), and the sand contributes some color and textural variegation to the weathered surfaces.
  The air content is estimated at 6-8% by volume on average and the mortar is well consolidated and compacted. The cured product is hard, indurate, and impermeable.
- Overall, the mortar appears to be in generally sound condition despite some minor microscopic cracking. Carbonation is complete over the thickness examined.
- Corrosion product is identified along some surfaces though the source is not apparent from the provided sample.
- The presence of secondary mineralizations as well as biological growth and soiling on bed surfaces suggests that the mortar may be disbonded from the glass block substrate.
- A more detailed discussion of these findings may be found in the “Petrographic Findings and Discussion” sections beginning on page 3 of this report.

1. Introduction

On November 16, 2015, Highbridge received two samples from Mr. Edward FitzGerald of Jablonski Building Conservation reported to have been taken from the Gropius House in Lincoln, MA. The samples are identified as follows:

GH-001: Mortar removed from exterior glass block wall
GH-007: Acoustical plaster removed from water-damaged interior wall. Likely "Stucoustic" brand manufactured by California Stucco Products Co.

At the client's request, a compositional analysis is performed on the mortar sample. The testing includes petrographic examination and chemical analysis to identify constituents, estimate proportions, and assess overall condition. An acid digestion to recover a sand sample for description and gradation is excluded from the analysis. The results of this testing are presented below. The client has also requested a petrographic examination on the small fragments of acoustical plaster, and these results are presented under separate cover in Highbridge Report SL1000-01.

2. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained within ASTM C1324. Data collection is performed by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 4 of ASTM C856. Chemical analysis is conducted according to the procedures outlined in ASTM C1324. Water, carbon dioxide, and aggregate weight percentages are determined gravimetrically. Oxide weight percentages are determined by inductively coupled plasma-optical emission spectroscopy (ICP-OES). The methods are modified when accounting for dolomitic lime. Rather than approximating lime through DTA with possible errors due to carbonated lime, dolomitic lime is instead calculated directly from the chemical analysis by simultaneous equations based on typical dolomitic lime chemistry.

3. Standard of Care

Highbridge has performed its services in conformance with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time. Interpretations and results are based strictly on samples provided and/or examined.

4. Confidentiality Statement

This report presents the results of laboratory testing requested by the client to satisfy specific project requirements. As such, the client has the right to use this report as necessary in any commercial matters related to the referenced project. Any reproduction of this report must be done in full. In offering a more thorough analysis, it may have been necessary for Highbridge to describe proprietary laboratory methodologies or present opinions, concepts, or original research that represent the intellectual property of Highbridge Materials Consulting and its successors. These intellectual property rights are not transferred in part or in full to any other party. Presentation of any or all of the data or interpretations for purposes other than those necessary to satisfy the goals of the investigation are not permitted without the express written consent of the author. The findings may not be used for purposes outside those originally intended. Unauthorized uses include but are not limited to internet or electronic presentation for marketing purposes, presentation of findings at professional venues, or submission of scholarly articles.

5. Petrographic Findings and Discussion

5.1 - General Summary

The examined sample is identified as a cement-lime mixture with a natural sand consisting of granitic, metamorphic, and volcanic components. The binder contains a gray portland cement and a dolomitic dry hydrated lime. The proportions of the mix are consistent with a properly sanded Type N formulation (historic Type B). The cement to lime ratio is estimated at 1 : 0.64 while the binder to sand ratio is estimated at 1 : 2.5 by volume. The mortar has a gray color except where discolored by carbonation (Munsell code approximately N 5.25), and the sand contributes some color and textural variegation to the weathered surfaces. The air content is estimated at 6-8% by volume on average and the mortar is well consolidated and compacted. The cured product is hard, indurate, and impermeable.

Overall, the mortar appears to be in generally sound condition despite some minor microscopic cracking. Carbonation is complete over the thickness examined. Corrosion product is identified along some surfaces though the source is not apparent from the provided sample. The presence of secondary mineralizations as well as biological growth and soiling on bed surfaces suggests that the mortar may be disbonded from the glass block substrate.

5.2 - Materials

The aggregate contains a mixed assemblage of granitic components, fine-grained metaclastics, metabasite, and volcanic components as well as trace heavy accessories. The granitic component consists of granite, feldspar, and moderately to highly strained quartz. The metaclastics are mostly micaceous quartzites, phyllites, and fine-grained metawackes. The metabasites have varied levels of alteration but contain amphibole and pyroxene as the primary minerals. The volcanic grains are plagioclase-rich and fine-grained siliceous particles might consist of felsite. Both the volcanic grains and the strained quartz in the granitic component are known to be alkali-reactive in concrete mixes. Though these mineralogies comprise a large component of the aggregate employed here, there is no observed deleterious reaction between the aggregate and the cement paste. No significant clay coatings or friable materials are detected. Despite the concentration of potentially reactive components, the sand is considered hard, non-porous, and durable for use in masonry mortar. The aggregate was not extracted from the mortar through acid digestion, and the appearance is not fully described. However, under low magnification of the mortar in hand sample, the sand appears moderately variegated with a mixture of semi-translucent light-colored grains and more opaque pink and grayish green grains.

The sand is somewhat sharp-textured with mostly equidimensional and minor subequant grains that are subangular in shape on average. The grain shape varies from subrounded in the coarser sizes to angular in the finer sizes. The particle size distribution is estimated petrographically rather than quantified through a gradation analysis. Based on petrographic observations, the aggregate is medium-grained and broadly graded. The nominal top size is estimated at the No. 8 mesh with most passing, and there appears to be a peak abundance between the No. 16 and No. 30 sieves. The fines content is low. It is possible that the aggregate is compliant with modern masonry sand gradations as specified by ASTM C144 though this is not confirmed by a sand extraction.

The binder is a mixture of gray portland cement and dolomitic dry hydrated lime. No pozzolanic or pigment additions are present. The binder matrix appears to have been homogeneously developed with a moderate to moderately low capillary porosity. The cement hydration is advanced. Still, residual portland cement grains are detected in moderate abundance. The cement grains are present as agglomerates of former calcium silicate with interstitial iron-bearing ferrite. There is also a notable abundance of ferrite distributed throughout the binder matrix. The ferrite identifies the cement as a gray rather than white variety. This is confirmed by the measured chemistry, which has an SiO_2/Fe_2O_3 ratio of 5.6. The cement has a fine to medium grind with most grains retained between the No. 100 and No. 200 sieves. None of the cement grains have sizes that appear to exceed the No. 100 mesh. These cement textures are consistent with an early to mid-twentieth century product and the ca. 1937-38 construction date provided by the client.

There is also a moderately high abundance of fine-grained lime inclusions. These grains are all carbonated and internally nondescript except for rare inclusions of burned mica from the original lime rock. Most are less than 150 µm, and none exceed 0.5 millimeters in size. The chemical analysis suggests that the lime is a dolomitic rather than high-calcium variety. The particulate texture of the lime suggests the use of a prepackaged dry hydrate product. This is also consistent with the reported ca. 1937-38 construction date. Prepackaged dry hydrates became commercially available in the United States ca. 1910 and were used almost exclusively by the 1930s.

5.3 - Component Proportions
Chemical analysis is performed on the mortar sample, and the results are summarized in Section 6 below. Compared to modern specifications for masonry mortar described in ASTM C270, the mortar is estimated to be in the range of a properly sanded Type N mixture (historic Type B). The cement to lime ratio is estimated at 1 : 0.64, and the corresponding binder to sand ratio is calculated at 1 : 2.5 by volume.

Though modern cements are often considered "harder" than their historic counterparts, the approximate hand sample qualities of the provided sample do not appear to differ significantly from what might be expected of a modern Type N mix with a typical 1 : 1 : 6 proportion. Of course, this is a general statement that is not confirmed through physical testing. Nevertheless, it may be safe to start from the premise that the chemically determined mortar proportions can be used to estimate the physical properties of the mixture. While good restoration practice usually stresses the use of more lime-rich formulations, the type, condition, and exposure of the masonry should always be considered in any repair strategy. The author is not fully aware of these site conditions and it is not within the scope of the testing laboratory to recommend replication mixtures.

5.4 - Condition and Service Performance
Based on the sample pieces examined, the mortar components were mostly well mixed with no sand streaks or binder lumps. The original mix water appears to have been well incorporated with no signs of late retempering. The mortar is compacted, and the air content is estimated at 6-8% by volume on average. The air content is not considered excessive and the mortar is reasonably well consolidated. The air structure varies both within and between pieces but is mostly observed as coarse, irregular voids. The cured product is hard, indurate, and not noticeably water absorptive. These features are consistent with the estimated proportions of the cement-rich mixture.

The binder matrix is fully carbonated, which is usually a normal and desirable consequence of long-term curing. Along surfaces, the carbonation has resulted in a noticeable color change from medium gray to a rich salmon tone. This is not unusual in older portland cement mortars and is often mistaken as an intentional pigmentation. Carbonation results in a reduction of pH due to consumption of calcium hydroxide. This can cause the depassivation of any encased metals and make these susceptible to corrosion. There are semi-circular impressions in the mortar that might represent impressions of some type of metallic embedment. Whether or not this is correct, there is a thin layer of corrosion product opposite the tooled masonry surface. The laboratory is not aware of the construction details. However, it should be noted that carbonated mortar does not offer any protection to encased steel.

In the pieces examined in thin section, there is a low abundance of sharp, hairline cracks parallel to the outer surface. In one piece, there are two main cracks at three and five millimeter depths from the outer surface with fewer subordinate cracks. In another piece, there is a single crack approximately one centimeter from the tooled surface. There is not obvious pattern to the cracking and it is not known if it relates to the possible steel corrosion. Despite this microscopic cracking, the mortar material itself appears rather sound and indurate based on the pieces provided.

Though no secondary mineralizations are observed in the bulk of the mortar, there is some evidence of calcite scale on one bed surface. In thin section, there is one surface with a thin deposit of a clear, viscous-looking material. Though its identification is not confirmed, its association with glass block might suggest the development of a small amount of hydrous silica or an alkali-silica reaction gel. Much of the material is not isotropic and this would indicate some age if it were a reaction gel. There is no evidence for any distress related to this deposit. On other bed surfaces, there is a thin layer of soiling and biological growth. Again, these are only observed on the bed surfaces and do not penetrate the depth of the mortar. However, the presence of these external contaminants suggests that the mortar may be disbonded from the glass block masonry, at least in the sampled area.

6. Chemical Analysis

Table 6.1: Chemical Analysis Results

Sample ID	**GH-001**
Component (wgt. %)	
SiO_2	3.89
CaO	13.88
MgO	2.27
Al_2O_3	0.85
Fe_2O_3	0.70
Insoluble residue	63.94
LOI to 110°C	1.87
LOI 110°C-550°C	3.09
LOI 550°C-950°C	10.01
Measured Totals	**100.48**

Table 6.2: Calculated Components

Sample ID	**GH-001**
Component	
Portland cement (wgt. %)	21
Masonry cement (wgt. %)	Not detected
Lime expressed as dry hydrate (wgt. %)	5.7
Supplementary cementitious materials (wgt. %)	Not detected
Pigment (wgt. %)	Not detected
Sand (wgt. %)	73
Cement : lime ratio (by volume with lime as dry hydrate)	1 : 0.64
Binder : sand ratio (by volume with lime as dry hydrate)	1 : 2.5

Notes:
1. The cement weight percentage is calculated assuming an original SiO_2 content of 21% in gray portland cement. Sufficient CaO and MgO are subtracted from the measured values to satisfy this cement content. The remaining CaO and MgO are reported as their respective dry hydroxides through molecular weight conversion. This presents the weight percentage of lime in dry hydrate form. Sand is taken directly from the acid-insoluble residue. Reported weight percentages are then normalized to 100%. Volumetric ratios are calculated assuming bulk weights for portland cement, hydrated lime, and damp, loose sand of 94 lbs./ft.^{3}, 40 lbs./ft.^{3}, and 80 lbs./ft.^{3} respectively.

Respectfully submitted,

Heather Hartshorn

Heather Hartshorn
Staff Scientist/ Chemist
Highbridge Materials Consulting, Inc.

Reviewed by,

John J. Walsh
President/ Senior Petrographer
Highbridge Materials Consulting, Inc.

Appendix I: Visual Description of Sample as Received

Sample ID	**GH-001**
Description	The sample consists of four small mortar pieces weighing a total of 37 grams. The joint thickness is approximately 0.25" with up to 0.75" of the depth and 1.75" of the joint length represented. The depth is represented up to an area where there is residual corrosion product. This is present on the rear surfaces of the mortar pieces and may represent the location of some reinforcement feature.
Surfaces	Tooled surfaces are concave with moderate relief, medium sand exposure. The entire tooled surface is covered with a dark brownish gray soiling. Bed surfaces are compact. One side of the bed surfaces on each piece is sandy to slightly creamy-textured and soiled within the front five millimeters of the tooled surface. The other bed surface on each piece is somewhat creamy-textured and covered with a nearly white, scaly mineral deposit.
Hardness / Friability	The paste is hard, and the mortar is nonfriable.
Appearance	Freshly exposed surfaces have a subvitreous luster and are gray in color (Munsell code approximately N5.25).
Other Details	No cracking or binder inclusions are visible in hand sample. There is a low abundance of white mineral deposit much less than one millimeter in diameter and possibly filling air-voids. All surfaces are not noticeably water absorptive.

Appendix II: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
µm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, Highbridge also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.

Figure 1: Photographs of the mortar sample provided to Highbridge for examination. The mortar is uniform in appearance with a gray color. The cured product is hard, nonfriable, and not noticeably water absorptive. The lower image shows a closer view of the tooled surface. The exposed aggregate contributes some color and textural variegation to the weathered joint face. However, the overall color is much darker than the fresh paste due to soiling at the surface.

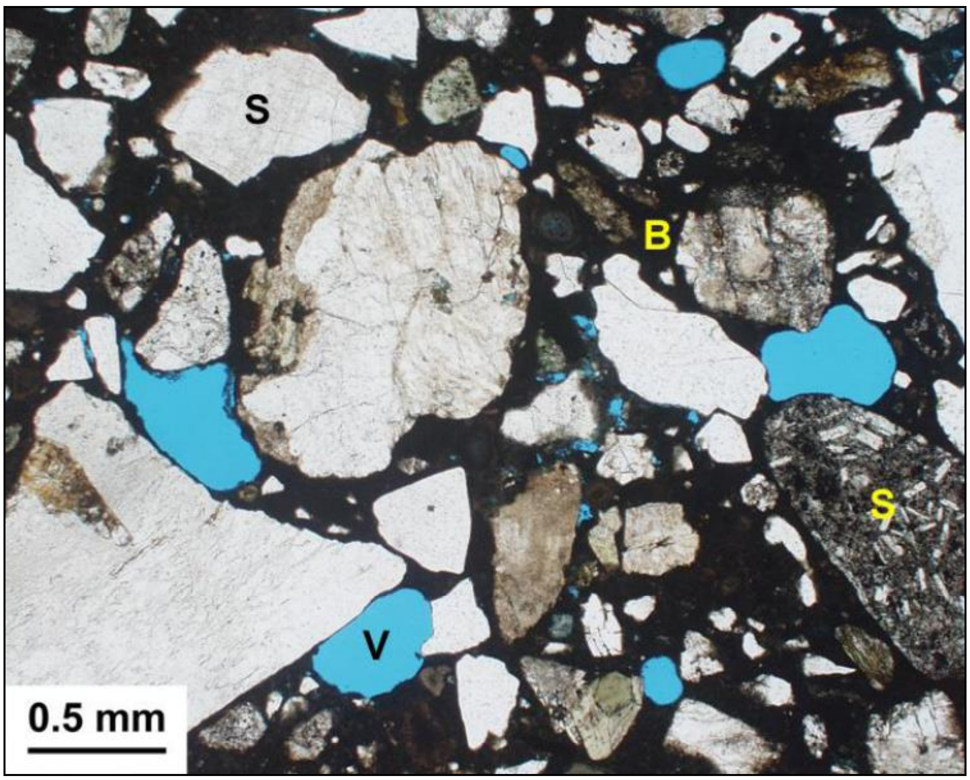


Figure 2: PPL photomicrograph illustrating the overall microtexture of the mortar. The sample is impregnated with a low-viscosity, blue-dyed epoxy in order to highlight cracks, pores, and voids. The homogeneously developed binder matrix (B) has a moderate to moderately low capillary porosity as indicated by lack of absorption of the dyed epoxy. Sand grains (S) are somewhat sharp-textured and well distributed throughout the paste. The content of air-voids (V) is somewhat high but not overly excessive. Overall, the mortar is compacted and rather well consolidated.

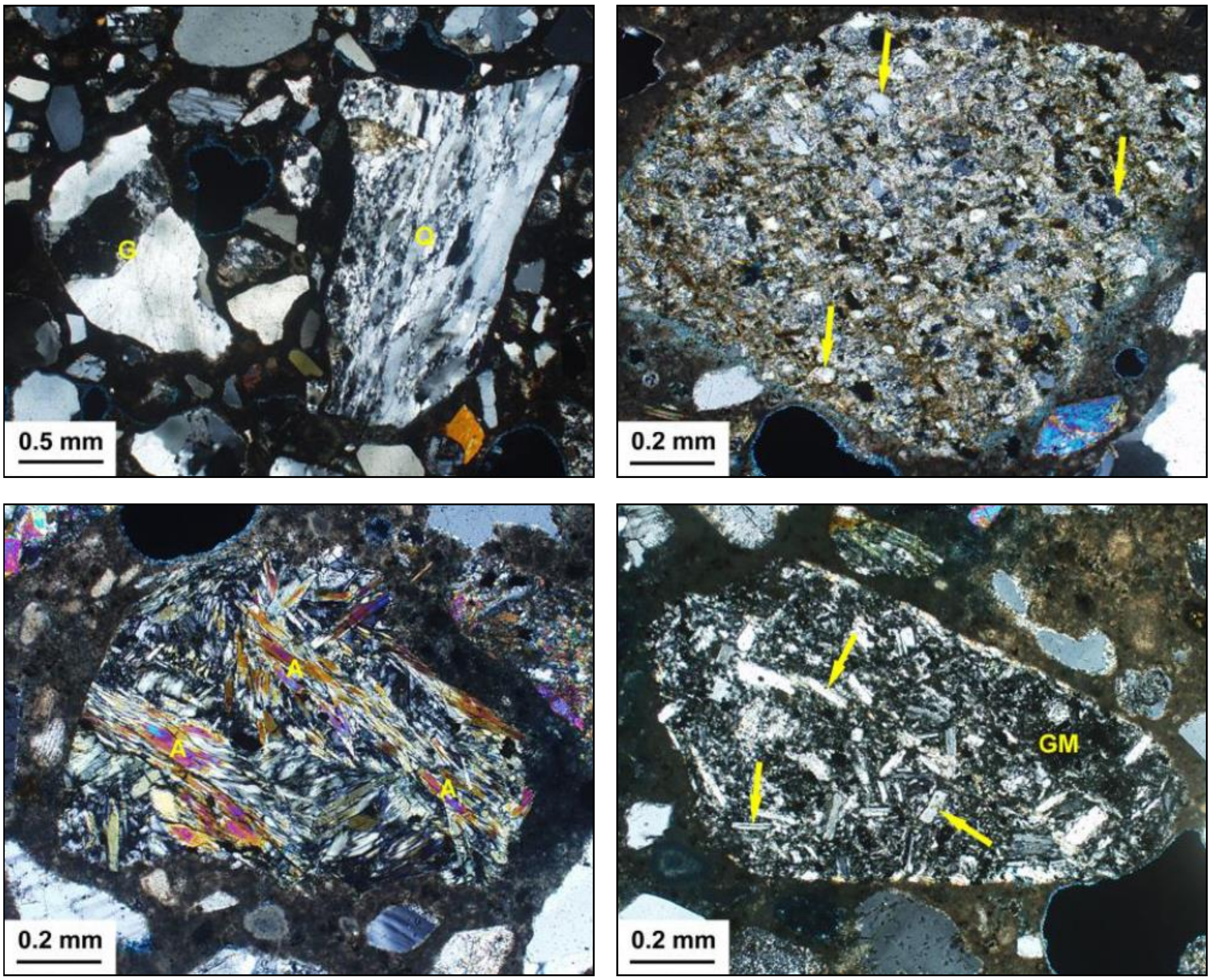
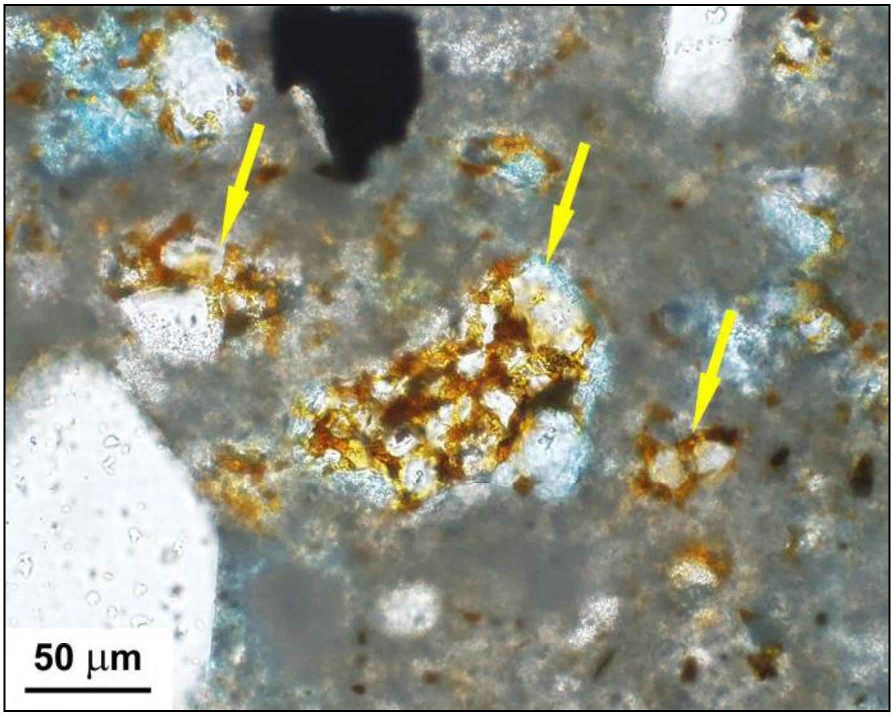


Figure 3: XPL photomicrographs illustrating the mineralogy of the sand, which consists of a mixture of granitic components, fine-grained metaclastics, metabasite, and volcanic components. (Upper left image) Particles belonging to the granitic component are depicted. A granite particle (G) is shown as well as a quartzite grain (Q) containing highly strained quartz. (Upper right image) A metaclastic particle is shown containing a number of fine-grained quartz inclusions (arrows). (Lower left image) A metabasite grain is depicted that contains amphibole (A) as a primary mineral. (Lower right image) A volcanic particle is shown containing an abundance of plagioclase (arrows) in a fine-grained groundmass (GM).



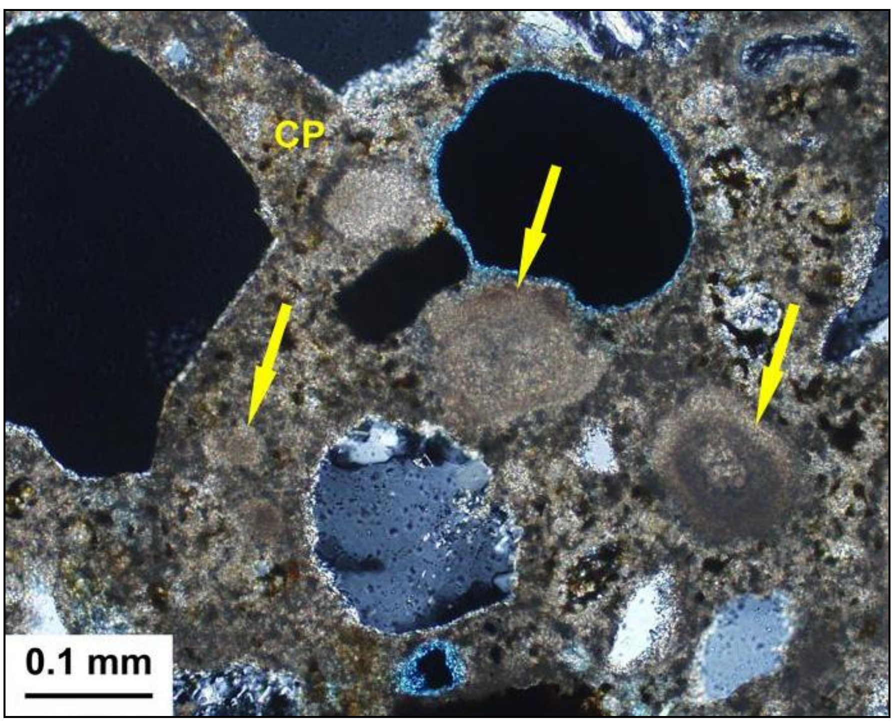


Figure 4: PPL photomicrographs illustrating the binder characteristics identified in the mortar sample. (Upper image) Residual portland cement grains (arrows) are present in moderate abundance as mostly hydrated agglomerates of former calcium silicate with interstitial iron-bearing ferrite. The ferrite identifies the cement as a gray rather than white variety. The ferrite has a distinctly orange color in the area shown in this photograph. This discoloration corresponds to a visual discoloration from gray to salmon. This is not unusual in older carbonated cement mortars. The cement has a fine to medium grind, which is consistent with the 1937-38 construction date provided by the client. (Lower image) There is a moderately high abundance of nondescript lime inclusions (arrows) that are mostly less than 150 µm in size. All of these lime grains are carbonated and well distributed throughout the carbonated paste (CP). The particulate texture of the lime suggests a product that was added as a prepackaged dry hydrate.

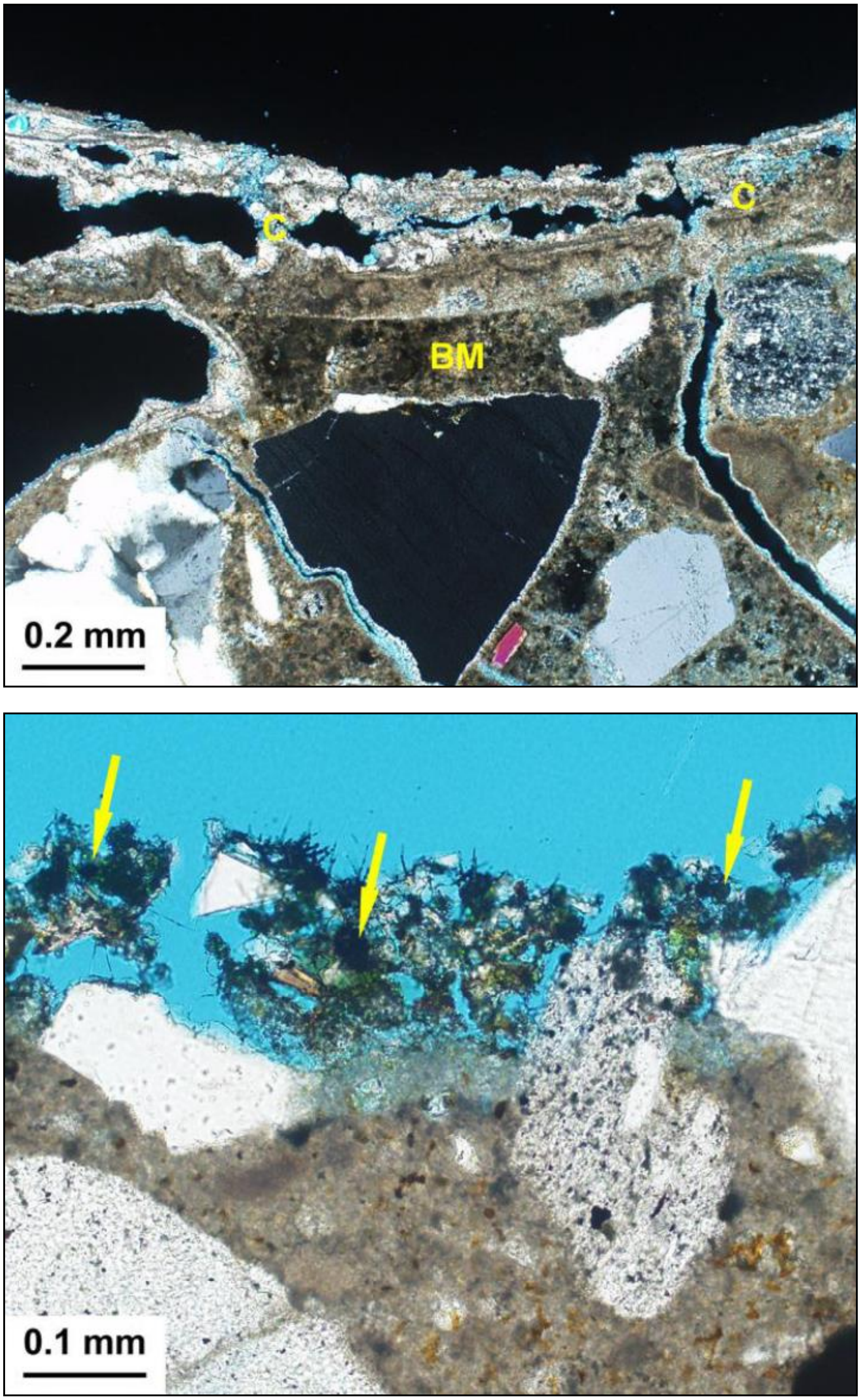
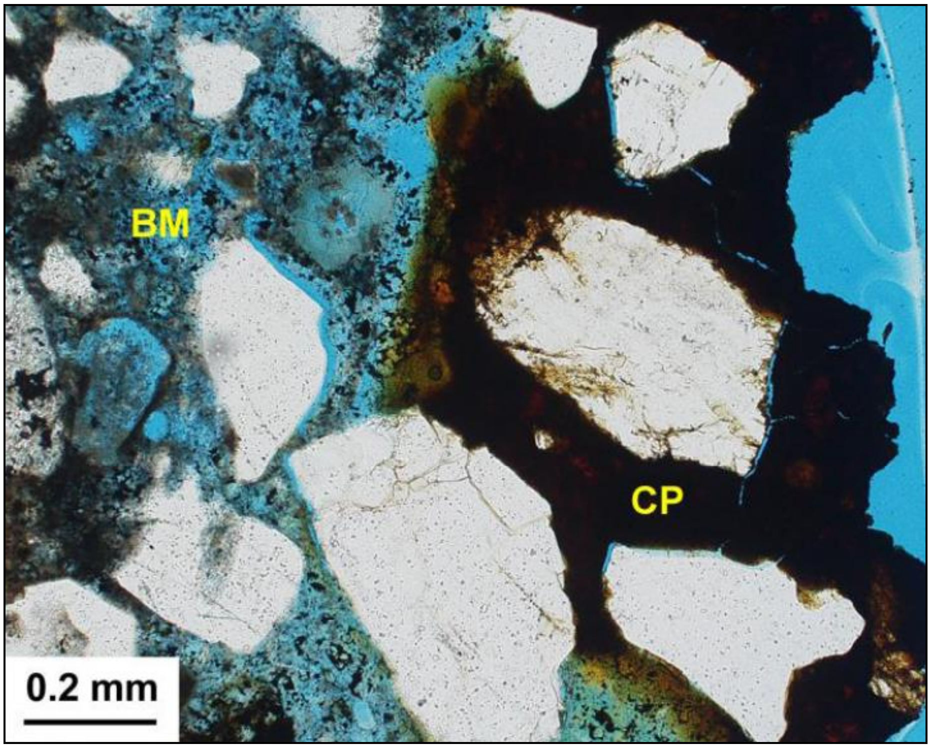


Figure 5: Photomicrographs illustrating secondary effects observed in the mortar sample. (Upper XPL image) One bed surface is covered with thin calcite scale (C). This is differentiated from the carbonated binder matrix (BM) by the coarser texture of the recrystallized carbonate. No other secondary mineralizations are observed in the examined mortar sample. (Lower PPL image) Other bed surfaces are covered with a thin layer of soiling and biological growth (arrows). These features are only observed on the surfaces of the mortar, and the bulk of the sample is considered to be in generally sound condition.



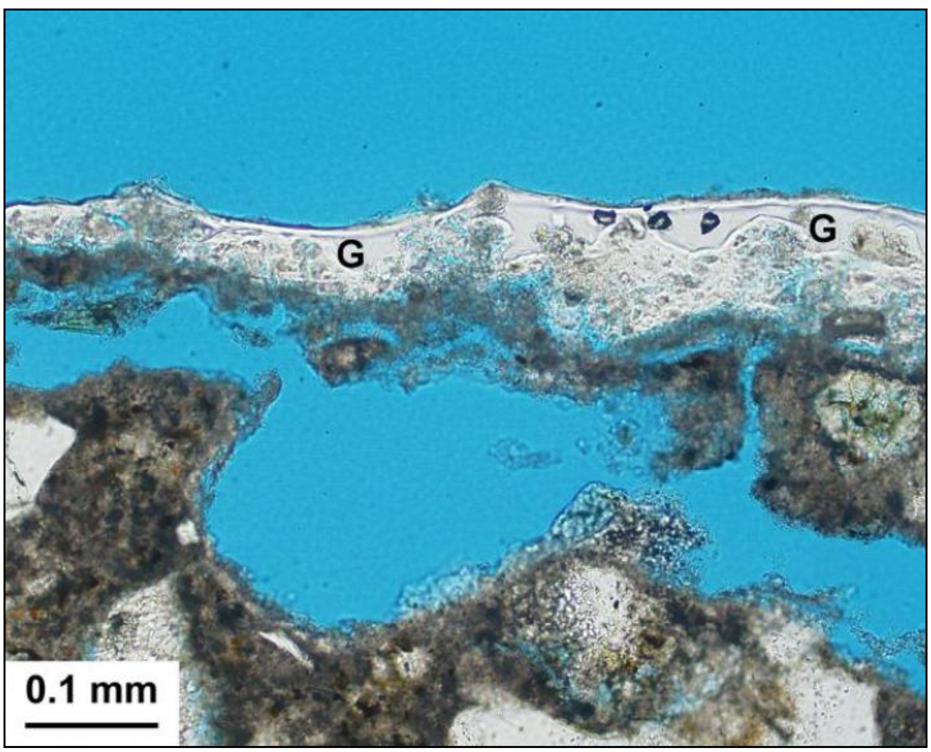


Figure 6: PPL photomicrographs illustrating secondary effects observed in the mortar sample that are potentially related to other materials in the masonry assembly. (Upper image) There is a thin layer of corrosion product (CP) opposite from the tooled joint surface. It is shown here directly adjacent to the binder matrix (BM) and enveloping sand grains. The laboratory is not aware of the construction details but it is possible that this is due to corrosion of some encased steel in the carbonated mortar. (Lower image) There is also one surface with a thin deposit of what could be a silica or alkali-silica reaction gel (G). This identification of the material is not confirmed but is likely due to the association of the bed surface with the glass block masonry units.

APPENDIX D
Petrographic and Asbestos Analysis of Acoustical Plaster

Gropius House

HIGHBRIDGE
MATERIALS CONSULTING, INC.

404 Irvington Street
Pleasantville, NY 10570
Phone: (914) 502-0100
Fax: (914) 502-0099
www.highbridgematerials.com

MATERIALS ANALYSIS REPORT

Client:	Jablonski Building Conservation, Inc.	**Client ID:**	JABL001
Project:	Gropius House	**Report #:**	SL1000-01
Location:	Lincoln, MA	**Date Received:**	11/16/15
Sample Type:	Acoustical plaster and masonry mortar	**Report Date:**	12/19/15
Delivered by:	Client (E. FitzGerald)	**Petrographer:**	J. Walsh
		Page 1 of 15	

Report Summary

- This report presents the results of a qualitative petrographic examination on small fragments of acoustical plaster sampled from the Gropius House in Lincoln, MA.
- Based on the microscopic analysis, the material is a lime-based mixture. No evidence for foaming agents is detected. The lightweight character of the plaster is largely the result of a medium-grained and narrowly graded pumice aggregate along with a woody material. Crushed marble is a relatively minor constituent. The plaster contains a fiber addition that is interpreted to be a textile rather than a mineral fiber. Some ultrafine-grained particulates are detected but an intentional pigmentation is not suspected. The cured product is soft and moderately friable.
- There is some evidence to suggest that a thin outer coating overlies the substrate plaster. This thin layer is spongier due to a high content of spherical air-voids. Sparse remnants of a simple lime paste are detected over this outer layer as well.
- Some secondary mineralizations are identified petrographically in the substrate plaster.
- A more detailed discussion of these findings may be found in the ñPetrographic Findings and Discussionò section on page 3 of this report.

1. Introduction

On November 16, 2015, Highbridge received two samples from Mr. Edward FitzGerald of Jablonski Building Conservation reported to have been taken from the Gropius House in Lincoln, MA. The samples are identified as follows:

GH-001: Mortar removed from exterior glass block wall
GH-007: Acoustical plaster removed from water-damaged interior wall. Likely ñStucousticò brand manufactured by California Stucco Products Co.

At the clientôs request, a compositional analysis is performed on the mortar sample and this will be presented under separate cover when the analysis is complete. The client has also requested a petrographic examination on the small fragments of acoustical plaster. Due to the fragmental condition of the small sample, only a qualitative examination is provided with an emphasis on identifying inorganic constituents. A chemical analysis is excluded from this testing.

2. Important Statement Regarding Detection of Asbestos Containing Materials

The possibility of asbestiform materials are discussed in this report. However, this document must not be used in lieu of a certified asbestos analysis report by an ELAP accredited laboratory or similar agency as local regulations require. Highbridge Materials Consulting is not accredited for any environmental testing and any statements made regarding ACMs cannot be used for abatement or safety assessments.

3. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained in ASTM C856. Data collection is performed or supervised by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 4 of ASTM C856.

4. Standard of Care

Highbridge has performed its services in conformance with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time. Interpretations and results are based strictly on samples provided and/or examined.

5. Confidentiality Statement

This report presents the results of laboratory testing requested by the client to satisfy specific project requirements. As such, the client has the right to use this report as necessary in any commercial matters related to the referenced project. Any reproduction of this report must be done in full. In offering a more thorough analysis, it may have been necessary for Highbridge to describe proprietary laboratory methodologies or present opinions, concepts, or original research that represent the intellectual property of Highbridge Materials Consulting and its successors. These intellectual property rights are not transferred in part or in full to any other party. Presentation of any or all of the data or interpretations for purposes other than those necessary to satisfy the goals of the investigation are not permitted without the express written consent of the author. The findings may not be used for purposes outside those originally intended. Unauthorized uses include but are not limited to internet or electronic presentation for marketing purposes, presentation of findings at professional venues, or submission of scholarly articles.

6. Petrographic Findings and Discussion

6.1 - General Summary

This report presents the results of a qualitative petrographic examination on small fragments of acoustical plaster sampled from the Gropius House in Lincoln, MA. Based on the microscopic analysis, the material is a lime-based mixture and no hydraulic components or gypsum-based binders are positively identified. No evidence for foaming agents is detected. The lightweight character of the plaster is largely the result of a medium-grained and narrowly graded pumice aggregate. A secondary aggregate appears to consist of a woody material though the identification of organic constituents is not within the scope of the petrographic examination. Some crushed marble is also detected but this is a relatively minor constituent that does not appear to have an important function. The plaster contains a fiber addition that is interpreted to be a textile rather than a mineral fiber. Some ultrafine-grained particulates are detected and these may represent a modest pigment addition. However, freshly exposed surfaces are a dull but bright white suggesting that there was no intent for an integral colorant. The cured product is soft and moderately friable.

There is some evidence to suggest that a thin outer coating overlies the substrate plaster. This thin layer is spongier due to a high content of spherical air-voids. Sparse remnants of a simple lime paste are detected over this outer layer as well. Some secondary mineralizations are identified petrographically in the substrate plaster.

6.2 - Materials

The primary aggregate is a medium-grained and narrowly graded pumice. The pumice is highly glassy and vesicular with relatively little crystalline material aside from trace phenocrysts of quartz, feldspar, and opaque phases. In some cases, the pumice is uniform and isotropic. In others, there is a distinctive flow texture with elongate, tube-like void structures. The material has a bright white color. Particles are generally equidimensional with an overall subrounded shape. However, grain surfaces have an exceptionally rough texture resulting from the microscopic embayments created by vesicles that intersect the grain boundaries. The aggregate has a nominal top size estimated at the No. 8 sieve and few grains passing the No. 30 mesh. The pumice is narrowly graded with a strong peak abundance estimated in the range of the No. 16 sieve.

An organic material that appears to be some type of wood fragment represents a secondary aggregate or filler. Highbridge does not have an expertise in organic materials and no speculation on species can be offered. The material has an orange-yellow color. The material is cellular with granules that are relatively equidimensional in shape. Particles are found mostly in the range of the No. 50 to No. 30 sieves.

Crushed carbonate grains are also identified in minor proportion and these are not derived from either aggregate. There source or purpose is not clear especially given the low quantity. The carbonate consists of angular cleavage fragments found to a maximum size of approximately 0.5 mm. A single amphibole grain is found in association with carbonate and this suggests that the grains derive from a marble. The association also importantly indicates that the amphibole does not necessarily derive from an asbestos addition.

Fine fibers represent an important constituent of the mixture. When extracted from the plaster through acid digestion, the fibers are revealed to be tangled mats of individual flexible fibers with thicknesses no greater than 10 µm and lengths of about one to two millimeters. Most of the fibers are bright white. However, red and blue fibers are also identified. Optically, the fibers have low relief and moderately low birefringence. The active birefringence indicates that the fibers are not glass. Technically, Highbridge is not accredited to make statements regarding asbestos-containing materials (ACMs) and the absence of asbestos must be formally recognized by an accredited environmental laboratory as local regulations require. Nonetheless, the fibers do not exhibit amphibole-type characteristics meaning that only chrysotile asbestos could be possible. But this also appears to be excluded as a possibility. A portion of the extracted fibers were fired to approximately 400°C and were found to char after a short period. Due to this, it is suspected that the fibers are some type of textile.

The binder itself appears to be altered in most places examined and this may limit the ability to positively identify all constituents. The exclusion of a chemical analysis also limits the characterization. Where visible, the binder is an ultrafine-grained homogeneous mass with relatively low birefringence in many areas. Near regions that appear to represent the outermost surface, the binder is carbonated as indicated by the locally higher birefringence. Essentially, the hardened paste is consistent with a nonhydraulic lime binder. Undispersed lime grains are detected in moderate concentration as discrete particulates that are fully carbonated even where the paste is not. The fine agglomerate sizes below a No. 200 sieve and the particulate nature of the lime are typical of lime added as a dry hydrate.

No other binder materials are positively identified. A more careful chemical analysis modified to avoid including components from the other additives would be required to confirm the identification. Even still, portions of the binder appear to be altered by a diffuse sulfate precipitation (possibly gypsum) and this would interfere with a chemical analysis as well. An isotropic salt is also detected as a void lining and this is likely to be chloride-based. Despite what appears to be a broad sulfate deposition, there is no positive evidence for any type of gypsum plaster. The binder itself lacks the ultrafine-grained network of gypsum crystallites that accompany all types of gypsum plaster hydration. There are no discrete hydration pores containing coarser-grained fibrous gypsum. There are also no anhydrite crystals or other impurities that often accompany gypsum plasters. Evidence for a portland cement addition is also absent. There are no calcium silicate residuals or pores that retain the morphology of hydrated cement grains.

Though petrographic examination cannot positively identify organic admixtures, their influence on paste microstructure can often be discerned. In acoustical plasters, there is always a question of foaming agents. In this case, the binder does not have the microscopically frothy texture that usually accompanies such admixtures. There is a region interpreted to represent the outermost face of the plaster where spherical air-voids are somewhat more concentrated. This could indicate some type of air-entraining agent but this does not appear to be widespread.

The client has reported that historical records indicate a pigment addition. There is a moderately low abundance of ultrafine-grained reddish-brown and orange-brown particulates distributed throughout the hardened binder paste. Extremely fine ñflecksò of color are also detected in the acid-insoluble residue after digesting the binder in a 10% v/v hydrochloric acid solution. In both cases, these could represent a modest pigment dosage. However, the sample pieces provided for analysis are bright white where freshly exposed suggesting that there was no intent for an integral colorant.

6.3 - Notes on Original Placement

The quality of the sample did not permit an evaluation of the plaster placement and the petrographic examination was focused solely on an identification of constituents. Nevertheless, a few of the pieces examined in thin section appear to contain evidence suggestive of more than one layer or lift. In some cases, there is an outer layer at least 0.5 millimeters thick that exhibits an increase in fine, spherical bubbles. It is difficult to determine whether this is truly a separate layer since no discrete boundary with the substrate is detected in the few places observed. Over this spongier layer are traces of an adhered lime paste similar to what might be found in a lime wash. No components other than carbonated lime are identified in these sparse remnants.

6.4 - Secondary Alteration

The client has indicated that mineralizations are visible in association with the plaster layer. An identification of salt species was not included as part of the scope of the examination. Nevertheless, some evidence of these is detected petrographically. In some areas of the binder, there are patches of diffuse mineralization within the capillary pores of the binder. Though not confirmed through chemistry or other instrumental analysis, these have optical characteristics consistent with the sulfate phases. There are also exceptionally thin linings along the surfaces of some air-voids. These are optically isotropic suggesting that they are chloride rather than sulfate species.

Respectfully submitted,

John J. Walsh
President/ Senior Petrographer
Highbridge Materials Consulting, Inc.

Appendix I: Visual Description of Sample as Received

Sample ID	**GH-007**
Description	The sample consists of multiple small acoustical plaster fragments weighing a total of 8 grams. None are larger than approximately 1ò x 0.5 ñ in area. A maximum of about 3/16ò depth is represented.
Surfaces	It is not obvious whether any prepared surfaces are included with the sample pieces. Two distinctive sides are present on most larger pieces. One is slightly ñsandyò in character with a very light gray color (Munsell code approximately 1Y 8/1). The other is smoother and bright white (Munsell code approximately N9). The darker surface simply appears to be soiled relative to the opposite face.
Hardness / Friability	The paste is soft and the mixture is moderately friable.
Appearance	Freshly exposed surfaces have a dull luster.
Other Details	The material is rapidly water absorptive. Other details are not easily assessed due to the fragmental condition of the sample.

Appendix II: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
µm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, Highbridge also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.

Figure 1: Photograph of the sample provided to Highbridge for examination. The acoustical plaster is nearly white except where soiled to a light gray color.

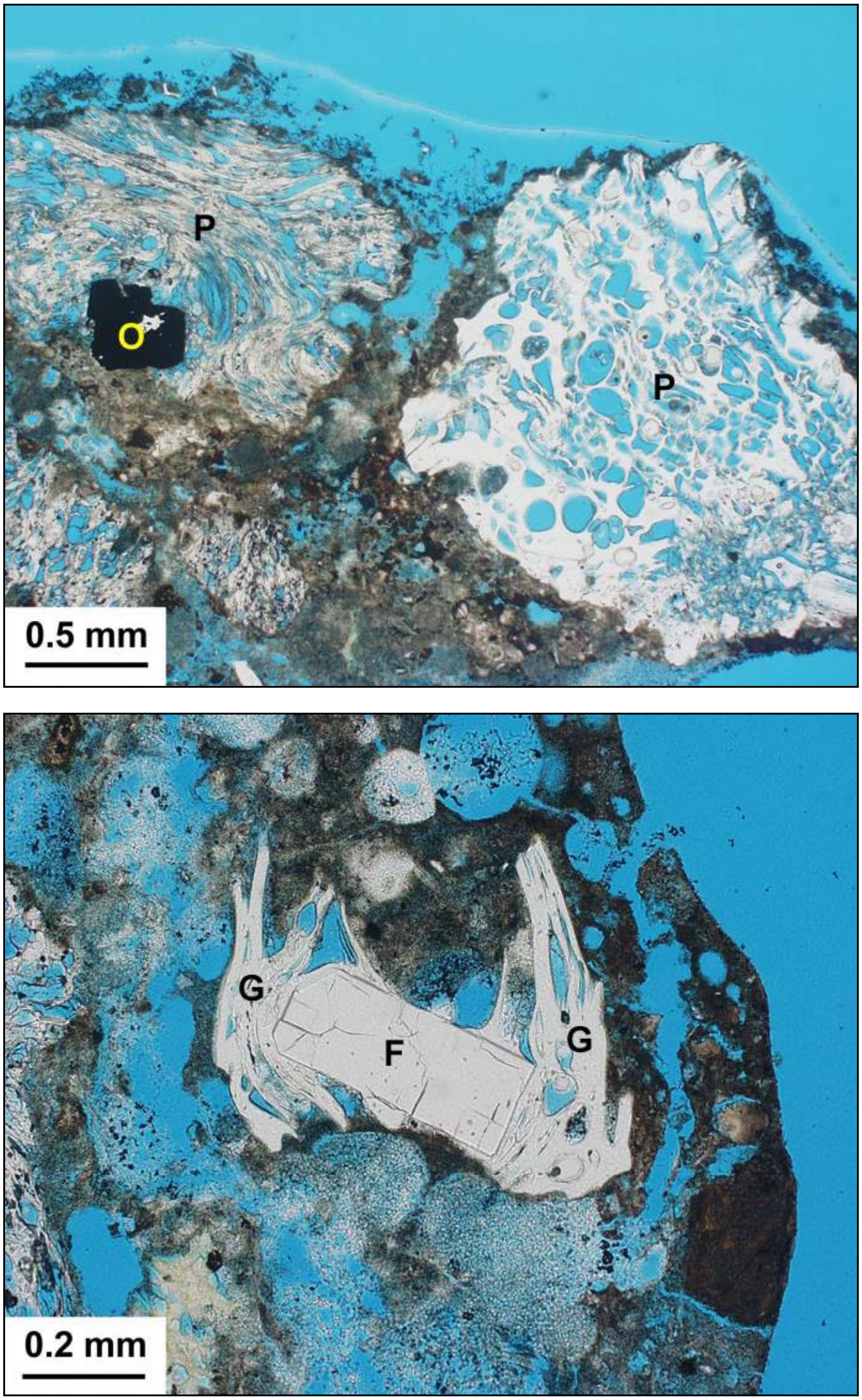


Figure 2: PPL photomicrographs illustrating the pumice aggregate (P). The sample is impregnated with a blue-dyed epoxy to highlight pores and other void structures. The pumice consists primarily of glass (G) that appears white in these images. Vesicles (V) appear blue. In the upper image, the grain at left exhibits an elongate flow texture while the grain at right is more uniform in texture. Phenocrysts are relatively rare. Opaque phases (O) are shown in the upper image. A well-crystallized feldspar (F) is shown in the lower image.

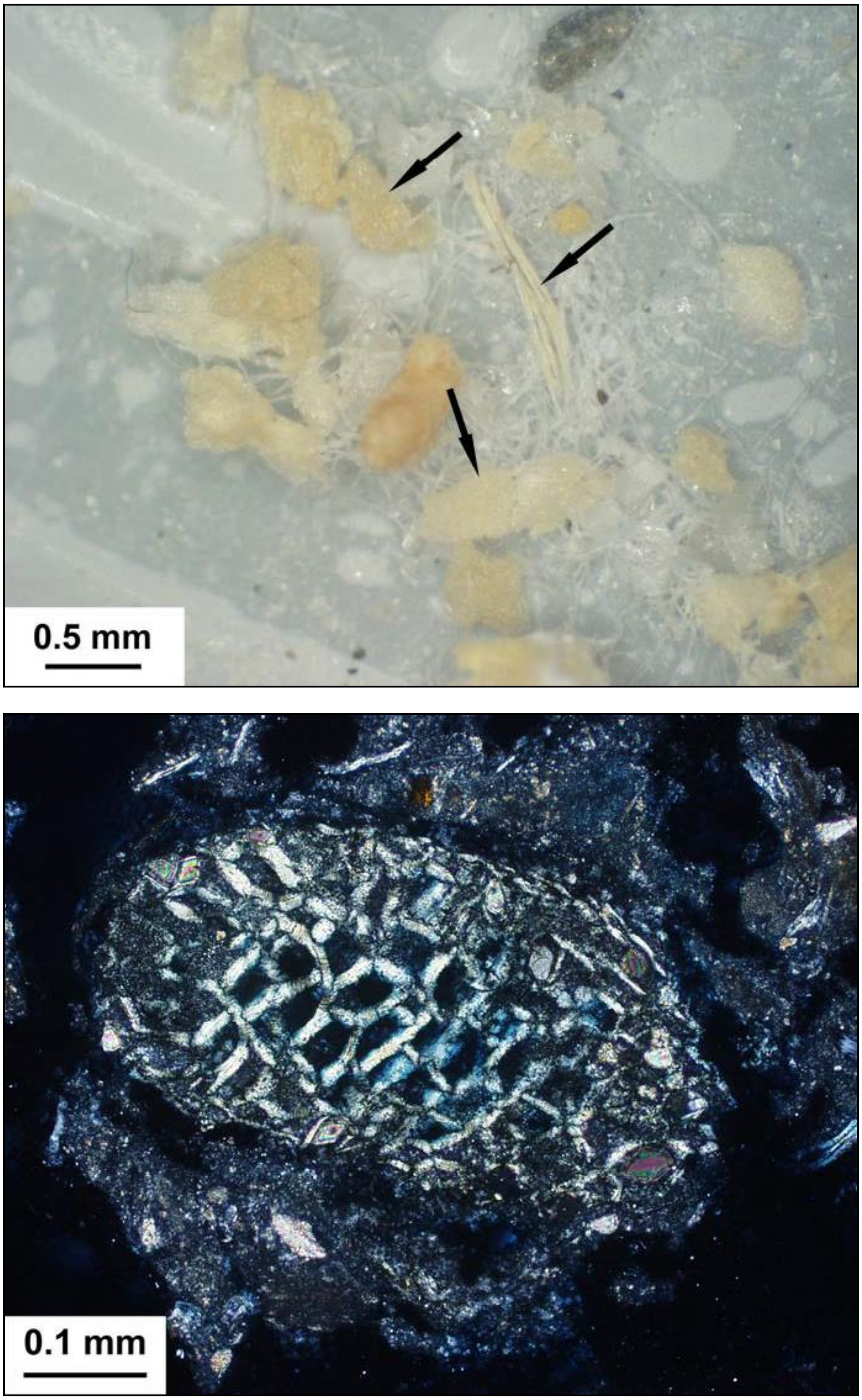


Figure 3: (Upper reflected light image) The arrows indicate cellular material extracted from the plaster by dissolving the binder in acid. The granules are consistent with some type of woody material. (Lower XPL image) The cellular nature of these fragments is more apparent in petrographic thin section.

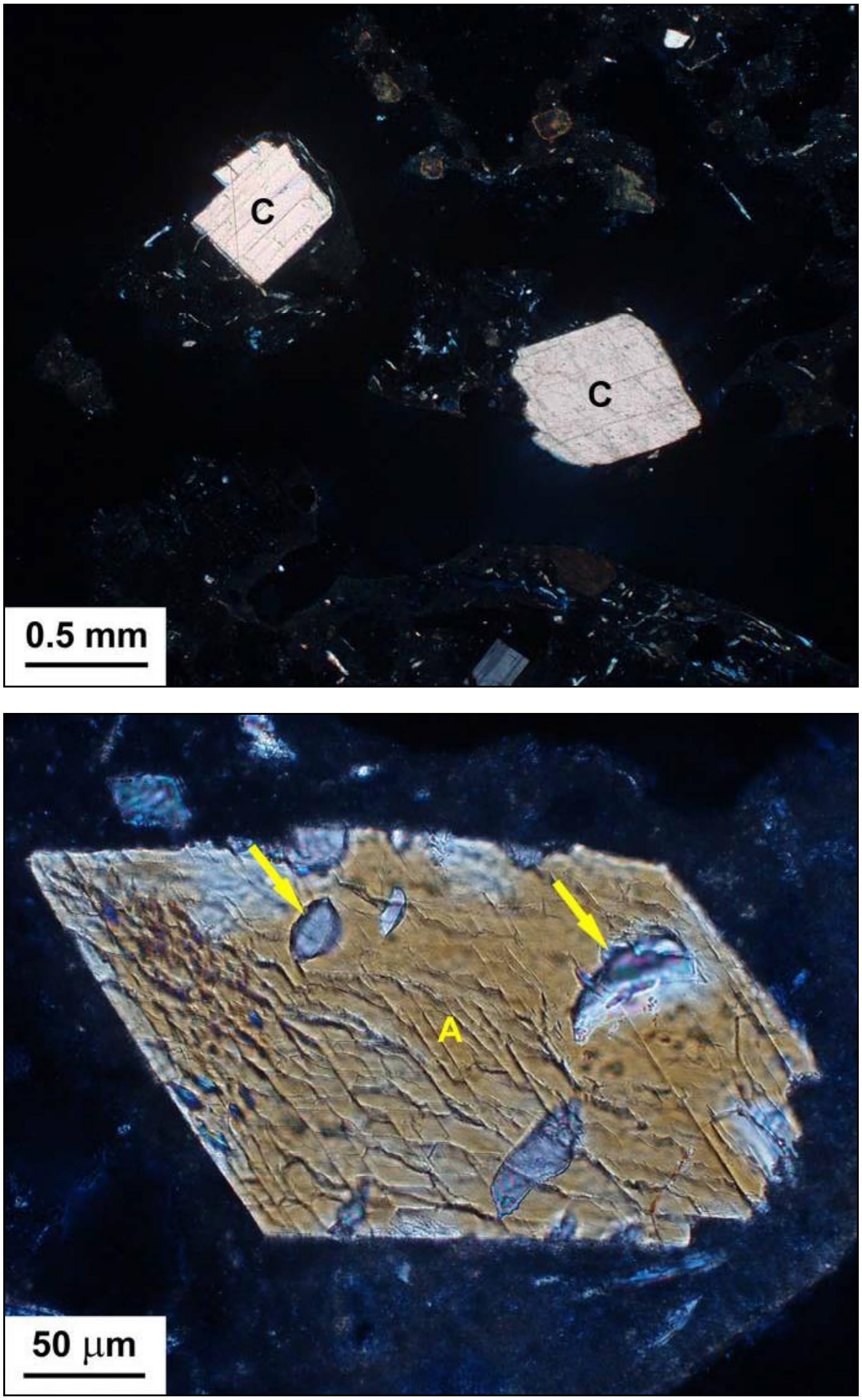


Figure 4: XPL photomicrographs. A minor component of crushed marble is also observed in the plaster. Angular carbonate cleavage fragments are shown in the upper image (C). An amphibole particle is shown in the lower image (A). The arrows indicate calcite inclusions that associate the amphibole with a marble.

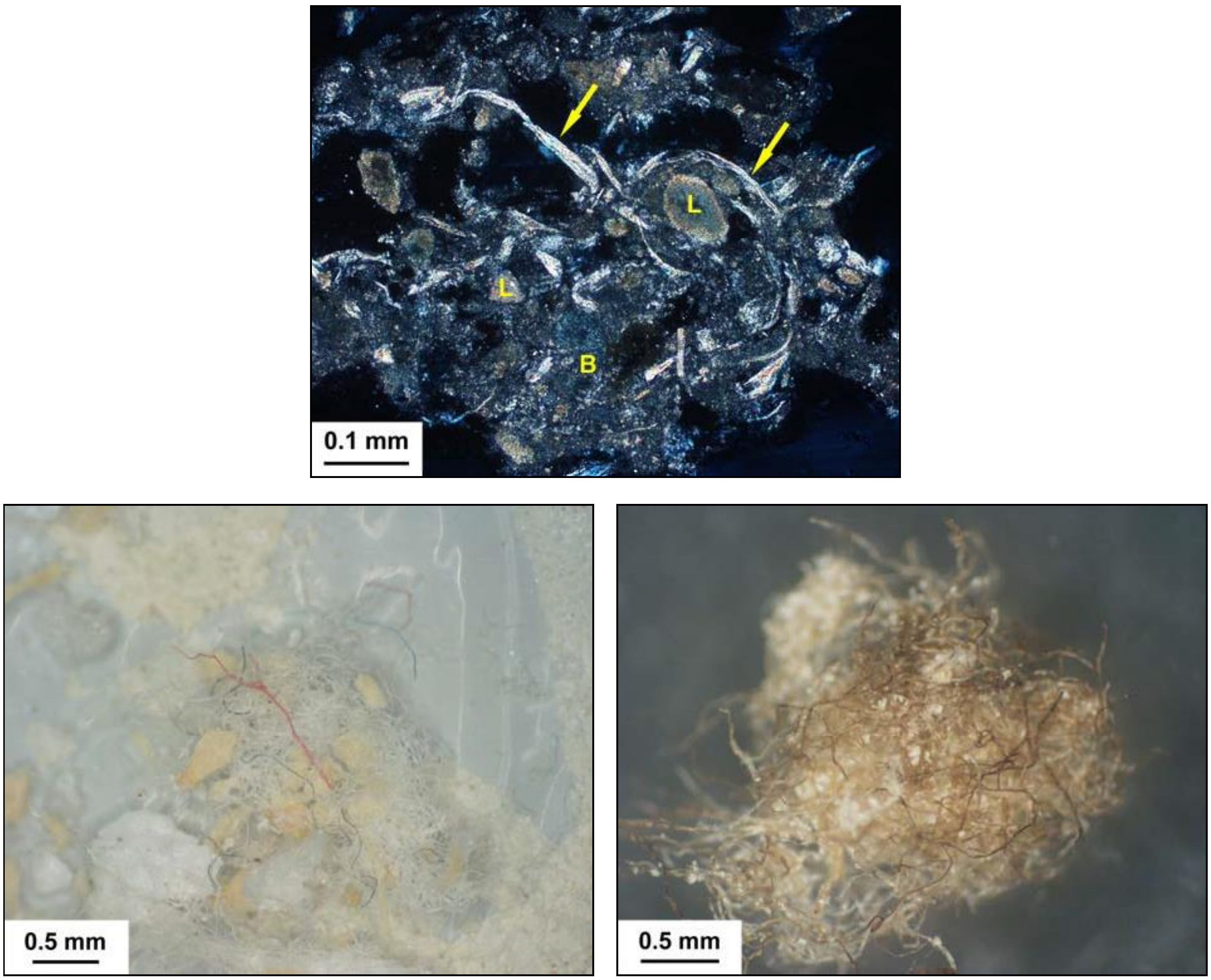


Figure 5: (Upper XPL image) The binder (B) is homogeneous with a low birefringence and appears to consist solely of hydrated lime. Undispersed lime grains (L) are relatively common. The arrows indicate fine fibers that are embedded in the binder. (Lower left reflected light image) The fibers were extracted from the binder through acid digestion. A tangled mat is shown on a filter paper in the same manner it existed within the plaster. Note that most of the fibers are white and difficult to distinguish against the similarly light background. A few red and blue fibers are also detected. (Lower right reflected light image) The fibers were fired at relatively low temperature. Note the charring that indicates the fibers are not mineral based.

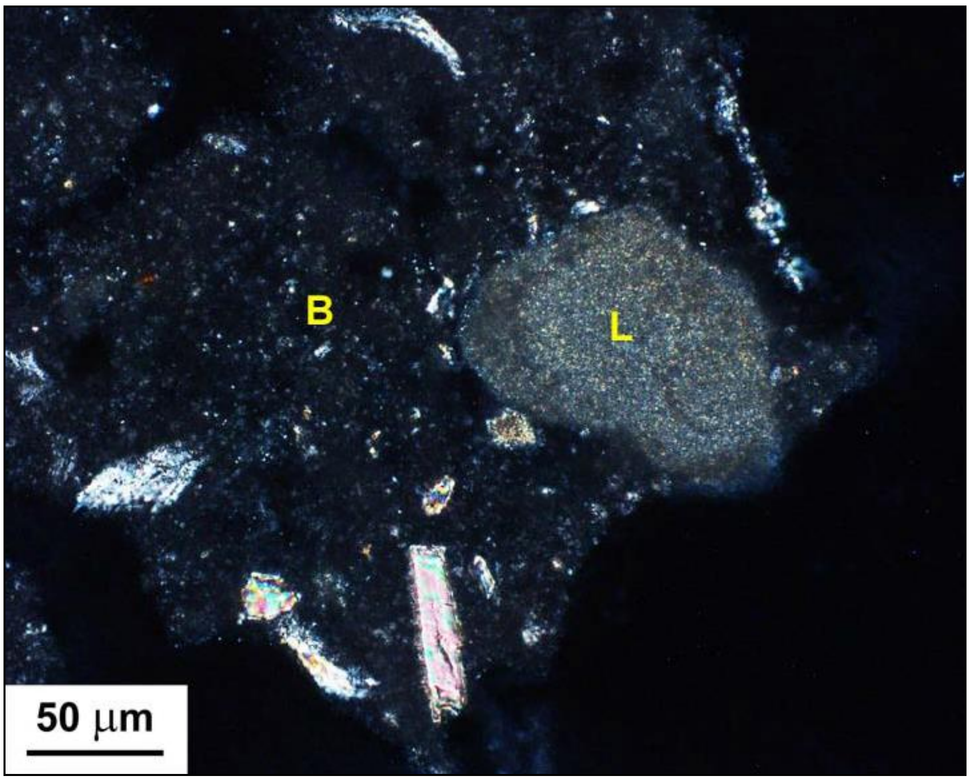


Figure 6: XPL photomicrograph of the hardened binder taken at high magnification. The weakly birefringent binder (B) contains no evidence for gypsum-based plaster. In this area, the binder is identified as slaked and uncarbonated lime. A carbonated lime particle (L) is also shown. The fine size and particulate quality of the lime inclusions is consistent with lime added as a dry hydrate.

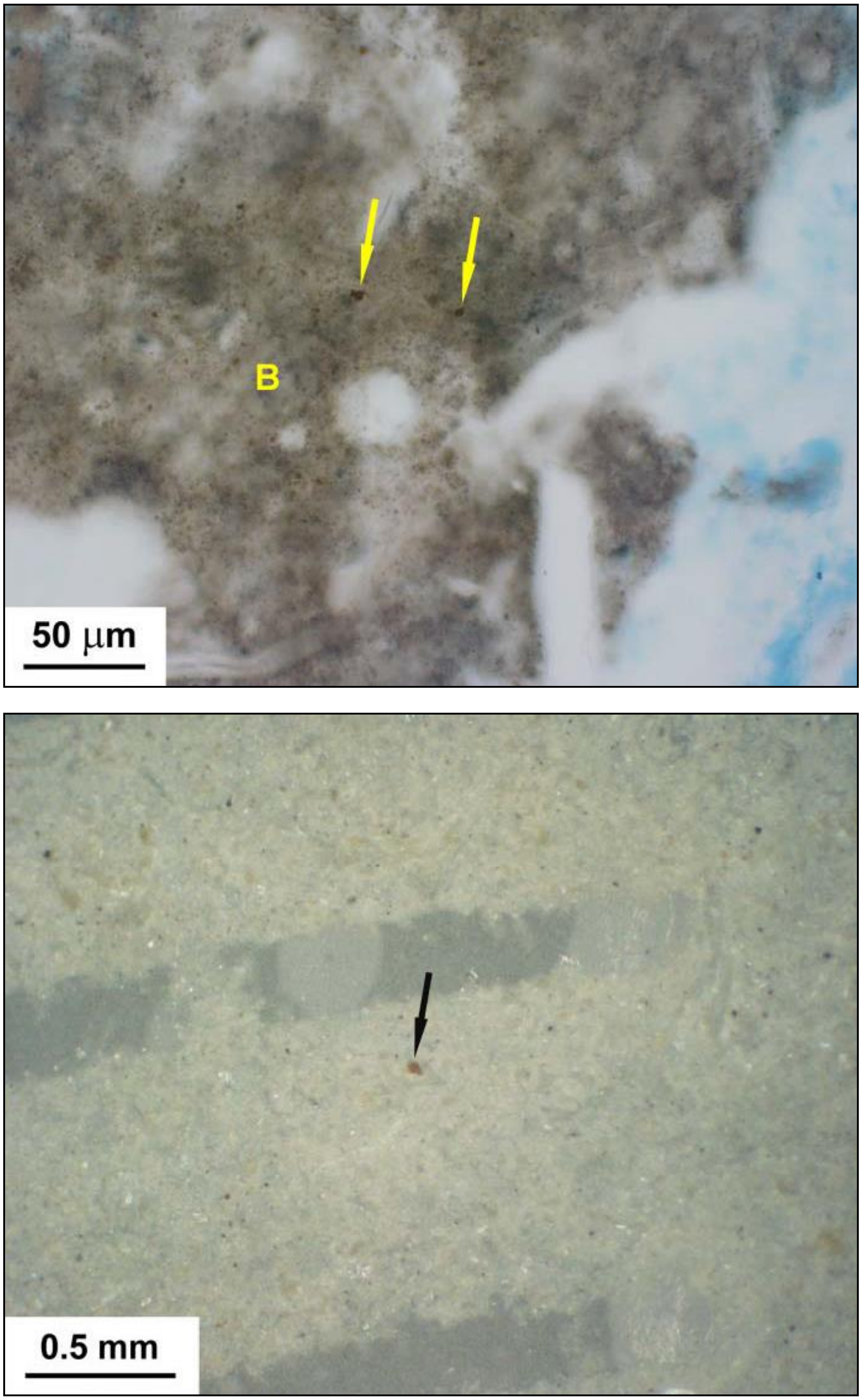


Figure 7: (Upper PPL image) The image is taken with a condenser lens inserted into the light path. The condenser blurs the image but allows for increased contrast of ultrafine-grained particles. The arrows indicate brownish particulates detected within the binder (B). (Lower reflected light image) A similar type of particle is shown on a filter paper after acid-dissolution of the binder. While any of these particles might represent an intentional pigment, the binder is a bright white color when freshly exposed.

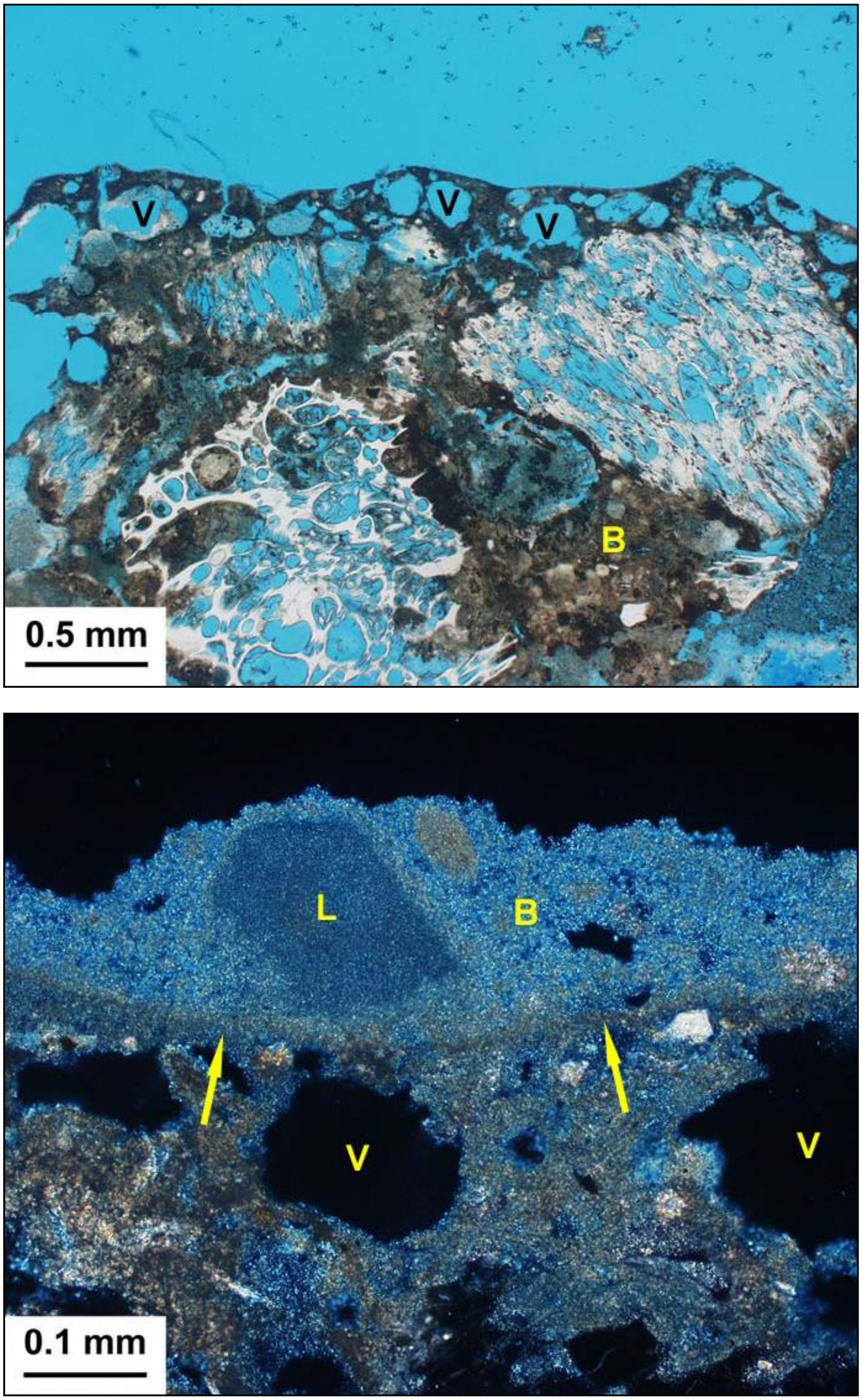


Figure 8: (Upper PPL image) In a few places, what appears to be the outermost skin of the plaster contains a concentration of fine, spherical air-voids (V). There is no discrete boundary with the substrate plaster. However, note that the binder within (B) is uniform with relatively few micropores. Note also that this microstructure is not consistent with the addition of a foaming agent. (Lower XPL image) A higher magnification view is shown for one of these outer layers. The voids (V) appear dark under crossed polars. The arrows indicate the boundary between the plaster and an adhered remnant of lime paste. The paste consists solely of carbonated lime binder (B) with fine-grained undispersed lime inclusions (L).

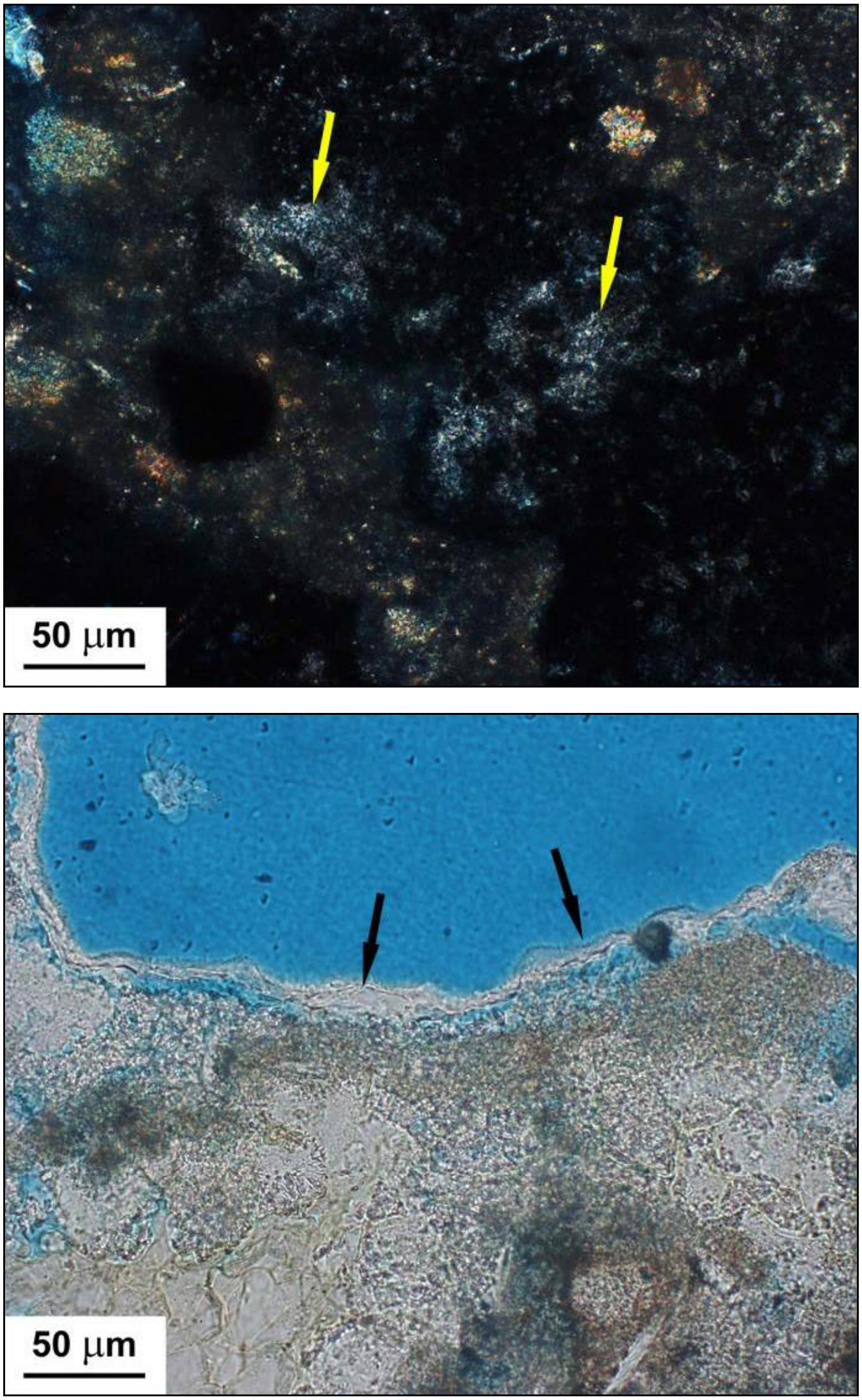


Figure 9: Photomicrographs illustrating secondary mineralizations. (Upper XPL image) The arrows indicate diffuse patches of birefringent material within the micropores of the lime binder. These are consistent in optical character with sulfate deposits. (Lower PPL image) The arrows indicate a fine mineral lining along an air-void surface. The optical properties are consistent with chloride salts.

Please Reply To:

AmeriSci

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

FACSIMILE TELECOPY TRANSMISSION

To: Individual
Jablonski Building Conservation

Fax #:

Email:

From: David W. Roderick
AmeriSci Job #: 215112760
Subject: PLM 3 day Results
Client Project: Gropius House; 68 Baker Bridge Rd., Lincoln, MA

Date: Friday, November 20, 2015
Time: 06:43:07
Comments:

Number of Pages: 3
(including cover sheet)

AMERI SCI

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Jablonski Building Conservation
Attn: Individual
40 W 27th St.

New York, NY 10001

Date Received 11/17/15
Date Examined 11/20/15

AmeriSci Job # 215112760
P.O. #
Page 1 **of** 1

RE: Gropius House; 68 Baker Bridge Rd., Lincoln, MA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GH-006	215112760-01	***No***	NAD

Location: 1st Floor Office, Above Ext. Door - Friable Plaster Sample

(by CVES)
by David W. Roderick
on 11/20/15

Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Cellulose 2 %, Non-fibrous 98 %

Reporting Notes:

Analyzed by: David W. Roderick

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that car be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:

END OF REPORT

Relinquished By: E.G. [signature] Date/Time: 11/13/15

Received By: [signature] Date/Time: 11/17/15 1041

Relinquished By: Date/Time:

Received By: Date/Time:

AMERISCI

WWW.AMERISCI.COM

BULK CHAIN OF CUSTODY

AMERISCI NEW YORK
117 EAST 30TH STREET
NEW YORK, NY 10016
TOLL FREE: (800) 705-5227
PHONE: (212) 679-8600
FAX: (212) 679-9392

Company: Jablonski Building Conservation

Street Address: 40 W 27th St.

City: New York State: NY Zip: 10001

Phone: (212) 532-7775 ex. 11 Fax: (212) 532-2188

Cell: Fax:

E-mail efitzgerald@jbconservation.com Verbal Results: Y / (N)

Results to: " "

AMERISCI #:

Project: Gropius House

Proj Mgr: Edward G. FitzGerald Proj #:

Proj Address: 68 Baker Bridge Rd, Lincoln Proj State: MA

Analysis: ✓ PLM; __ Positive Stop; __ TEM; __ NY ELAP PLM/TEM w/ NOB Prep.

ASTM Dust __ (Microvac) __ (Wipe); ✓ Qualitative; __ Other (describe in comments)

Turnaround Time: 4-6 wks Material Type: ✓ Bulk __ Dust __ Water

Sampled By: FitzGerald Date Sampled: 10/30/2015

Special Instructions or Comments: No larger sample available. Perform analysis as required for state of Massachusetts. Contact me if cost will exceed $200.00.

Lab ID	Field ID	Location	Sample Description (dust area)	Homogenous Area
	GH-006	1st Floor office, above ext. door.	Frisble plaster sample	
			#215112760	

APPENDIX E
Product Data

Gropius House

To improve bonding and durability of cement-based materials.

ACRYL® 60
LIQUID ADMIXTURE

CONSUMER PRODUCTS

Acryl® 60 significantly improves adhesion, cohesion, tensile, compressive, and flexural strengths of cement-based materials. Will not re-emulsify when exposed to water. Excellent chemical and UV resistance. Improves freeze/thaw stability of Portland cement-based materials. Acryl® 60 can be used straight or be diluted with water. Coverage will vary depending on application and use.

Surface Preparation
Surface must be clean and sound. Remove all loose and disintegrated material. Remove any and all traces of oil, grease, dirt, dust, efflorescence, biological, mold or mildew, release and curing agents. Vacuum, sweep or blow out the areas to be patched with clean, oil free air.

Mixing
The normal ratio of Acryl® 60 to clean potable water is 1 part Acryl® 60 to 3 parts water (1:3). Where increased physical and chemical resistance requirements are more stringent, increase the Acryl® 60 content in the mixing liquid to a 1:2 or 1:1 Acryl® 60 to water ratio. Always mechanically mix. Do not overmix or mix at a high speed.

Application
Sand/Cement Mortar
Thoroughly mix all cement and sand first. The sand must be clean, free of clay, and dry. Make up mixing liquid from a 1:3 or 1:2 Acryl® 60 water ratio depending upon requirements. Slowly add the mixing liquid to the cement sand mixture, and mix for a short time (1-2 minutes) to avoid entrapping air. After preparing, cleaning, and predampening the surface, brush apply a bond coat (not diluted) of Acryl® 60 modified cement sand. Mix vigorously into the surface to displace any air pockets. Place the mix into the bond coated repair area while the bond coat is still wet or tacky. Maximum time for placement should not exceed 20 minutes. Higher air and surface temperatures will decrease working/placement time. Place the mix and avoid overtroweling. The trowel should be cleaned frequently, kept wet, and used with minimal pressure. When drying is rapid, due to high temperature or breeze, cover surface with wet burlap. For normal use, allow a 24-hour curing period. For heavy wheeled traffic, allow a 4-day curing period.

Limitations
- Do not use with air entrained cement.
- Do not use Acryl® 60 where air circulation is limited.
- Do not use Acryl® 60 modified mixes when the ambient air or surface temperature is below 40°F (4°C) or expected to fall below there within 48 hours.
- Make certain the most current version of the data guide is being used; call 1 (216) 839-7171 to verify.

Protect From Freezing
Prolonged freezing may damage contents. Frozen material should be placed immediately in a warm spot to thaw, but direct heat should not be applied. If Acryl® 60 can be stirred after thawing, bonding qualities have not been impaired.

BASF The Chemical Company
Thoro Consumer Products • BASF Construction Chemicals, LLC • 23700 Chagrin Blvd. • Cleveland, Ohio 44122
phone 216-839-7171 or 866-518-7171 • fx 216-839-8833 or 866-494-8833 • ThoroProducts.com

ACRYL® 60

1. Product and Company Information

Company:	Thoro Consumer Products BASF Construction Chemicals, LLC 23700 Chagrin Blvd. Cleveland, Ohio 44122
Telephone:	(216) 839-7171 or (866) 518-7171
Emergency telephone:	(800) 424-9300 (703) 527-3887 (Outside continental U.S.)
Product name:	Thoro ACRYL® 60
Product Use Description :	Admixture

2. Hazardous Ingredients

Does not contain hazardous chemicals as defined by 29 CFR 1910.1200 and WHMIS.

3. Hazards Identification

HMIS® rating:	Health	Flammability	Physical Hazard
	1	0	0

WHMIS class: D2B

Effects of Overexposure

Inhalation:	Can cause slight irritation.
Skin:	Can cause slight irritation.
Eyes:	Can cause slight irritation.
Ingestion:	Can cause slight irritation.
Chronic exposure:	Can cause slight irritation.

CONSUMER PRODUCTS

ACRYL® 60

4. First Aid Measures

Eye contact:	Flush eyes with water, lifting upper and lower lids occasionally for 15 minutes. Seek medical attention.
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. If irritation persists seek medical attention. Wash contaminated clothing before reuse.
Ingestion:	Do not induce vomiting without medical advice. If conscious, drink plenty of water. If a person feels unwell or symptoms of skin irritation appear, consult a physician. If a person vomits, place him/her in the recovery position. Never give anything by mouth to an unconscious person.
Inhalation:	Remove victim from exposure. If difficulty with breathing, administer oxygen. If breathing has stopped administer artificial respiration, preferably mouth-to-mouth. Seek immediate medical attention.

5. Fire-Fighting Measures

Flash point:	Not combustible.	Autoignition temperature:	Not combustible.
Lower explosion limit:	No data available	Suitable extinguishing media:	CO_2 Foam Dry chemical Water fog
Upper explosion limit:	No data available		

Fire and explosion hazards: Containers can build up pressure if exposed to heat (fire). Cool closed containers exposed to fire with water spray.

Special fire-fighting procedures: As in any fire, wear self-contained breathing apparatus pressure-demand (MSHAINIOSH approved or equivalent) and full protective gear.

6. Accidental Release Measures

Methods for cleaning up: Wear appropriate protective equipment. Take action to eliminate source of leak; prevent from entry into open streams or sewers; contain spill by diking; vacuum up liquid or use absorbent media; remove to storage for disposal and rinse residual stain with water.

7. Handling and Storage

Handling:	Keep out of reach of children. For personal protection see section 8.
Storage:	Keep tightly closed.

CONSUMER PRODUCTS

ACRYL® 60

8. Exposure Controls / Personal Protection

Eye protection:	Wear as appropriate: safety glasses with side-shields goggles face-shield
Hand protection:	Wear as appropriate: impervious gloves
Body protection:	Wear as appropriate: impervious clothing preventive skin protection
Respiratory protection:	In case of insufficient ventilation wear suitable respiratory equipment. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygienic practices:	Avoid contact with skin, eyes and clothing. Ensure adequate ventilation, especially in confined areas. Wash hands before breaks and at the end of workday. When using, do not eat, drink or smoke. Handle in accordance with good industrial hygiene and safety practice.
Engineering Controls :	Local exhaust ventilation can be necessary to control any air contaminants to within their TLVs during the use of this product.

9. Physical and Chemical Properties

Color:	White	Physical state:	Liquid
Odor:	Slight ammoniacal	pH (at 100 %):	9.5-10
Odor threshold:	No data available	Vapor pressure:	No data available
Vapor density:	Heavier than air	Boiling point/range:	No data available
Freeze point:	Not determined	Water solubility:	Dilutable
Specific gravity:	1.04	Viscosity:	No data available
Evaporation rate:	Slower than Butyl acetate	Partition coefficient: (n-octanol water)	No data available

VOC Concentration as applied
(less water and exempt solvents): 1 g/l

10. Stability and Reactivity

Stability:	Stable under recommended storage conditions.
Conditions to avoid:	Prolonged exposure to high temperatures.
Materials to avoid:	Strong mineral acids, Lewis acids, oxidizing agents, strong bases.
Hazardous polymerization:	Will not occur under normal conditions.

CONSUMER PRODUCTS

ACRYL® 60

11. Toxicological Information

	Type	Value	Species	Exposure Time
Acute inhalation toxicity				
Product	LC50	No data available		
Acute oral toxicity				
Product	LD50 (Oral)	No data available		
Acute dermal toxicity				
Product	LD50 (Dermal)	No data available		

12. Ecological Information

Ecotoxicological Information: There is no data available for this product.

13. Disposal Considerations

Recommendations: Use excess product in an alternate beneficial application. Handle disposal of waste material in manner which complies with local, state, province and federal regulation.

14. Transportation Information

DOT:	Proper shipping name	Not regulated
IATA:	Proper shipping name	Not regulated

15. Regulatory Information

SARA 313

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and the Reauthorization Act of 1986 and 40 CFR Part 372:

This product contains no chemicals subject to the SARA 313 supplier notification requirements.

CERCLA

CERCLA section 103(a) specifically requires the person in charge of a vessel or facility to report immediately to the National Response Center (NRC) a release of hazardous substances whose amount equals or exceeds the assigned RQ.

The following hazardous substances are contained in this product:

RQ	CAS Number	Chemical Name

No CERCLA chemicals exist in this product above reportable concentrations.

TSCA Section 12(b) Export Notification

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

CAS Number	Chemical Name

There are no TSCA 12(b) Chemicals in this product.

CONSUMER PRODUCTS

ACRYL® 60

California Proposition 65

The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm. Unless otherwise specified in Section 2 of this MSDS, these chemicals are present at < 0.1%:

CAS Number	Chemical Name
50-00-0	Formaldehyde
75-21-8	Ethylene oxide

16. Other Information

Legend:

N.E. - Not established
TLV - Threshold limit value
STEL - Short term exposure limit
PEL - Permissible exposure limit
CEIL - Ceiling

Prepared by: Environment, Health and Safety department

This information is furnished without warranty, representation, or license of any kind, except that this information is accurate to the best of the manufacturer's knowledge, or is obtained from sources believed by the manufacturer to be accurate and is not intended to be all inclusive. No warranty is expressed or implied regarding the accuracy of this information or the results to be obtained from its use thereof. The manufacturer assumes no responsibility for injuries proximately caused by use of the Material if reasonable safety procedures are not followed as stipulated in this Data Sheet. Additionally, the manufacturer assumes no responsibility for injuries proximately caused by abnormal use of the Material even if reasonable safety procedures are followed. Buyer assumes the risk in its use of the Material.

End of MSDS.

GRAYMONT

GRAYMONT DOLIME (OH) INC.

HEAD OFFICE / PLANT
21880 West State Route 163
P.O. Box 158
Genoa, Ohio 43430
Tel: (419) 855-8336
(800) 537-4489
Fax: (419) 855-4602

Website: www.graymont-oh.com
E-mail: Info@graymont-oh.com

BONDCRETE®
MASON'S PRE-BLEND®
MORTASEAL®
GRAND PRIZE®
IVORY®
NIAGARA®
SNOWDRIFT®
KEMIDOL®
SUPER LIMOID®
LIMOID®
HI-MAG®

MASON'S LIME PRODUCTS
TYPICAL CHARACTERISTICS

I. BRAND NAMES	**Mortaseal® Super Limoid® S**	**Bondcrete® Super Limoid® SA**
II. HYDRATED LIME TYPE (ASTM C-207)	S	SA
III. CHEMICAL ABSTRACT SERVICE NUMBER	39445-23-3	39445-23-3
IV. CHEMICAL CHARACTERISTICS		
a. Calcium Oxide (%)	43.09	43.09
b. Magnesium Oxide(%)	28.23	28.23
c. Acid Insolubles (%)	0.71	0.74
d. Iron & Alumina Oxide (%)	0.59	0.59
e. Loss on Ignition (%)	26.6	26.6
f. Carbon Dioxide (%)	2.9	2.9
g. Hydrated Oxides (%)	94.59	94.59
V. PHYSICAL CHARACTERISTICS		
a. Particle Size Distribution		
1. Plus 30 Mesh (Cum % On)	0	0
2. Plus 200 Mesh (Cum % On)	4	2
3. Plus 325 Mesh (Cum % On)	9.75	6.25
b. Blaine Surface Area (cm^2/gm)	30,400	31,800
c. Vicat Consistency (ml/gm)	101	31,800
d. Plasticity (Emley Units)	310	360
e. Product Soundness		
1. Pops (#/Plate)	0	0
2. Pits (#/Plate)	0	0
VI. MORTAR CHARACTERISTICS		
a. ASTM Type S Mortar (1:1/2:4 1/2)		
1. Compressive Strength - 28 Days (psi)	4,984	4,973
2. Water Retention (%)	87	87
b. ASTM Type N Mortar (1:1.6)		
1. Compressive Strength - 28 Days (psi)	2,532	2,550
2. Water Retention (%)	89	89
c. ASTM Type O Mortar (1 :2:9)		
1. Compressive Strength - 28 Days (psi)	904	774
2. Water Retention (%)	90	90

**** Based on materials having an initial flow of 110 ± 5%***

GRAYMONT

SAFETY DATA SHEET

DOLOMITIC HYDRATED LIME

Section 1. Identification

GHS product identifier : DOLOMITIC HYDRATED LIME

Other means of identification : Hydrated dolomitic lime ($Ca(OH)_2MgO$), Double hydrated dolomitic lime ($CaMg(OH)_4$)

Product code : Not available.

Product type : Solid.

Identified uses

Neutralization, flocculation, stabilization, polishing, masonry mortar, plaster, stucco, fresco paints and lime wash.

Supplier/Manufacturer : GRAYMONT
#200-10991 Shellbridge Way
Richmond, BC V6X 3C6
Canada
Phone: 1 604 207-4292
Toll free : 1 866 207-4292
Fax: 1 604 207-9014
Web Site: http://www.graymont.com/

Emergency telephone number (with hours of operation) : CANUTEC (613-996-6666)
CHEMTREC, US (800-424-9300
INTERNATIONAL: (703-527-3887)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
CARCINOGENICITY (inhalation) - Category 1A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H318 - Causes serious eye damage.
H315 - Causes skin irritation.
H350 - May cause cancer if inhaled.
H335 - May cause respiratory irritation.
H372 - Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

Section 2. Hazards identification

Prevention : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P281 - Use personal protective equipment as required.
P280 - Wear protective gloves. Wear eye or face protection.
P271 - Use only outdoors or in a well-ventilated area.
P260 - Do not breathe dust.
P270 - Do not eat, drink or smoke when using this product.
P264 - Wash hands thoroughly after handling.

Response : P314 - Get medical attention if you feel unwell.
P308 + P313 - IF exposed or concerned: Get medical attention.
P304 + P340 + P312 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell.
P302 + P352 + P362 + P363 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse.
P332 + P313 - If skin irritation occurs: Get medical attention.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : P401 - Store to minimize dust generation.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified (HNOC)

Physical hazards not otherwise classified (PHNOC) : None known.

Health hazards not otherwise classified (HHNOC) : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Hydrated dolomitic lime ($Ca(OH)_2MgO$), Double hydrated dolomitic lime ($CaMg(OH)_4$)

CAS number/other identifiers

CAS number : Not applicable.

Product code : Not available.

Ingredient name	%	CAS number
Calcium Magnesium Tetrahydroxide	60 - 100	39445-23-3
Calcium Magnesium Dihydroxide Oxide	60 - 100	58398-71-3
Calcium Hydroxide	30 - 60	1305-62-0
Crystalline silica, quartz	0.0001 - 1	14808-60-7

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source.

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Get medical attention immediately. Call a poison center or physician.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	: Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: Causes serious eye damage.
Inhalation	: May cause respiratory irritation.
Skin contact	: Causes skin irritation.
Ingestion	: No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact	: Adverse symptoms may include the following: pain watering redness
Inhalation	: Adverse symptoms may include the following: respiratory tract irritation coughing burning sensation
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur
Ingestion	: Adverse symptoms may include the following: burning sensation abdominal cramps and pain vomiting

Section 4. First aid measures

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : None.

Special protective actions for fire-fighters : No special measures are required.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store to minimize dust generation. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Calcium Hydroxide	**OSHA PEL (United States, 2/2013).** TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust **ACGIH TLV (United States, 4/2014).** TWA: 5 mg/m³ 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 5 mg/m³ 10 hours. **MSHA PEL** TWA 8/40 hours: 5 mg/m³
Crystalline silica, quartz	**OSHA PEL Z3 (United States, 2/2013).** TWA: 10 mg/m³ 8 hours. Form: Respirable TWA: 250 mppcf 8 hours. Form: Respirable **NIOSH REL (United States, 10/2013).** TWA: 0.05 mg/m³ 10 hours. Form: Respirable dust **ACGIH TLV (United States, 4/2014).** TWA: 0.025 mg/m³ 8 hours. Form: Respirable fraction **MSHA PEL** TWA 8/40 hours: 30 mg/m³/(%SiO2)+2 mg/m³ Form: Total dust 10 mg/m³/(%SiO2)+2 mg/m³ Form: Respirable dust

Canada

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredient	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Magnesium oxide	US ACGIH 4/2014	-	10	-	-	-	-	-	-	-	[a]
	AB 4/2009	-	10	-	-	-	-	-	-	-	[b]
	BC 7/2013	-	10	-	-	-	-	-	-	-	[c]
		-	3	-	-	10	-	-	-	-	[d]
Magnesium oxide, Mg	ON 1/2013	-	10	-	-	-	-	-	-	-	[a]
Magnesium oxide, as Mg	QC 1/2014	-	10	-	-	-	-	-	-	-	[b]
Calcium dihydroxide	US ACGIH 4/2014	-	5	-	-	-	-	-	-	-	
	AB 4/2009	-	5	-	-	-	-	-	-	-	[3]
	BC 7/2013	-	5	-	-	-	-	-	-	-	
	ON 1/2013	-	5	-	-	-	-	-	-	-	

Section 8. Exposure controls/personal protection

	QC 1/2014	-	5	-	-	-	-	-	-	-	
Crystalline silica, quartz	US ACGIH 4/2014	-	0.025	-	-	-	-	-	-	-	[e]
	AB 4/2009	-	0.025	-	-	-	-	-	-	-	[f]
	BC 7/2013	-	0.025	-	-	-	-	-	-	-	[g]
	ON 1/2013	-	0.1	-	-	-	-	-	-	-	[e]
	QC 1/2014	-	0.1	-	-	-	-	-	-	-	[h]

[3]Skin sensitization
Form: [a]Inhalable fraction [b]Fume [c]Inhalable fume [d]Respirable dust and fume. [e]Respirable fraction [f]Respirable particulate. [g]Respirable [h]Respirable dust

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Engineering controls may be required to control the primary or secondary risks associated with this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/ or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Solid. [Fine powder.]
Color	: White.
Odor	: Sweet, soil like odor.
Odor threshold	: Not available.
pH	: 12.45 [Sat. soln.] at 25°C
Melting point	: Not available.
Boiling point	: Not available.
Flash point	: Not applicable.
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not applicable.
Lower and upper explosive (flammable) limits	: Not applicable.
Vapor pressure	: Not available.
Vapor density	: Not available.
Relative density	: 2.2 to 2.6
Solubility	: Not available.
Solubility in water	: 0.1 g/100 g at 20°C
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: 345°C (653°F)
Viscosity	: Not available.
Volatility	: Not available.
VOC (w/w)	: 0 % (w/w)

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: None.
Conditions to avoid	: Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds. reactive powered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible materials	: Reactive or incompatible with the following materials: oxidizing materials and acids.
Hazardous decomposition products	: None.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium Hydroxide	LD50 Oral	Rat	7340 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Calcium Hydroxide	Eyes - Severe irritant	Rabbit	-	10 mg	-

Sensitization

There is no data available.

Carcinogenicity

Classification

Product/ingredient name	OSHA	IARC	NTP	ACGIH	EPA	NIOSH
Magnesium oxide	-	-	-	A4	-	-
Crystalline silica, quartz	-	1	Known to be a human carcinogen.	A2	-	+

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Calcium Magnesium Tetrahydroxide	Category 3	Not applicable.	Respiratory tract irritation
Calcium Magnesium Dihydroxide Oxide	Category 3	Not applicable.	Respiratory tract irritation
Calcium Hydroxide	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Crystalline silica, quartz	Category 1	Inhalation	kidneys, respiratory tract and testes

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
burning sensation

Section 11. Toxicological information

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
burning sensation
abdominal cramps and pain
vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer if inhaled. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Calcium Hydroxide	Acute LC50 33884.4 µg/L Fresh water	Fish - Clarias gariepinus - Fingerling	96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

AERG : Not applicable.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined

United States inventory (TSCA 8b): Dolomitic Hydrated Lime is subject to inventory update reporting (IUR).

RCRA classification: Dolomitic Hydrated Lime is not listed or classified.

CWA-311: Dolomitic Hydrated Lime is not listed.

CERCLA: Dolomitic Hydrated Lime is not listed.

FDA: Not applicable

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Calcium Magnesium Tetrahydroxide	60 - 100	No.	No.	No.	Yes.	No.
Calcium Magnesium Dihydroxide Oxide	60 - 100	No.	No.	No.	Yes.	No.
Calcium Hydroxide	30 - 60	No.	No.	No.	Yes.	No.
Crystalline silica, quartz	0.0001 - 1	No.	No.	No.	No.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Not listed	-	-
Supplier notification	Not listed	-	-

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

New York : None of the components are listed.

New Jersey : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

Pennsylvania : The following components are listed: Magnesium oxide; Calcium Hydroxide; Crystalline silica, quartz

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Crystalline silica, quartz	Yes.	No.	No.	No.

Section 15. Regulatory information

Canada

Canadian lists

Canadian NPRI	: None of the components are listed.
CEPA Toxic substances	: None of the components are listed.
Canada inventory	: At least one component is not listed in DSL but all such components are listed in NDSL.

International lists

National inventory

Australia	: Not determined.
China	: All components are listed or exempted.
Europe	: All components are listed or exempted.
Japan	: Not determined.
Malaysia	: Not determined.
New Zealand	: Not determined.
Philippines	: Not determined.
Republic of Korea	: All components are listed or exempted.
Taiwan	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health : 3 * **Flammability :** 0 **Physical hazards :** 1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Health : 3 **Flammability :** 0 **Instability :** 1

History

Date of issue mm/dd/yyyy	: 04/15/2015
Version	: 1
Prepared by	: KMK Regulatory Services Inc.

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Section 16. Other information

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

masonRE **Latex 20**

Waterless Poultice Cleaner

The masonRE Latex 20 is formulated with natural rubber and intended for the removal of heavy dirt and grime on limestone, sandstone, marble, concrete, plaster, brick, tile and terra cotta. The product is designed for interior use on structures where adequate ventilation can be provided. Exterior applications are possible with protection from direct sunlight and rain.

Features and Benefits

- **No water required**
- **Brush or spray applied**
- **Effective nicotine and soot removal**

Application Procedures

Test Area

Always prepare a test area prior to full application. This will indicate the time required for project completion and suitability of product for effective cleaning of the substrate. Additionally, specific jobsite consumption rates can be calculated after the test area is completed.

Equipment and Tools

This product is engineered for airless spray or brush application. A minimum of 1 GPM capability is adequate however a Graco UltraMax 695 or equivalent is recommended. Equip the sprayer with a minimum tip size of 0.013 inches or 0.015 inches. (Example: a 413 or 515 tip). Larger tips may be used depending on airless pump capacity. Other equipment required: brushes, masking tape, plastic (polyethylene) sheet, which can be used for protecting surfaces not to be treated with masonRE Latex 20.

Preparation

MASKING: Cover/protect areas where cleaning is not desired, including adjoining surfaces where over spray may travel. Plastic (polyethylene) sheets make a very effective barrier. Plants should be covered before and during application.

MIXING: If the product appears to have separated, thoroughly mix the masonRE Latex 20 with a drill until it becomes homogeneous once again. DO NOT SHAKE. DO NOT DILUTE.

EQUIPMENT: Ensure application equipment is free of any previously applied products or chemicals or solvents.

Application

Apply a thick, even layer of masonRE Latex 20 onto the substrate to be cleaned. An airless sprayer is the most effective means of application. Always start the sprayer pump at the lowest pressure setting and slowly build up the pressure until an adequate fan pattern has been generated. The minimum wet film thickness should be 1/8 - 3/16 inch. If too little product is applied the removal of the latex film will be more difficult. Once applied, leave the product alone. When applying masonRE Latex 20 by brush, try to build a thick uniform layer to ensure ease of removal after film formation.

Dwell Time

The time required for the masonRE Latex 20 to cure and form a dry latex film will vary depending on temperature, thickness of application, and relative humidity. Product applied on a substrate at 68° F with 40% relative humidity will be dry in approximately 24 hours. Once product has completely turned a shade of yellow and is rubbery to the touch it is ready to be removed. Do not leave the product on more than 3 days after polymerization. Do not apply to exterior surfaces if temperature is above 90° F or rain is predicted. Protect from direct sun and rain.

Removal and Cleanup

Substrate Cleanup: Once the masonRE Latex 20 has been removed wipe down the surface of the substrate with a damp sponge.

Pump Cleanup: Cleanup should be completed at the end of every day to ensure spray equipment is not damaged. Please follow the steps below.

1. Remove the intake or suction hose from the unit of latex 20.
2. Clean the latex from the outside of the intake hose using a damp cloth.
3. Place the intake hose in a 5-gallon bucket of clean water.
4. Place the pump's prime hose in a empty waste bucket.
5. Switch the pump to prime and turn on the pump.

Allow the pump to cycle on prime until the fluid coming out of the prime hose is nearly clear. The pump, intake hose and prime hose are now clean enough to clear the spray line and gun.

6. Turn off the pump.
7. Remove the spray gun from the line. Place the line in the waste bucket.
8. Turn the pump on and adjust the pressure to the lowest setting.
9. Switch the pump from prime to spray.

Allow the pump to cycle on prime until the fluid coming out of the spray hose is nearly clear. The pump, intake hose and spray hose are now clean enough to clear the gun.

10. Turn the pump off.
11. Reinstall the spray gun.
12. Turn the pump on and squeeze the trigger while pointing the gun into the waste bucket.
13. Flip the spray tip between clean and spray a few times to clean the tip.
14. Remove the entire spray nozzle and the spray tip.
15. Spray the gun without tip holder and nozzle installed.
16. Switch the pump to prime and turn off the power.

The final step is a safeguard to keep the gun clean. Remove the gun from the spray hose and place it in a container of clean water overnight. Any brushes used in application should be placed in a bucket of water overnight. Do not use paint thinners or other solvents.

Safety Requirements

Proper safety procedures should be followed at all times while handling this product. Refer to the Safety Data Sheet for important health/safety information before use.

Limitations

Surface temperatures should be 50° to 90°F (10° to 32°C). The product performs effectively at lower temperatures (even at 40°F, 5°C), but the dwell time increases.

Packaging and Coverage

Packaging: Approximately 5 gallons
The product is engineered for thick film build up on vertical and overhead surfaces. Minimum wet film thickness should be **62** mil (**1/16 inches**). Typical coverage is approximately 25 to 30 sq. ft. per gallon (smooth surface)

Technical Data

Appearance	Thick white liquid
Specific Gravity	>0.93
Boiling Point	98.1ºC
pH	10.4
VOC content	**NO**

DO NOT ALLOW PRODUCT TO FREEZE!

Notice: The information contained herein is based on our own research and the research of others, and it is provided solely as a service to help users. It is believed to be accurate to the best of our knowledge. However, no guarantee of its accuracy can be made, and it is not intended to serve as the basis for determining this product's suitability in any particular situation. For this reason, purchasers are responsible to make their own tests and assume all risks associated with using this product.

7/2015

MasonRE Latex 20

Safety Data Sheet

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name : MasonRE Latex 20

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Manufacturing

1.3. Details of the supplier of the safety data sheet

Cathedral Stone Products
7266 Park Circle Drive
Hanover, MD 21076
T 410-782-9150

1.4. Emergency telephone number

Emergency number : 800-331-1696

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2 H315
Eye Irrit. 2A H319
STOT SE 3 H335

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) : H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) : P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - If on skin: Wash with plenty of water
P304 + P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a poison center/doctor if you feel unwell
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification (GHS-US)
Rubber, natural, latex, reaction products with ammonium hydroxide	(CAS No) 129311-51-9	75	Not classified
Tetrasodium EDTA	(CAS No) 64-02-8	5	Not classified
Cellulose, 2-hydroxyethyl ether	(CAS No) 9004-62-0	0.5 - 2	Not classified

Full text of H-phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Obtain medical attention if breathing difficulty persists.

First-aid measures after skin contact : Rinse with plenty of water. Get medical attention if irritation develops or persists.

First-aid measures after eye contact : Remove contact lenses immediately. Flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

First-aid measures after ingestion : Seek immediate medical attention. The latex will coagulate (solidify) in the digestive tract.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : May cause respiratory irritation.

Symptoms/injuries after skin contact : Causes skin irritation.

Symptoms/injuries after eye contact : Causes eye irritation, redness, tearing and blurred vision.

Symptoms/injuries after ingestion : May be harmful if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use carbon dioxide, foam, dry chemical or water.

Unsuitable extinguishing media : None.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Not flammable.

Explosion hazard : None known.

5.3. Advice for firefighters

Protection during firefighting : Firefighters should wear full protective gear.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment : Stop the flow of material, if this is without risk.

Methods for cleaning up : Confine spill and soak up with absorbent. Place in an approved container and dispose in accordance with local, state and federal regulations.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid breathing vapors.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Cellulose, 2-hydroxyethyl ether (9004-62-0)	
ACGIH	Not applicable
OSHA	Not applicable

Tetrasodium EDTA (64-02-8)	
ACGIH	Not applicable
OSHA	Not applicable

Rubber, natural, latex, reaction products with ammonium hydroxide (129311-51-9)	
ACGIH	Not applicable
OSHA	Not applicable

8.2. Exposure controls

Hand protection : Wear neoprene or nitrile gloves to minimize skin contact.
Eye protection : Use goggles or face shield.
Skin and body protection : Wear suitable working clothes.
Respiratory protection : If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid
Appearance : Milky.
Color : White
Odor : Ammonia
Odor threshold : No data available
pH : 10.4
Melting point : No data available
Freezing point : No data available
Boiling point : 98.1 °C
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available
Explosion limits : No data available
Explosive properties : No data available
Oxidizing properties : No data available
Vapor pressure : 760 mm Hg (for water phase)
Specific gravity : >0.93
Relative vapor density at 20 °C : No data available
Solubility : Soluble
Log Pow : No data available
Log Kow : No data available
Auto-ignition temperature : No data available

Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

Will not occur.

10.4. Conditions to avoid

Contact with acids or salts will cause coagulation.

10.5. Incompatible materials

Not determined.

10.6. Hazardous decomposition products

Oxides of carbon.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Tetrasodium EDTA (64-02-8)	
LD50 oral rat	1658 mg/kg
ATE US (oral)	10000000.000 mg/kg

Skin corrosion/irritation	:	Causes skin irritation. pH: 10.4
Serious eye damage/irritation	:	Causes serious eye irritation. pH: 10.4
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

Tetrasodium EDTA (64-02-8)	
LC50 fish 1	41 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 fish 2	59.8 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on the global warming	:	No known ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	:	Dispose of contents/container in accordance with local/regional/national/international regulations.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	:	UN1760 Corrosive liquids, n.o.s., 8, III
UN-No.(DOT)	:	UN1760
DOT Proper Shipping Name	:	Corrosive liquids, n.o.s.
Department of Transportation (DOT) Hazard Classes	:	8 - Class 8 - Corrosive material 49 CFR 173.136
Hazard labels (DOT)	:	8 - Corrosive 
Packing group (DOT)	:	III - Minor Danger
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	203
DOT Packaging Bulk (49 CFR 173.xxx)	:	241
DOT Symbols	:	G - Identifies PSN requiring a technical name
DOT Special Provisions (49 CFR 172.102)	:	IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672). T7 - 4 178.274(d)(2) Normal............. 178.275(d)(3) TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling. TP28 - A portable tank having a minimum test pressure of 2.65 bar (265 kPa) may be used provided the calculated test pressure is 2.65 bar or less based on the MAWP of the hazardous material, as defined in 178.275 of this subchapter, where the test pressure is 1.5 times the MAWP.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	60 L
DOT Vessel Stowage Location	:	A - The material may be stowed óon deckô or óunder deckô on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	40 - Stow óclear of living quartersô

SECTION 15: Regulatory information

15.1. US Federal regulations

Cellulose, 2-hydroxyethyl ether (9004-62-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Tetrasodium EDTA (64-02-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. US State regulations

No additional information available

SECTION 16: Other information

Full text of H-phrases::

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

CONSERVATION PLAN:
EXTERIOR WOOD SIDING

GROPIUS HOUSE
LINCOLN, MA

Prepared for:
Historic New England
Lyman Estate
185 Lyman St.
Waltham, MA 02452

Prepared by:
Jablonski Building Conservation, Inc.
40 West 27th Street, Suite 1201
New York, NY 10001

October 5, 2016

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Jablonski Building Conservation, Inc. (JBC) was retained by Historic New England (HNE) to identify materials and analyze conservation issues related to the exterior wood siding at the Gropius House in Lincoln, Massachusetts, in order to determine how to treat and monitor the material over time.

Materials Identification

JBC removed samples of original siding to confirm the wood species and examine it for signs of deterioration. A total of three samples from the north and east elevations were removed, sectioned, and mounted to glass slides for microscopic examination.

Based on microscopic observation, the diagnostic features of the three samples examined are consistent with *sequoia sempervirens*, more commonly known as redwood. Little in the way of deterioration features were observed outside of a scarcity of extractives filling parenchyma cells (as would be seen in freshly cut wood). However, this condition is consistent with wood that has been exposed to weathering.

Conditions Assessment

JBC conducted a field survey and documentation of biological soiling apparent on the exterior wood siding. This survey was executed visually from the ground and the second story roof deck. Conditions were noted on elevation drawings (see Appendix B).

The exterior siding at Gropius House has significant biological growth. This growth was identified microscopically as *aspergillus*, a very ubiquitous and resilient genus of mold fungi. Records of past treatments indicate that the substrate was "pre-treated" with a mixture containing linseed oil, a medium known to support mold growth. However, in cross-sectioned samples, no mold hyphae were observed penetrating the coatings on the siding. The mold appears to be growing on nutrients in the paint and on organic wind-borne debris (such as pollen) deposited on the coated surface. The soiling is most prevalent on the east end of the north elevation and across the south and west elevations. All of these areas receive tree shade.

While unsightly, the biological growth appears to have no serious adverse effect on the wood substrate. However, the high moisture levels supporting mold growth have led to deterioration of the siding in the most exposed areas.

Cleaning Tests: Mold Removal and Control

JBC tested eight mold removal and control products on areas of wooden siding exhibiting severe biological soiling. Test patches were applied in two locations including, the east elevation of the detached garage and the west elevation of the second story roof deck. All products tested were effective in initially removing visible traces of soiling. While none of the products were completely effective in preventing recolonization of treated areas after ten months of exposure,

D/2 Biological Solution and sodium hypochlorite test patches exhibited the least regrowth. JBC recommends removing biological soiling from the siding on an annual basis with D/2.

INTRODUCTION

The services of Jablonski Building Conservation, Inc. (JBC) were retained by Historic New England (HNE) to identify materials and analyze conservation issues related to the exterior wood siding at the Gropius House in Lincoln, Massachusetts, in order to determine how to treat and monitor the material over time. Conservators Mary Jablonski and Edward G. FitzGerald from JBC visited the site October 28-30, 2015, to collect samples and perform an assessment of the existing conditions and cleaning tests. Second and third site visits were conducted April 19-20 and May 31-June 1, 2016, to inspect cleaning test patches. Results and recommendations are presented below.

I. HISTORY AND DESCRIPTION

The Gropius House is clad in V-groove vertical wooden siding, believed to be an intentional reference by Gropius to traditional New England building materials. Paint research conducted in 1995 indicates that the siding has always been painted white (with the exception of gray and pink accent walls) and that the earliest finish was a traditional linseed oil-based paint pigmented with white lead. This research also identified the presence of mold spores between paint layers and a fungicide containing pentachlorophenol applied on top of the fourth generation of paint on the siding.[1] The fungicide corresponds to an invoice, dated 1960 and billed to Gropius, for the purchase of the product Retardol. Pentachlorophenol is the main ingredient in Retardol. This information suggests that Gropius himself had had to contend with biological growth on the siding over 50 years ago.

The problem with biological growth on the siding persisted after HNE took over management of the property in the 1980s. Remedial actions including stripping, treating, and re-painting the siding, and periodically cleaning the siding with fungicides, have only temporarily removed the growth. A partial chronology of activities related to the exterior siding is contained in Appendix A.

[1] Susan L. Buck, "Cross-Section Microscopy Report," (report, SPNEA Conservation Center, April 13, 1995).

II. MATERIALS IDENTIFICATION

Primary accounts indicate that the vertical wooden siding installed on the exterior facades is redwood.[2] JBC removed samples of original siding to confirm the wood species and examine it for signs of deterioration. Wood examination and speciation were conducted using standard microscopy techniques.

A. Sampling

Samples of the wooden siding were removed using a scalpel from a total of three locations on the north and east elevations. Samples were labeled as GH-W-03, 04, and 05. Sampling locations are identified in Figures 1 and 2 below.

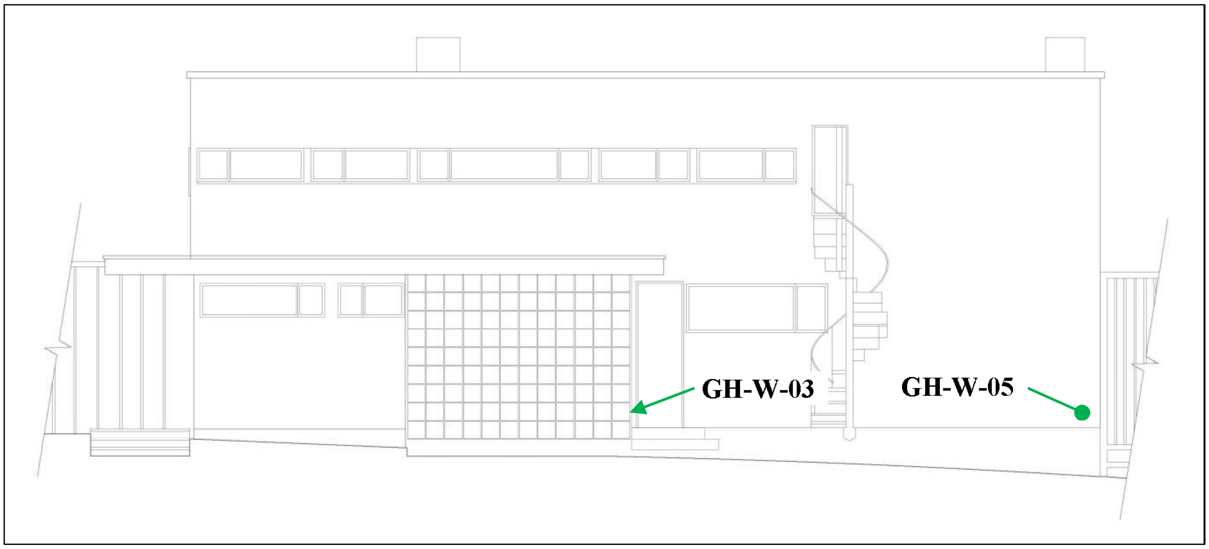


Figure 1. North elevation showing siding sampling locations.

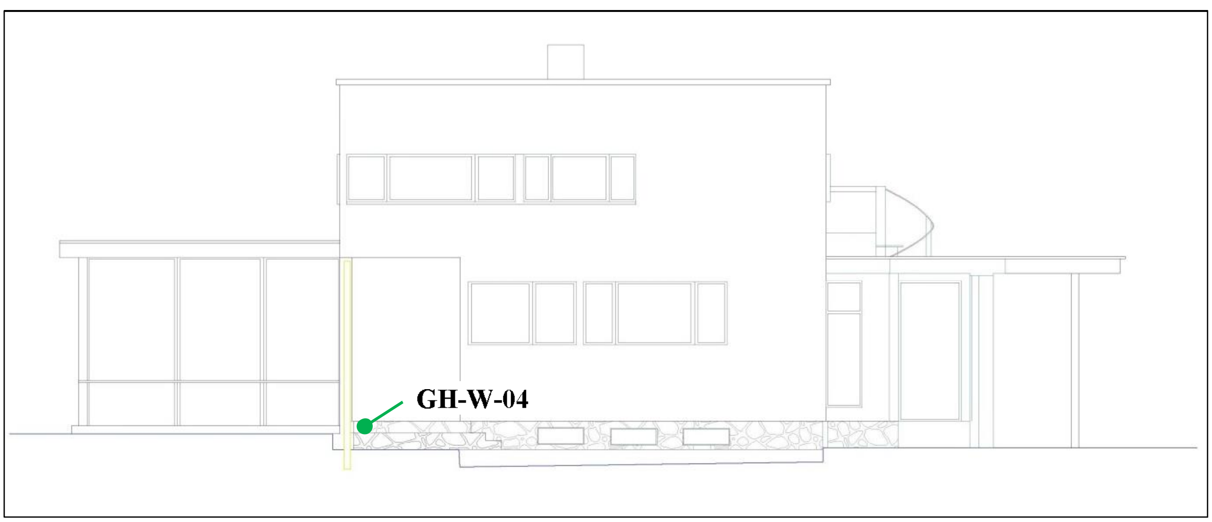


Figure 2. East elevation showing siding sampling location.

[2] Ise Gropius, History of the Gropius House (SPNEA, 1977), 7.

B. Methodology

Samples were prepared for examination by surfacing cross, radial, and tangential surfaces using a razor blade. Samples were then examined microscopically using a Motic Stereo Zoom microscope with 7.5X - 50X magnification. Thin sections were removed by hand from cross, radial, and tangential planes and stained using safranine in aqueous solution to aid in the detection of microscopic features. When necessary, samples were softened in boiling water prior to sectioning. The stained sections were mounted to glass slides using Cargille Meltmount with a refractive index of 1.662 and examined using a Zeiss Axioskop 40 polarizing light microscope.

C. Findings

Due to the weathered condition of the samples, unaided visual examination provided limited information. Under low magnification, all three samples exhibited similar characteristics. Growth rings measuring approximately 0.2-0.5mm and having an abrupt transition from early to late wood were observed in a cross-sectioned hand sample (Figure 3). Early wood tissue is composed primarily of large, easily visible tracheids, arranged in a radial fashion and fairly uniform in diameter. Based on the size of tracheids visible in cross section, the sample is classified as having a coarse texture. Uniseriate and biseriate rays are present but barely visible. Fusiform rays and resin canals are absent. These features are indicative of softwoods, particularly coarse-textured conifers.

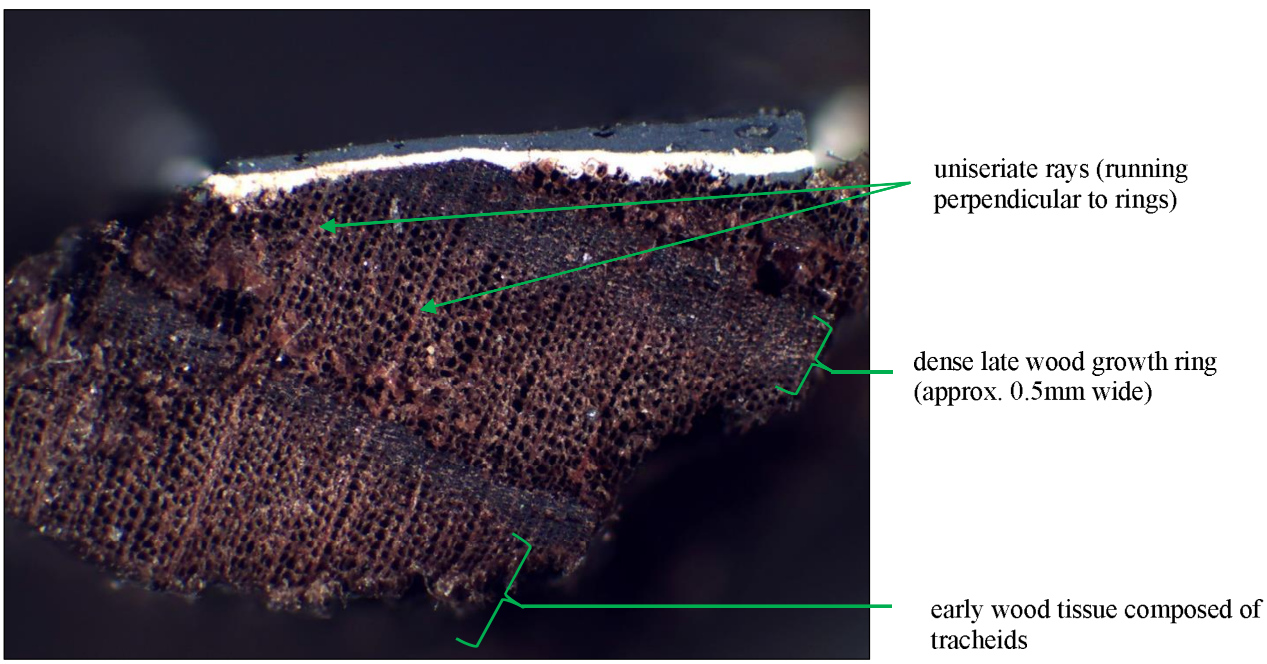


Figure 3. Cross section view of wood sample GH-W-03. (30X)

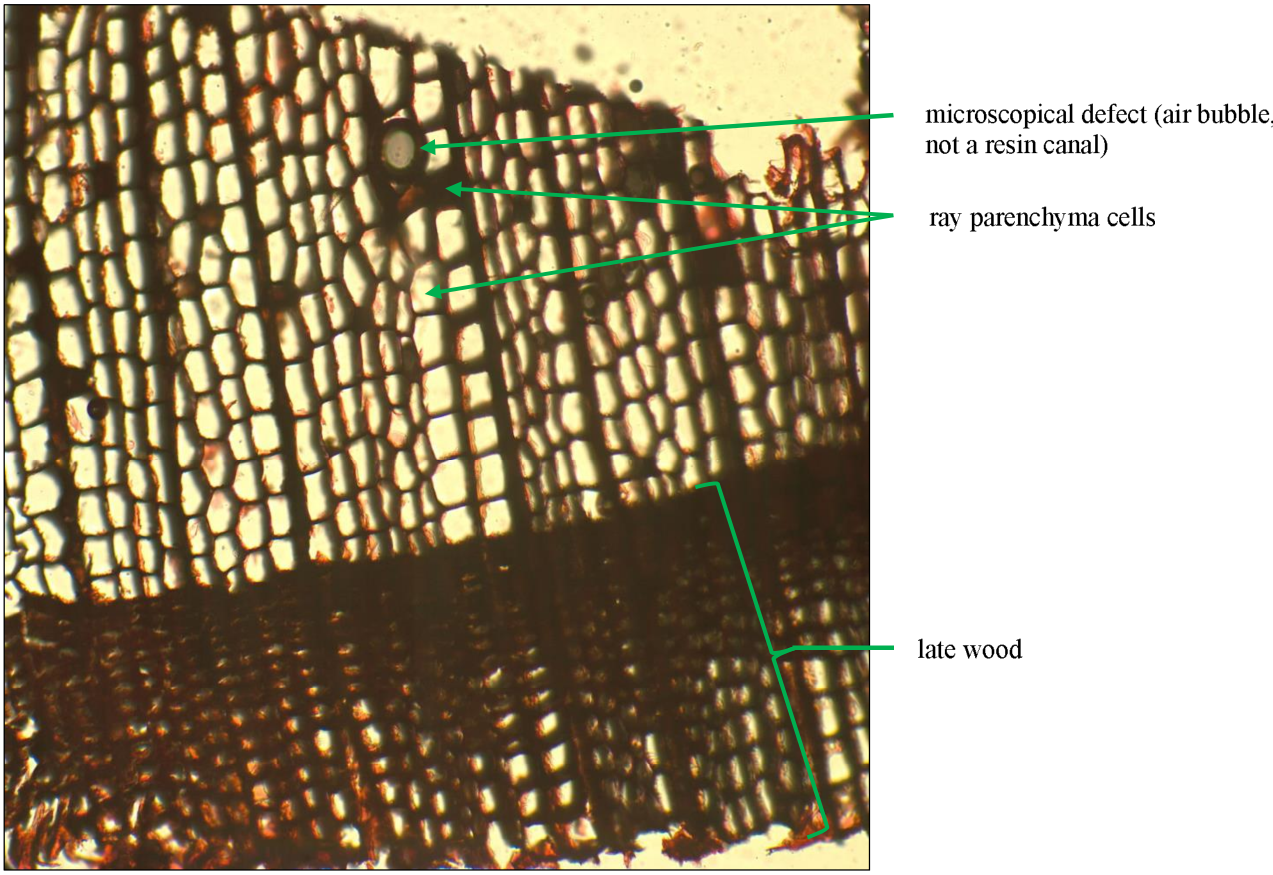


Figure 4. Stained and mounted cross section of wood sample GH-W-03. (100X)

In the stained and mounted cross section, parenchyma cells have a square shape and are occasionally filled-in by extractives (Figure 4). In tangential section, scattered rays are visible (Figure 5). Rays are both uniseriate (i.e. consisting of a single vertical tier of cells) and biseriate. Again, the tissue is lacking resin canals. End walls of longitudinal parenchyma appear smooth, lacking nodules (as seen in baldcypress and incense-cedar) (Figure 6). Spiral thickening (found in only two conifers, Douglas-fir and yew) is absent. However, limited spiral checking, which can result from severe seasoning stresses, was observed. No hyphae, indicative of wood-rotting fungus, were observed in the cell structure of the mounted sample.[3]

In radial section, the walls of longitudinal tracheids exhibit bordered pitting (typically in two rows) and ray tracheids are absent (Figure 7). Cross-field pitting (generally 1-4 pits per field) is large and exhibits prototypical taxodioid form (Figure 8**Error! Reference source not found.**).

[3]Mold spores were observed on the wood surface in sample GH-W-05, taken from the end of a siding board nearest the ground.

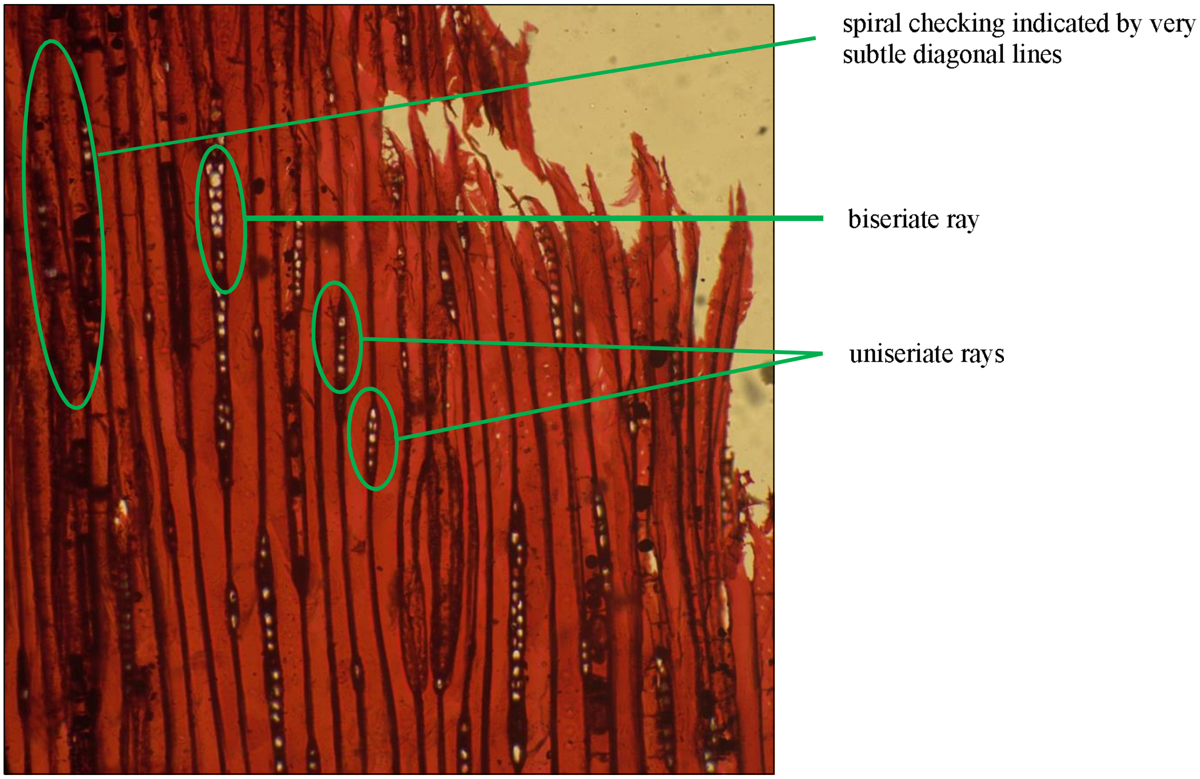


Figure 5. Stained and mounted tangential section of wood sample GH-W-03. (100X)

Figure 6. Stained and mounted tangential section of wood sample GH-W-04. (100X)

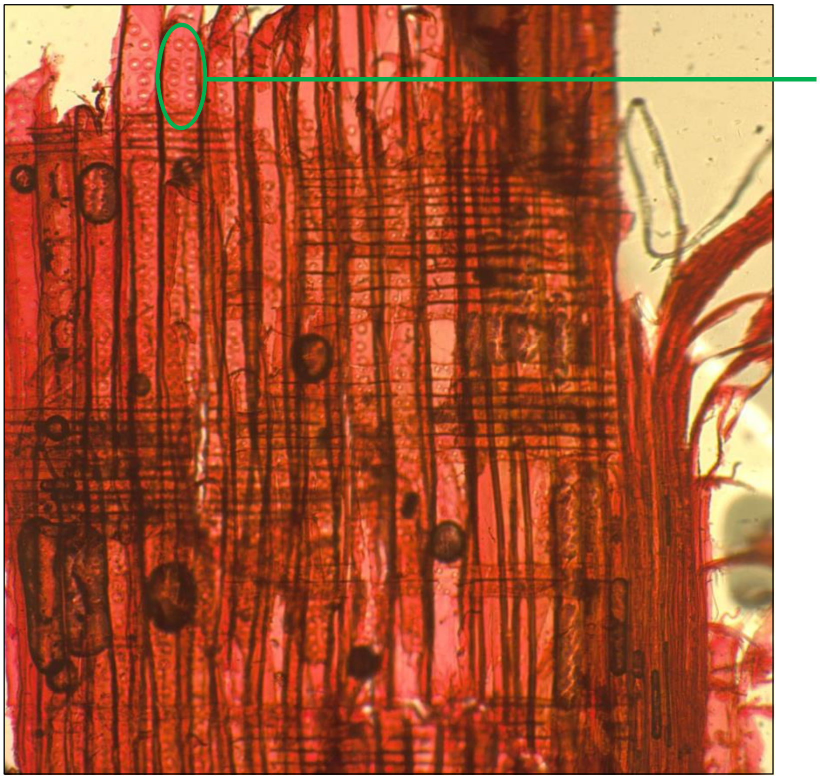


Figure 7. Stained and mounted radial section of wood sample GH-W-03. (100X)

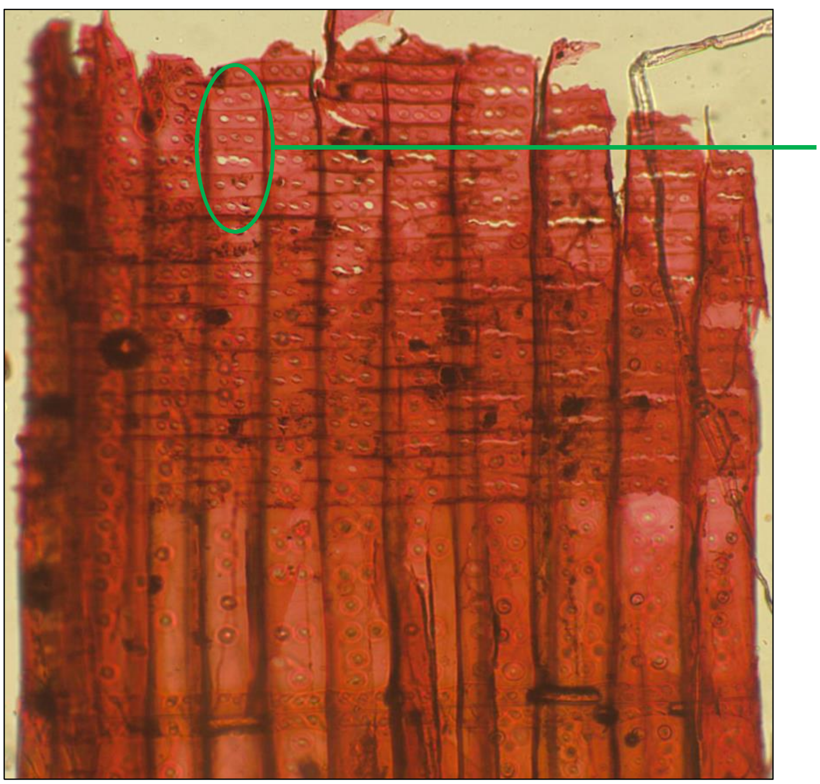


Figure 8. Stained and mounted radial section of wood sample GH-W-05. (100X)

D. Conclusions

Based on microscopic observation, the diagnostic features of the three samples examined are consistent with *sequoia sempervirens*, more commonly known as redwood. The growth rings examined in the unmounted samples clearly identify them as a softwood. The lack of resin canals and fusiform rays exclude species such as pines, Douglas-fir, spruce, and larch. The coarse texture and early to latewood transition suggest bald cypress, incense cedar, redwood, or western red cedar. The presence of biseriate rays eliminates western red cedar. Smooth end walls in longitudinal parenchyma and taxodioid cross-field pitting further distinguish the samples from similar softwood species and confirm them as belonging to redwood. Little in the way of deterioration features were observed outside of a scarcity of extractives filling parenchyma cells (as would be seen in freshly cut wood). However, this condition is consistent with wood that has been exposed to weathering.

III. CONDITIONS ASSESSMENT

A. Methodology

Prior to JBC's site visit, reports and other records of prior assessments and treatments supplied by the client were reviewed. Comprehensive documentation and field survey of the exterior wood siding was executed visually from the ground and the second story roof deck. Conditions were noted on elevation drawings (see Appendix B).

A swab sample was taken from biological growth apparent on the siding of the detached garage structure and sent to an external lab for identification and enumeration of culturable fungi (including speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys). Samples of peeling paint were also removed from the garage for direct examination of the biological growth.

B. Findings

The exterior siding at Gropius House has significant mold growth. This form of biological growth is often misnamed "mildew". However, true mildew, which is a form of mold, typically appears as a white powder and only grows on living plants. The growth appears as soiling in the form of dark spots or gray shading on painted surfaces. Mold on a painted surface is often found in damp or shaded areas, conditions that are conducive to mold growth.

In an effort to understand more about the biological growth, swabs were sent to an external lab for identification and enumeration of culturable fungi. Unfortunately, the results of the external laboratory's swab identification returned negative (i.e. no viable mold detected). This is most likely because the sample was either of a species of algae or was otherwise a fungus that was no longer viable, i.e. was not able to be cultured. Microscopic analysis of paint samples removed from the garage and examined by JBC found the surfaces dotted with mold spores with a network of clearly defined hyphae (Figure 9). The morphological characteristics of this colony appear consistent with the *aspergillus* genus of fungi, exhibiting characteristic globose head shape, hyaline, septate hyphae, and black or dark brown color, and may belong to the species *aspergillus niger* (Figure 10).[4] *A. niger* is a very ubiquitous mold species and lives in nearly all environments. It is also very resilient, being capable of surviving in freezing temperatures and in environments lacking nutrients.

In conversations with HNE staff, concerns were raised regarding the use of a linseed oil-based wood preservative treatment that was applied to the stripped siding prior to repainting. Specifically, the staff questioned whether this could be the cause of the biological growth. While linseed oil would indeed provide nutrients to support mold and other forms of biological growth, the *aspergillus* present on the siding does not appear to penetrate the coating film. A cross-section of the colonized coating sample shown in Figure 9 shows no sign of hyphae penetrating through the layers of paint and into the linseed oil-treated wood substrate (Figure 11). In this case, the mold appears to be growing on nutrients supplied by the paint and from organic wind-borne debris (such as pollen) deposited on the coated surface.

[4] Encyclopedia of Life, "Aspergillus niger," accessed 13 Sept. 2016, http://eol.org/pages/2920814/details

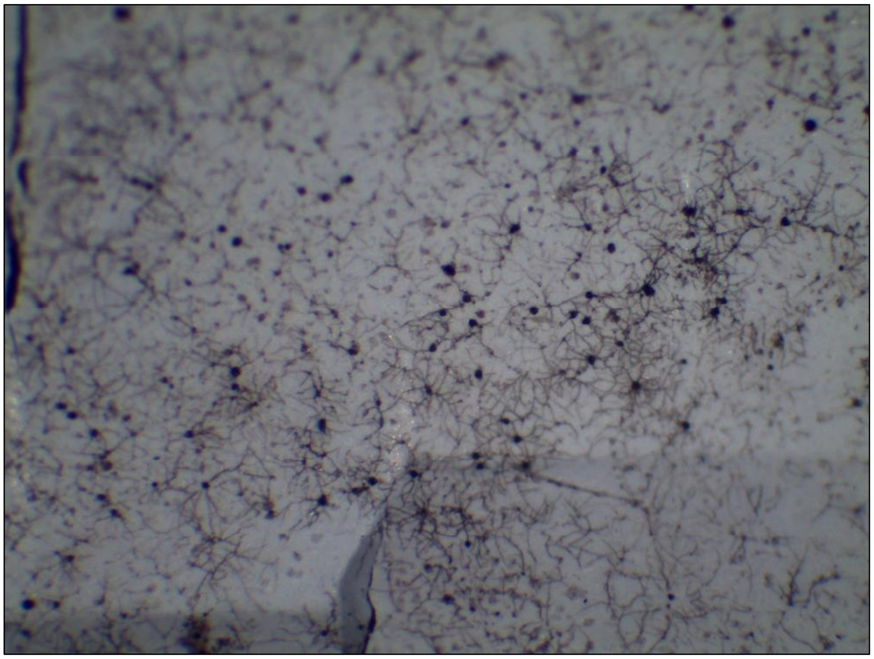


Figure 9. Coated surface of siding showing mold spores and hyphae (40X).

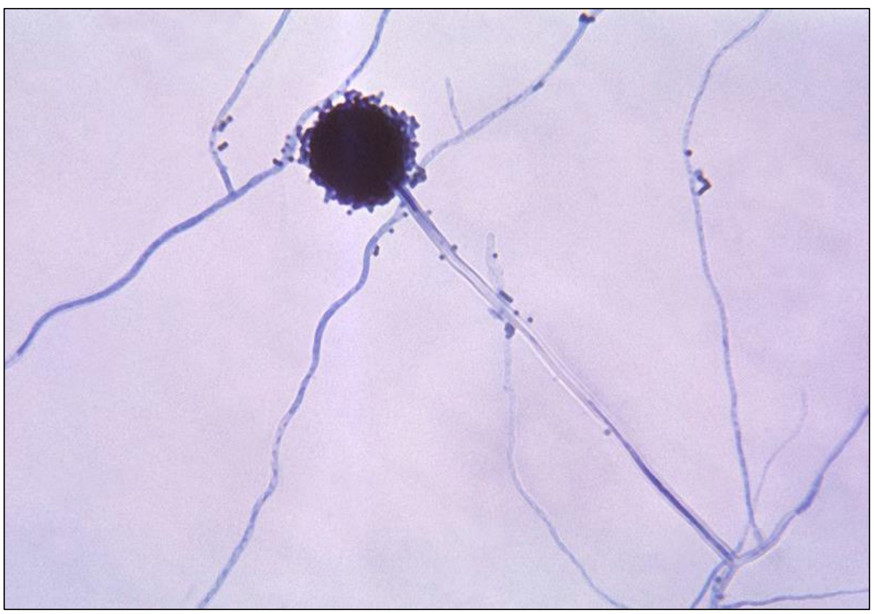


Figure 10. Photomicrograph at high magnification showing typical *aspergillus niger* morphology (Credit: Dr. L.K. Georg|CDC, http://phil.cdc.gov/phil/home.asp).

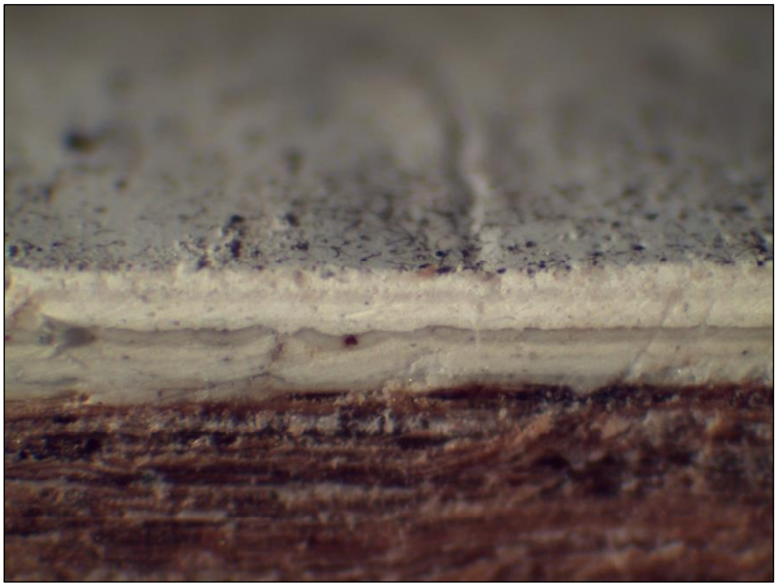


Figure 11. Cross-section through coatings and wood showing mold colony on upper surface and lack of hyphae penetrating coating layers (40X).

Results of the field survey documenting conditions affecting the siding indicates that biological soiling, while present to some degree on all elevations, is concentrated in areas protected by tree shade (see Appendix B). The soiling is most prevalent on the east end of the north elevation and across the south and west elevations. All of these areas receive tree shade.

While unsightly, the biological growth appears to have no serious adverse effect on the wood substrate. However, the high moisture levels supporting mold growth have led to deterioration of the siding in the most exposed areas. This is most evident on the fascia boards on the southwest corner of the building which exhibit signs of coating deterioration.

In several locations, the survey team noted individual siding boards that appeared bright white, apparently unafflicted by mold growth. These "anomaly boards" were likely treated differently than surrounding materials (i.e. have been replaced or refinished using different coatings). A similar phenomenon was observed in the coating applied over nail heads. Discussions with the staff revealed that nail heads were likely treated with a metal primer prior to being top coated with the siding paint. Metal primers often contain zinc oxide that, in addition to inhibiting rust, deters biological growth. It is unclear whether any fungicide is or was present in the coating applied in the most recent complete façade repainting campaign

IV. CLEANING TESTS: MOLD REMOVAL AND CONTROL

A. Methodology

Eight products, two at different concentrations, were selected for testing (see Table 1). Product data sheets are contained in Appendix C. Test patches were applied in two locations chosen by JBC, including the east elevation of the detached garage (Figure 12) and the west elevation of the second story roof deck (Figure 13), in October 2015. Mold was clearly present in both locations. The latter test included a condensed testing matrix with hydrogen peroxide and trisodium phosphate omitted. The test areas were masked, labeled, and photo-documented prior to testing. A baseline pH of the test surface and rinse water available on site was measured at pH 5, indicating a slight acidity. The products were applied as follows:

1. The test area was pre-wet with water spray to limit absorption of the cleaning product and soiling into the substrate;
2. The product was applied using a paint brush and the test area was scrubbed for one minute using a nylon bristle brush. D/2 and Wet & Forget were allowed to dwell for 10 minutes (as per manufacturer recommendation) and were reapplied as necessary to maintain a wet surface during this period.
3. The area was rinsed with water spray for approximately five minutes or until the pH of the rinse water runoff returned to normal (pH 5).

Table 1. Products Tested

Product Name	**Concentration** (in water)
Water	undiluted
D/2 Biological Solution	undiluted
Wet & Forget	undiluted
Vulpex	15%
Hydrogen Peroxide	3% (stock solution)
Hydrogen Peroxide	30%
Sodium Hypochlorite (Clorox Bleach)	5% (stock solution)
Sodium Hypochlorite (Clorox Bleach)	1.25%
Orvus	5%
Trisodium Phosphate (TSP)	1.52%

The test patches were reviewed the following spring during site visits in mid-April and late-May 2016 to determine whether any of the products were effective in preventing recolonization of the siding. However, insufficient time and exposure to optimal biological growth conditions (i.e. warm and humid environment) had elapsed for the test areas to be recolonized. A final determination of long-term effectiveness was made based on photographs of the test areas taken by HNE staff in August 2016, after ten months of exposure.

Figure 12. Cleaning test location on east elevation of the detached garage.

Figure 13. Cleaning test location on west elevation of the second story roof deck.

B. Findings

All products tested were effective in removing visible traces of soiling. Certain products left the surface slightly more alkaline than before testing, indicating the presence of residuals (see Table 2). However, the pH readings were still within an acceptable range. The other major difference between products observed during testing is that some required considerably more scrubbing and effort to be effective. At one extreme, the sodium hypochlorite solutions were effective with little or no scrubbing required while the cleaning test using just water required the most scrubbing to produce a clean surface. "Before and after" photographs of the two cleaning test areas are presented below.

Table 2. pH of Products and Test Area After Rinsing

Product Name (conc.)	**Product pH**	**pH After Rinsing**
Water	5.0	5.0
D/2 Biological Solution	9.5	6.0
Wet & Forget	8.0	4.5
Vulpex	9.0	5.0
Hydrogen Peroxide (3%)	5.0	5.0
Hydrogen Peroxide (30%)	4.0	5.0
Sodium Hypochlorite (1.25%)	12.0	6.0
Sodium Hypochlorite (5%)	>12.0	7.0
Orvus	7.0	5.0
Trisodium Phosphate	12.0	5.0

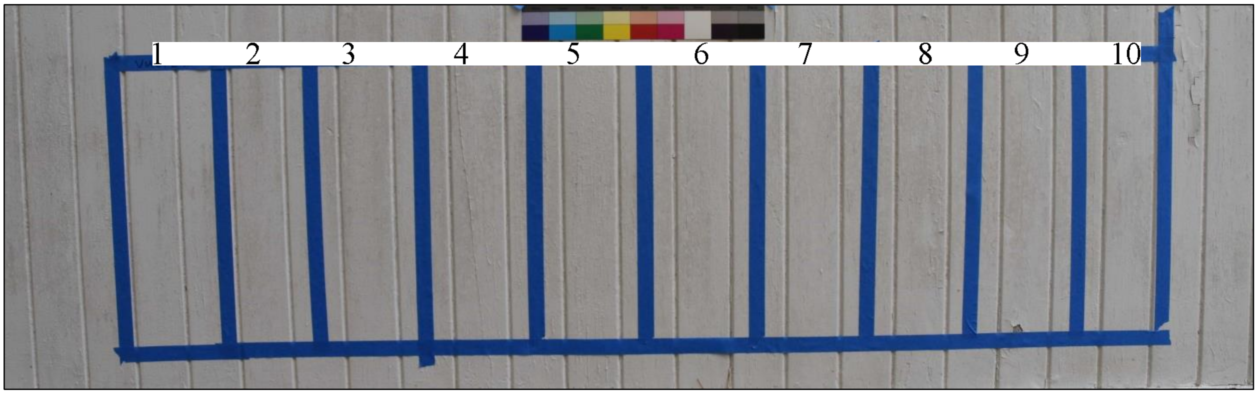


Figure 14. Cleaning test area on east elevation of garage before application. Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

Figure 15. Cleaning test area on east elevation of garage after application. Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

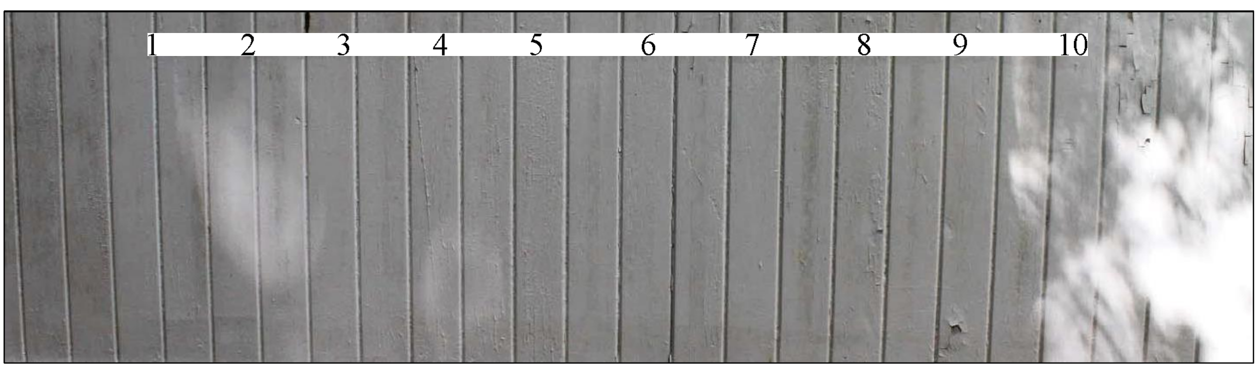


Figure 16. Cleaning test area on east elevation of garage after ten months of exposure (Credit: Colleen Chapin|HNE). Products: (1) Vulpex, (2) Water, (3) D/2, (4) Wet & Forget, (5) TSP, (6) 3% Hydrogen Peroxide, (7) 30% Hydrogen Peroxide, (8) 1.25% Sodium Hypochlorite, (9) 5% Sodium Hypochlorite, (10) Orvus.

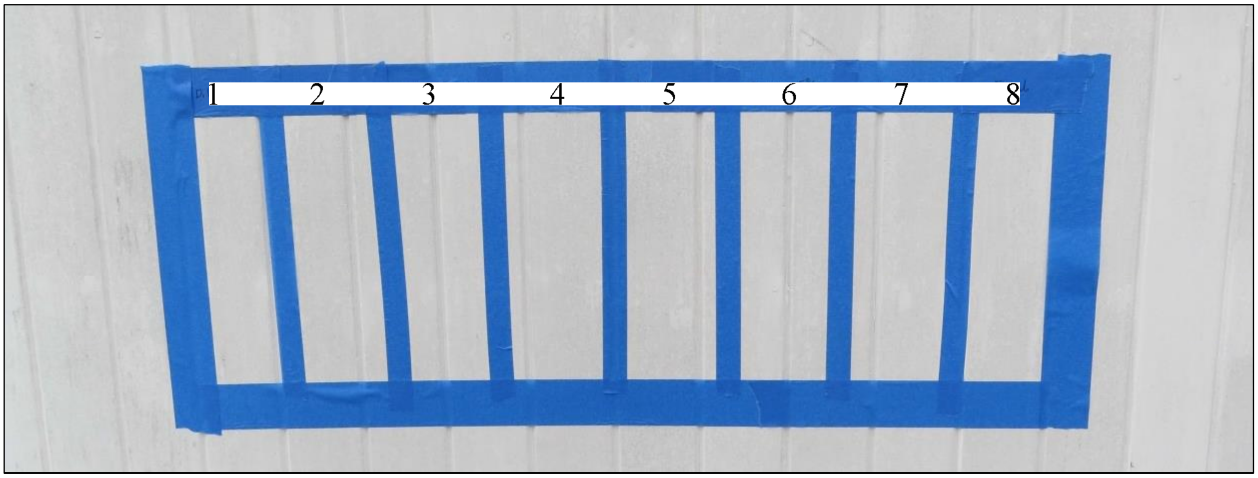


Figure 17. Cleaning test area on west elevation of roof deck before application. Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

Figure 18. Cleaning test area on west elevation of roof deck after application. Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

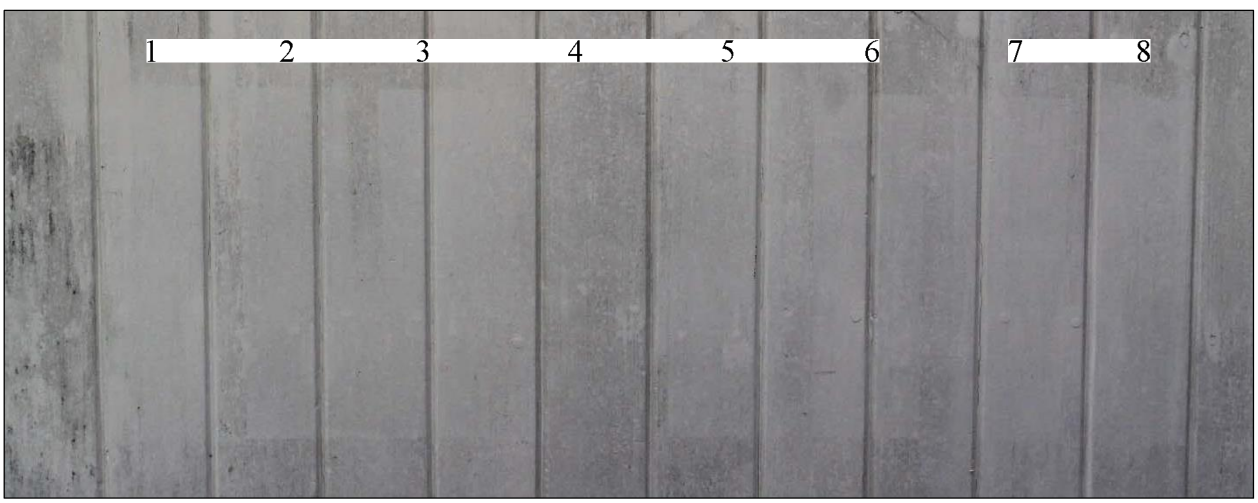


Figure 19. Cleaning test area on west elevation of roof deck after ten months of exposure (Credit: Colleen Chapin|HNE). Products: (1) 1.25% Sodium Hypochlorite, (2) Water, (3) Wet & Forget, (4) [untreated], (5) Vulpex, (6) Orvus, (7) D/2, (8) 5% Sodium Hypochlorite.

C. Conclusions

Of the eight products tested, D/2 Biological Solution and both concentrations of sodium hypochlorite were most effective in removing biological soiling and preventing its recurrence. All products, including water, were effective in initially cleaning biological soiling from the test surfaces (see Figure 15 and Figure 18). However, none could completely prevent recolonization of the siding. Areas treated with 3% hydrogen peroxide, trisodium phosphate, water, Wet & Forget, and Vulpex exhibited the least long-term preventative effect. Areas treated with 30% hydrogen peroxide and Orvus had some long-term effect. The difference between areas treated with 30% hydrogen peroxide and Orvus and the best-performing areas treated with D/2 and sodium hypochlorite is slight.

V. TREATMENT RECOMMENDATIONS

Based on the results of the cleaning tests, JBC recommends cleaning the siding with D/2 Biological Solution.[5] Diluted sodium hypochlorite (bleach) would also be effective and is easier to procure. However, this cleaner and the runoff from its use can kill vegetation and damage masonry and so, it should only be used in contained areas such as the porches on the house.

Scrubbing affected surfaces during treatment is an important step. Testing showed that even plain water can be effective in removing biological soiling if the surface is agitated with a stiff brush. JBC contends that, despite some manufacturer's claims, scrubbing is essential to allow biological cleaning agents to penetrate the cell walls of biological growth and thoroughly remove soiling from pores and crevices in the substrate that can later become attachment points or even food for recolonizing organisms.

Removal of biological growth will likely be necessary on a yearly basis. Cleaning tests showed that none of the products tested is completely effective in preventing recolonization of treated areas. As the current coating on the siding is exposed to additional weathering, the surface will likely become rougher and microscopic cracks will develop as the coating shrinks and loses elasticity. Rough and cracked coatings hold moisture longer and provide attachment points for windborne debris and biological growth, making them more susceptible to soiling than fresh coatings. Yearly cleaning and maintenance of the coating can prolong its useful life and minimize the severity of reoccurring biological growth.

Areas exhibiting cracked or peeling paint should be cleaned with D/2, rinsed, sanded (and scraped if coating has detached), and recoated. JBC recommends selecting a coating containing both a mildewstatic pigment, such as zinc oxide, and a mildewcide additive to prevent biological growth. Coatings continuing titanium dioxide should be avoided as this pigment has very little inhibiting effect on biological growth. Aftermarket mildewcide paint additives (e.g. Krud Kutter MC-2, Zinsser Add-2, etc.) should also be avoided as research has shown that these products can be difficult to evenly disperse within the liquid coating, may affect the physical performance of the coating, and typically have a short-lived effect.[6] It should also be noted that coatings that have a rougher surface texture, such as a flat or eggshell sheen, are more susceptible to biological soiling than glossier coatings such as 100% acrylic semi-gloss and high-gloss latex paints. Low grade coatings should be avoided as these often contain fillers or thickeners that may become food for biological growth.

[5] D/2 Biological Solution is available from a number of suppliers. Visit http://d2bio.com/distributors for a list of suppliers.

[6] Steve Bussjaeger, et al., "Mildew and Mildew Control for Wood Surfaces," *Journal of Coatings Technology* 71, no. 890 (March 1999): 67-69, accessed 13 Sept. 2016, t http://www.fpl.fs.fed.us/documnts/pdf1999/bussj99a.pdf

APPENDIX A
Siding Maintenance Chronology

Gropius House

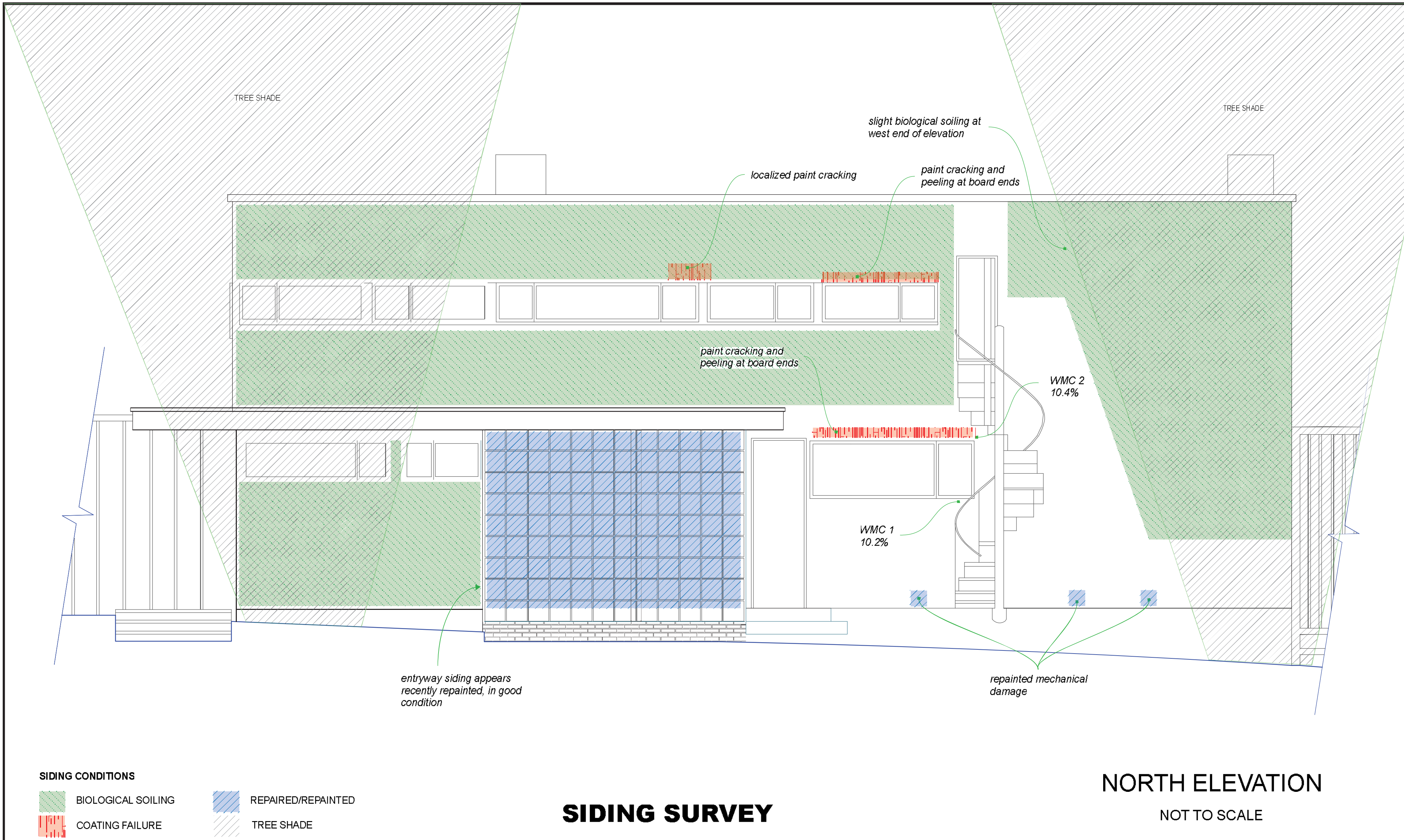
Exterior Siding Maintenance Chronology

Sept. 1938	Construction complete. Exterior likely painted using linseed-oil based paint.
[1960]	Retardol (pentachlorophenol) fungicide purchased by Gropius and likely applied to siding. (Invoice from The Paint Pot.)
1979	Gropius House donated to SPNEA.
Sept. 22, 1982	"Prep exterior, scrape, sand, wash mildew, apply 1 coat exterior oil primer, apply 1 coat exterior oil gloss - Pratt & Lambert paint. Includes siding, cornice, windows, doors, decks, railings, stairs, etc." (P.O. to Richard Dupont, Lennox, MA, $5400.)
1983	SPNEA assumes full responsibility for the property.
Feb. 27, 1986	"Preliminary paint study of the Gropius House to investigate color chronology and type, interior exterior." (P.O. to SPNEA Conservation Center, $1050.)
Feb. 27, 1986	"Prepare and paint exterior of house." (P.O. to Peter Connolly, Waltham, MA, $4200.)
June 30, 1986	"Prep and paint garage." (P.O. to Peter Connolly, $350.)
April 13, 1995	Analysis of exterior paint samples identifies early finishes, mold between paint layers and pentachlorophenol fungicide. ("Cross Section Microscopy Report.")
1996	East elevation and parts of north elevation stripped using methylene chloride-based product and repainted using two coats of alkyd primer and two finish coats of acrylic paint. ("Paint Crew Project Report.")
Sept. 2000	South and west elevation siding removed to workshop, then stripped and repainted. "All paint layers were removed by chemical materials [methylene chloride]. All surfaces were washed, and mildecide [sic.] was applied…. An application of two coats of alkyd primer was applied… followed by an application of two coats of acrylic finish coatings." May have also applied wood "consolidant" containing boiled linseed oil and mildewcide additive. ("Paint Crew Project Report: Gropius House Exterior siding, trim," 10/03/2000 and "Work Completion Report," 09/18/2000.) Paint crew notes mold on most surfaces of the north and east elevations and treats these surfaces with Greenshield-2000 (quarternary ammonium

	solution) followed by "a solution of clorox, Housewash mildecide [sic.]" (possibly sodium hypochlorite solution; unable to identify "Housewash" product, may be homemade solution with TSP and Clorox bleach).
May 2007	Exterior of house and garage cleaned using D/2 Biological Solution (quarternary ammonium solution). May not have been correctly applied. Biological growth reoccurs within a month. (Exterior Cleaning Completion Report, 01/16/2007.)

APPENDIX B
Condition Drawings

Gropius House



NORTH ELEVATION

NOT TO SCALE

SIDING SURVEY

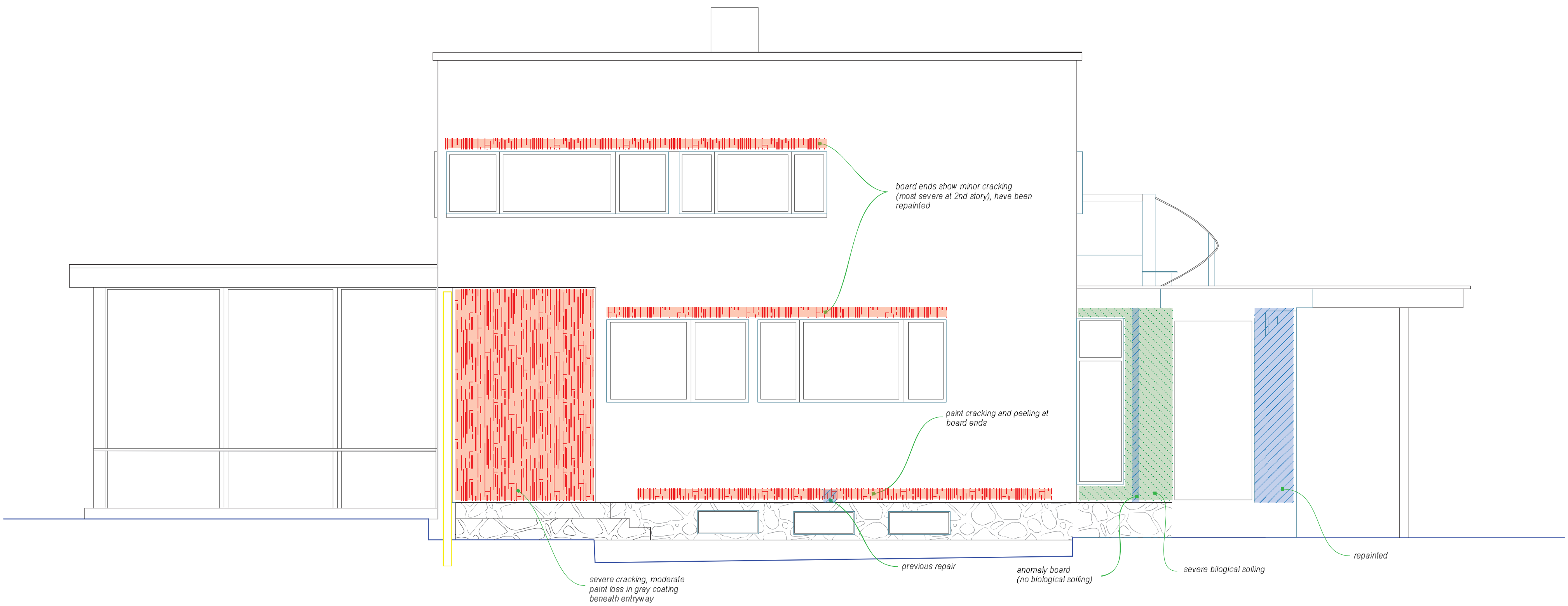
JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE
LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
1 OF 4



SIDING CONDITIONS

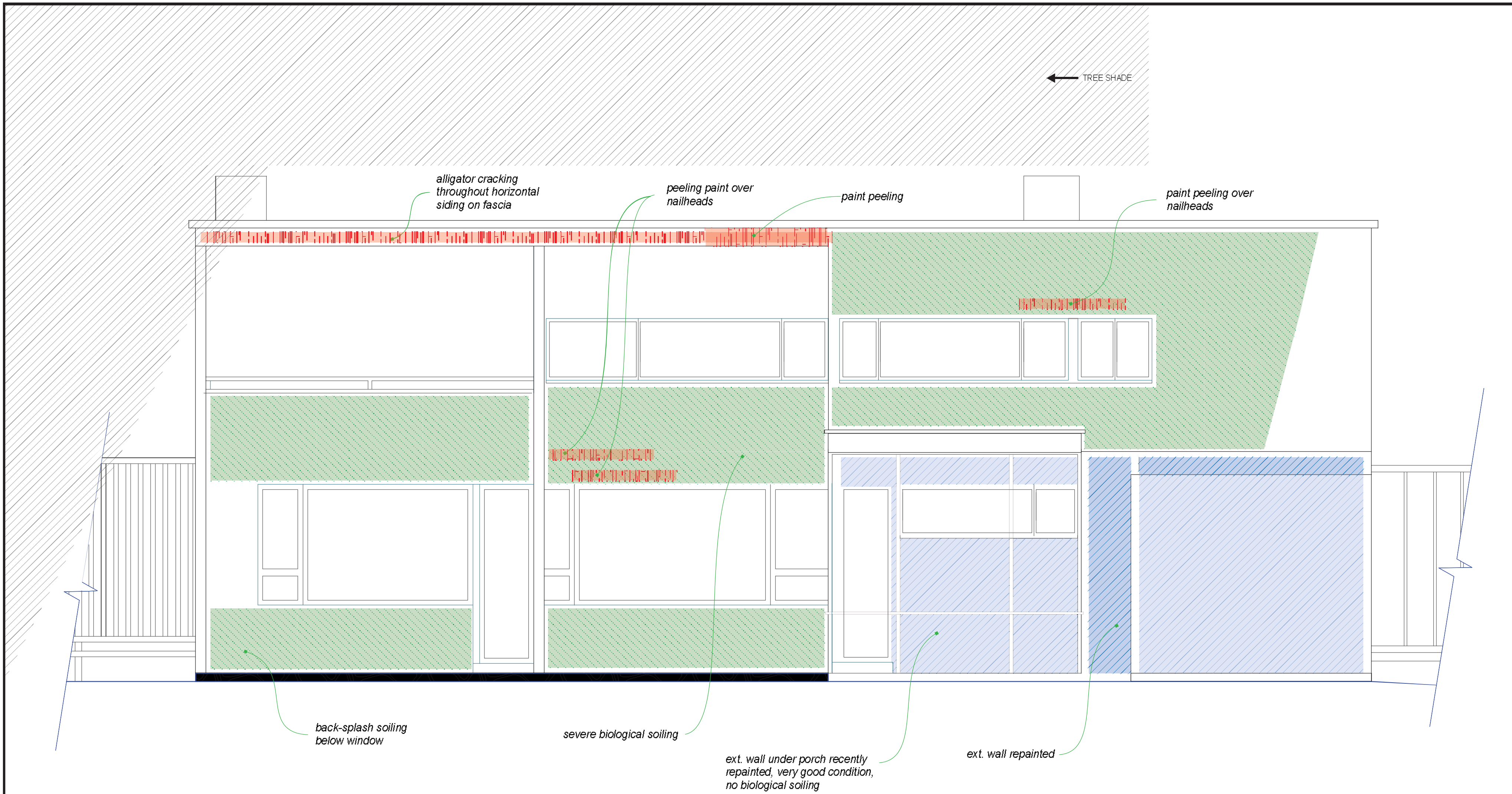
BIOLOGICAL SOILING
COATING FAILURE
REPAIRED/REPAINTED
TREE SHADE

SIDING SURVEY

EAST ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC. ARCHITECTURAL CONSERVATORS	**GROPIUS HOUSE** LINCOLN, MASSACHUSETTS	NOT FOR CONSTRUCTION	SURVEY DATE OCT. 28-30, 2015	SHEET **2** OF 4



SIDING CONDITIONS

- BIOLOGICAL SOILING
- COATING FAILURE
- REPAIRED/REPAINTED
- TREE SHADE

SIDING SURVEY

SOUTH ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

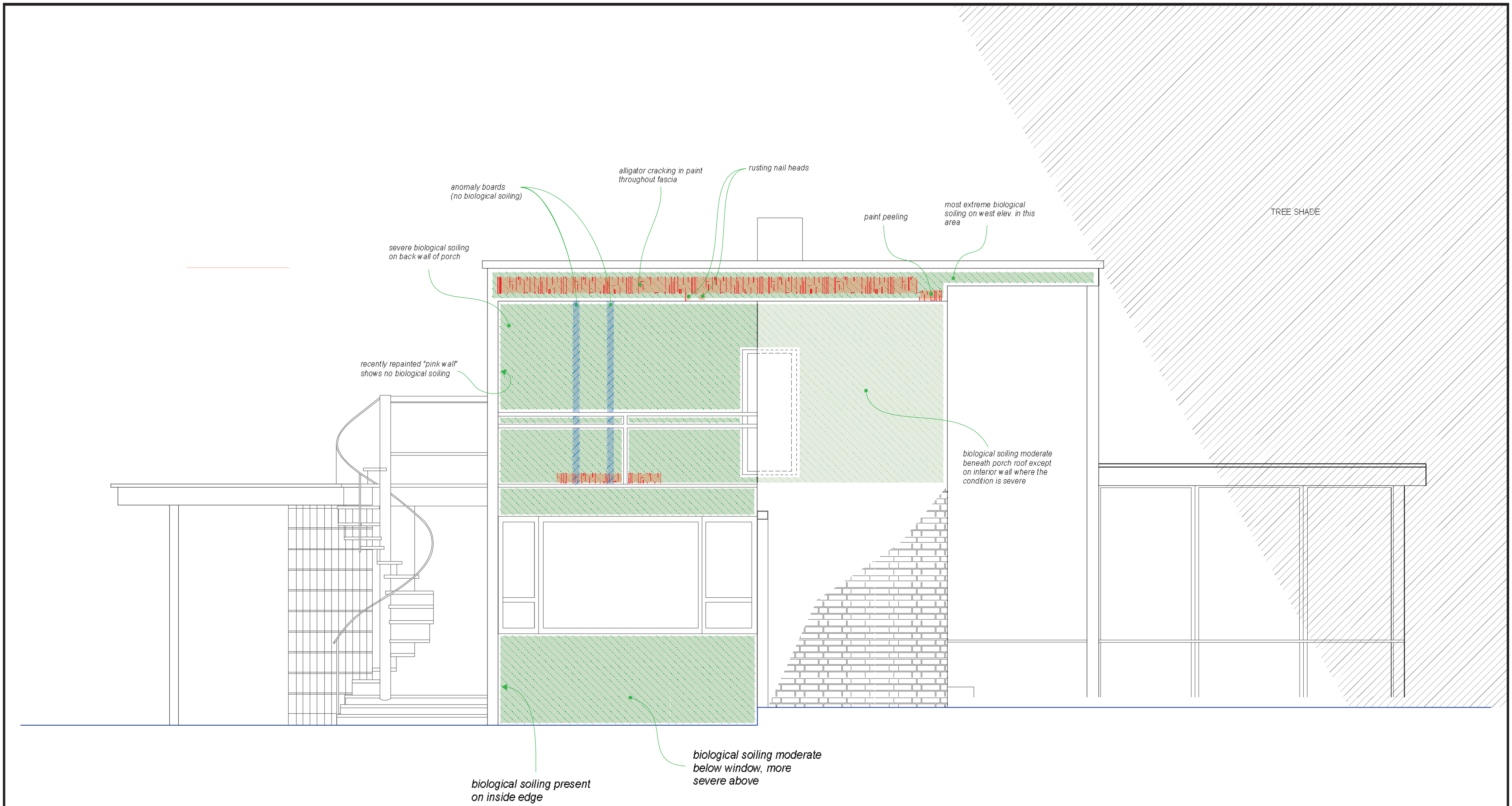
GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
3 OF 4



SIDING CONDITIONS

BIOLOGICAL SOILING

COATING FAILURE

REPAIRED/REPAINTED

SIDING SURVEY

WEST ELEVATION

NOT TO SCALE

JABLONSKI BUILDING CONSERVATION, INC.
ARCHITECTURAL CONSERVATORS

GROPIUS HOUSE

LINCOLN, MASSACHUSETTS

NOT FOR CONSTRUCTION

SURVEY DATE
OCT. 28-30, 2015

SHEET
4 OF 4

APPENDIX C
Product Data

Gropius House

D/2 Biological Solution

Discover the D/2 difference!

D/2 Biological Solution is a biodegradable, easy to use liquid that removes stains from mold, algae, mildew, lichens and air pollutants. It is effective on marble, granite, limestone, brownstone, travertine, masonry, terra cotta, concrete, stucco, wood, and other architectural surfaces including monuments, sculpture and headstones. A contact time of only 10 to 15 minutes followed by scrubbing with a soft nylon or natural bristle brush will loosen most biological and air pollutant staining.

D/2 Biological Solution is effective for removing harmful biological and air pollutant staining from many building materials including masonry, marble, granite, limestone, brownstone, travertine, terra cotta, concrete, stucco, wood, canvas and vinyl & aluminum siding.

Features and Benefits

- **Fast acting**: 10 to 15 minutes contact time for great results.
- **Biodegradable**
- **Contains no acids, salts, or chlorine**
- **pH neutral**
- **Will not etch metals or glass**
- **Safer to use around plantings**
- **Is not a hazardous material and requires no special handling or protection**
- **Use full strength, no in-field mixing required**
- **Shelf life of 5 years**

Application Procedures

Always do a spot test sample before proceeding with project. D/2 works best when air and surface temperatures are 45°F or above. Use D/2 undiluted for best results. In the event of excessive plant exposure, rinse all plants and water in all planted ground areas.

Immediate Result Method

1. Apply D/2 Biological Solution with a brush, roller, hand pump sprayer (garden style pump sprayer) or low pressure power sprayer.
2. Allow undiluted D/2 to remain on the surface 10-15 minutes.
3. Apply additional D/2 as necessary to maintain a wet surface.
4. Scrub with soft nylon or natural bristle brush. **DO NOT USE METAL BRUSH.**
5. Lightly mist with water and continue scrubbing.
6. Rinse thoroughly with clean, potable water.

No Scrub/No Rinse Method

1. Apply D/2 Biological Solution with a brush or pump sprayer to a dry surface. Do not pre-wet the surface.
2. Allow to dry. Repeat if there are heavy biological stains.

D/2 works with the elements and results occur within one week to one month depending on severity of growth and weather conditions. The surface will become cleaner over time as the subsurface biological stains release.

Safety Information

D/2 Biological Solution is non-mutagenic, and contains no carcinogenic compounds as defined by NTP, IARC, or OSHA. It is considered essentially non-toxic by swallowing, as it has an oral LD50 of 2.0 g/kg of body weight. No special ventilation is required during use.

D/2 Biological Solutions, Inc. | PO Box 3746, Westport, MA 02790 | (917) 693-7441 | d2bio.com

Packaging and Coverage

D/2 Biological Solution is available in 1 gallon and 5 gallon containers, and 55 gallon drums. The area that can be treated with one gallon of D/2 will vary considerably as a function of the nature and extent of biological deposits, as well as the physical characteristics of the surface. Typical coverage to remove medium deposits will vary from 250 to 350 square feet per gallon.

Technical Data

Physical Form . . . . . Transparent, low viscosity liquid

Color . . . . Almost colorless

pH 9.5

Specific Gravity 1.01g/cc

Solubility in Water . . . . Complete

Vapor Pressure . . . . 25 mm Hg @ 20°C

Notice: The information contained herein is based on our own research and the research of others, and it is provided solely as a service to help users. It is believed to be accurate to the best of our knowledge. However, no guarantee of its accuracy can be made, and it is not intended to serve as the basis for determining this product's suitability in any particular situation. For this reason, purchasers are responsible to make their own tests and assume all risks associated with using this product.

10/2012

D/2 Biological Solutions, Inc. | PO Box 3746, Westport, MA 02790 | (917) 693-7441 | d2bio.com

SAFETY DATA SHEET

D/2 Biological Solution

Supersedes Revision: 02/04/2015

1. Product and Company Identification

Product Code: 00400

Product Name: D/2 Biological Solution

Company Name: D/2 Biological Solution, Inc.
PO Box 3746
Westport, MA 02790

Phone Number: (917)693-7441

Web site address: d2bio.com

Emergency Contact: Chem-Tel (800)255-3924

Recommended Use: Removal of stains from mold, algae, mildew, lichen and air pollutants. Effective on marble, granite, limestone, travertine, brownstone, masonry, stucco, wood, canvas and other architectural surfaces.

Intended Use: For sale to, use and storage by service persons only.

Additional Information: Additional Product Codes: 00401, 00402

2. Hazards Identification

Skin Corrosion/Irritation, Category 3
Serious Eye Damage/Eye Irritation, Category 2B
Acute Toxicity: Oral, Category 4

GHS Signal Word: **Warning**

GHS Hazard Phrases:
Causes mild skin irritation.
Causes eye irritation.
Harmful if swallowed.

GHS Precaution Phrases:
Do not eat, drink or smoke when using this product.
Keep out of reach of children.

GHS Response Phrases:
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Rinse mouth.
If swallowed: Call a Poison Center or doctor if you feel unwell.
If on skin (or in hair): Wash with plenty of soap and water.

GHS Storage and Disposal Phrases:
Store in cool dry place at room temperature away from direct sunlight.
Dispose of contents and container according to the local, city, state and federal regulations.

Potential Health Effects (Acute and Chronic): Chronic: Effects may be delayed.

Inhalation: May be harmful if inhaled. Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Inhalation of dust may cause respiratory tract irritation. Can produce delayed pulmonary edema. Causes irritation of the mucous membrane and upper respiratory tract.

Skin Contact: May be harmful if absorbed through the skin. Causes skin irritation.

Eye Contact: Causes eye irritation. May cause chemical conjunctivitis.

Ingestion: May be harmful if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.

3. Composition/Information on Ingredients

CAS #	Chemical Name	Concentration
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	Proprietary
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	Proprietary
7396-58-9	Didecylamine, N-methyl-	Proprietary

4. First Aid Measures

Emergency and First Aid Procedures:

In Case of Inhalation: Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid.

In Case of Skin Contact: Wash off with soap and plenty of water. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

In Case of Eye Contact: Rinse thoroughly with plenty of water for at least 15 minutes. Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Consult a physician.

In Case of Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water. Consult a physician.

Signs and Symptoms Of Exposure: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Note to Physician: Show this safety data sheet to the doctor in attendance. Move out of dangerous area. Treat symptomatically and supportively.

5. Fire Fighting Measures

N / A

Flash Pt: NE

Explosive Limits: LEL: N/A UEL: N/A

Autoignition Pt: NE

Suitable Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or alcohol-resistant foam. Use agent most appropriate to extinguish fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Fire Fighting Instructions: Wear self contained breathing apparatus for fire fighting if necessary. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.

Flammable Properties and Hazards: No data available.

6. Accidental Release Measures

Steps To Be Taken In Case Material Is Spilled:	Personal precautions. Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Environmental precautions. Do not let product enter drains. Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. Use proper personal protective equipment as indicated in Section 8. Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions.

7. Handling and Storage

Precautions To Be Taken in Handling:	Handle in accordance to good industrial safety practice and hygiene. Keep container tightly closed in a dry and well-ventilated place. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from moisture.
Precautions To Be Taken in Storing:	Keep container tightly closed in a dry, well ventilated place away from incompatible substances (Oxidizing Agents and Chlorinated Compounds). Keep out of reach of children.

8. Exposure Controls/Personal Protection

Exposure Guidelines exposure limits	This product, as supplied, does not contain any hazardous materials with occupational established by the specific region regulatory bodies.
Engineering Controls	Eyewash station and shower.
General Hygiene	Handle in accordance with good industrial safety and hygiene standards. Wash hands before break and at end of the day. Do not smoke.
Eye & Face Protection	Wear safety goggles with side protection conforming to EN 166.
Skin & Body Protection	Wear protective gloves and clothing.
Respiratory Protection	If irritation is experienced or exposure limits are exceeded use a respirator that complies with appropriate government standards such as NIOSH (US) or CEN (EU).

9. Physical and Chemical Properties

Physical States:	[ ] Gas [X] Liquid [ ] Solid
Appearance and Odor:	Colorless liquid with herbal odor.
Melting Point:	NE
Boiling Point:	> 212.00 F
Freezing Point:	16 F
Decomposition Temperature:	NE
Autoignition Pt:	NE
Flash Pt:	NE
Explosive Limits:	LEL: N/A UEL: N/A
Specific Gravity (Water = 1):	1.020
Density:	8.50 LB/GA
Bulk density:	NE
Vapor Pressure (vs. Air or mm Hg):	NE
Vapor Density (vs. Air = 1):	> 1
Evaporation Rate:	NE
Solubility in Water:	100%
Saturated Vapor Concentration:	NE
Viscosity:	NP
pH:	9.0 - 10.0
Percent Volatile:	No data.
VOC / Volume:	0.0000 G/L
Particle Size:	NE
Heat Value:	NE
Corrosion Rate:	NE

10. Stability and Reactivity

Stability:	Unstable [ ] Stable [X]
Conditions To Avoid - Instability:	No data available. Incompatible materials.
Incompatibility - Materials To Avoid:	Strong oxidizing agents, Strong acids, Strong bases, Ammonia, magnesium, Sodium, calcium salts.
Hazardous Decomposition Or Byproducts:	Thermal decomposition can lead to irritating and toxic fumes and gases
Possibility of Hazardous Reactions:	Will occur [ ] Will not occur [X]
Conditions To Avoid - Hazardous Reactions:	None.

11. Toxicological Information

Toxicological Information:

Acute toxicity. No data available.
Respiratory or skin sensitization: Germ cell mutagenicity. Reproductive toxicity - no data available.
Specific target organ toxicity -single exposure (Globally Harmonized System)
Specific target organ toxicity -repeated exposure (Globally Harmonized System)
Aspiration hazard. Epidemiology: No information found.
Teratogenicity: No information available. Reproductive Effects: Mutagenicity:
Neurotoxicity:

Irritation or Corrosion:

CAS# 68439-46-3:
Acute toxicity, LD50, Oral, Rat, 1378. MG/KG.
Results:
Vascular:Measurement of regional blood flow.
Biochemical:Enzyme inhibition, induction, or change in blood or tissue levels: Dehydrogenases.
Biochemical: Metabolism (Intermediary): Lipids including transport.
- Journal of the American College of Toxicology., Mary Ann Liebert, Inc., New York, NY, Vol/p/yr: 10(4),427, 1991

CAS# 7320-34-5:
Acute toxicity, LD50, Skin, Species: Rabbit, 4640. MG/KG.
Results:
Paternal Effects: Testes, epididymis, sperm duct.
- National Technical Information Service, Vol/p/yr: OTS0571153,

No data available.

Carcinogenicity/Other Information:

Carcinogenicity.
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. CAS# 7320-34-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Carcinogenicity:

NTP? No IARC Monographs? No OSHA Regulated? No

12. Ecological Information

No data available.

Results of PBT and vPvB assessment:

CAS# 68439-46-3:
LC50, Fathead Minnow (Pimephales promelas), 11000. UG/L, 96 H, Mortality, Water temperature: 22.00 C C.
Results:
Morphological changes.
- Acute Toxicity and Structure-Activity Relationships of Nine Alcohol Ethoxylate Surfactants to Fathead Minnow and Daphnia magna, Wong, D.C.L., P.B. Dorn, and E.Y. Chai, 1997

Persistence and Degradability:

No data available.

Bioaccumulative Potential: No data available

Mobility in Soil: No data available.

13. Disposal Considerations

Waste Disposal Method: Product.
Observe all federal, state, and local environmental regulations.
Do not reuse container.

14. Transport Information

LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Not regulated as a hazardous material.
DOT Hazard Class:
UN/NA Number:

LAND TRANSPORT (Canadian TDG):

TDG Shipping Name: Not Regulated.

MARINE TRANSPORT (IMDG/IMO):

IMDG/IMO Shipping Name: Not Regulated.

AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Not Regulated.

15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Chemical Name	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	No	No	No
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	No	No	No
7396-58-9	Didecylamine, N-methyl-	No	No	No

CAS #	Chemical Name	Other US EPA or State Lists
7173-51-5	1-Decanaminium, N-Decyl-N,N-dimethyl-, chloride	CA PROP.65: No; CA TAC, Title 8: No
29911-27-1	2-Propanol, 1-(1-methyl-2-propoxyethoxy)-	CA PROP.65: No; CA TAC, Title 8: No
7396-58-9	Didecylamine, N-methyl-	CA PROP.65: No; CA TAC, Title 8: No

U.S. Federal Regulations

SARA 302, 304, 313	Superfund Amendment and Reauthorization Act of 1986	In compiiance
CA PROP. 65	California Proposition 65	In compliance
CWA	Clean Water Act	In compliance
CERCLA	Comprehensive Environmental Response and Compensation Act	In compliance

International Regulations

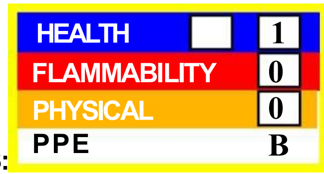
TSCA	U.S. Toxic Substance Control Act Section 8(b) Inventory	In compliance
DSL/NDSL	Canadian Domestic Substance List/Non Domestic Substance List	In compliance

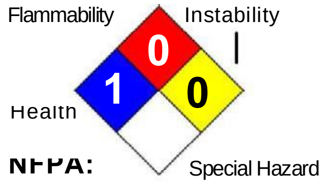
SAFETY DATA SHEET
D/2 Biological Solution

16. Other Information

Hazard Rating System:

HMIS:





Revision Date: 05/01/2015

Additional Information About This Product: No data available.

Company Policy or Disclaimer: The manufacturer believes the data set forth are accurate and makes no warranty with respects thereto and disclaims all liability for reliance thereon. Such data are offered solely for consideration, investigation and verification. Also, the data set forth is for the concentrated finished product. All lab samples are for experimental purposes only and used at the customers discretion.