HANNA HOUSE
RECOMMENDATIONS FOR SEISMIC REPAIR
and
CONSERVATION OF HISTORIC FEATURES

Final Report — by Arch1 Resource Group
February 1991
& Martin Weil
February 11, 1991

Jonathan Ryan
Facilities Project Management
855 Serra Street, 2nd Floor
Stanford University
Stanford, CA 94305-6114

Dear Jonathan:

We are pleased to submit the final report for the Hanna House which was prepared under contract number FC - 6362 signed in September, 1990. This report provides the recommendations for seismic repair of the Hanna House and additional recommendations for long term conservation of the building. It is the result of the efforts of all the team members assembled to work on the project.

We have enjoyed working together with you on this report and look forward to beginning the next phase of the project.

Sincerely,

Stephen J. Farneth, AIA

Martin Weil

SJF/ff
HANNA HOUSE

RECOMMENDATIONS FOR SEISMIC REPAIR
and
CONSERVATION OF HISTORIC FEATURES

Prepared for:
Facilities Project Management
Stanford University
Stanford, California 94305

Prepared by:
Martin Eli Weil
Restoration Architect
2175 Cambridge Street
Los Angeles, California 90006

Architectural Resources Group
Pier 9, The Embarcadero
San Francisco, California 94111

February, 1991
# TABLE OF CONTENTS

**HANNA HOUSE**

Recommendations for Seismic Repair and Conservation of Historic Features.

**TABLE OF CONTENTS**

- **LETTER OF TRANSMITTAL**
  - INTRODUCTION
    - Methodology.........................................................................................................................2
    - Executive Summary..................................................................................................................3
    - Administrative Data....................................................................................................................5
    - Landmark Status ..........................................................................................................................5
  - HISTORICAL BACKGROUND
    - Introduction...............................................................................................................................9
    - Design and Construction 1935-1937..........................................................................................9
    - Periods of Modification 1937-1975...........................................................................................10
    - Period of Stanford Occupancy 1975-1990................................................................................14
  - EXISTING CONDITIONS SUMMARY
    - Seismic Damage......................................................................................................................17
    - Deferred Maintenance ...............................................................................................................19
    - Ongoing Occupant Use .............................................................................................................20
  - CONSERVATION OBJECTIVES
    - Introduction..............................................................................................................................23
    - Proposed Goals for Ownership.................................................................................................23
    - Proposed Conservation Standards............................................................................................24
## Structural Section
- Introduction .......................................................... 27
- Soils Condition .......................................................... 27
- Earthquake Damage .................................................. 27
- Applicable Codes and Design Criteria ....................... 28
- Existing Lateral Force Resisting System ................... 29
- Remedial Measures .................................................. 29
- Summary and Conclusions ......................................... 31
- References .............................................................. 32
- Structural Drawings

## Architectural Section
- Introduction .......................................................... 39
- Outline Scope of Work ............................................. 33
- Architectural Drawing

## Mechanical Section
- Introduction .......................................................... 39
- Existing Conditions .................................................. 39
- Impact of Repairs of Seismic Damage ....................... 39

## Electrical Section
- Existing Building Systems ....................................... 43
- Impact of Repairs of Seismic Damage ....................... 44
- Long Term Electrical Recommendations ................. 45
- Electrical Drawing

## Landscape Section
- Introduction .......................................................... 47
- Site History ............................................................. 47
- Existing Conditions .................................................. 49
- Impact of Repairs of Seismic Upgrade ....................... 50

## Seismic Repair Cost Estimate ................................. 57
**TABLE OF CONTENTS**

**GENERAL CONSIDERATIONS FOR IMPLEMENTATION OF WORK**
- Protection of the House and Site ........................................................................................................ 59
- Storage and Protection of Original Materials during Construction ....................................................... 59
- Identification of Architectural Elements and Materials ...................................................................... 59

**REPAIR AND CONSERVATION OF HISTORIC FEATURES**
- Introduction ........................................................................................................................................ 61
- Exterior Building Elements
  - Terrace Walls ........................................................................................................................... 63
  - Terrace Paving ........................................................................................................................... 67
  - Walls .................................................................................................................................... 70
  - Doors/Windows ......................................................................................................................... 79
  - Eave/Fascia ............................................................................................................................... 85
  - Roof ...................................................................................................................................... 87
  - Planters Contiguous to the Building ....................................................................................... 89
- Interior Building Elements
  - Floors .................................................................................................................................... 93
  - Walls .................................................................................................................................... 96
  - Chimneys ................................................................................................................................ 98
  - Ceiling .................................................................................................................................. 103
  - Casework ............................................................................................................................... 105
  - Fixtures and Equipment .......................................................................................................... 108

**CONSERVATION COST ESTIMATE** .................................................................................................... 113

**APPENDIX**
- Cost Estimate Worksheet
- National Register Nomination
INTRODUCTION
INTRODUCTION

On October 17, 1989, the Loma Prieta Earthquake damaged the Hanna House which at that time served as the residence of the Stanford University Provost. As a result of the 1989 earthquake the occupants of the house moved out of the house, the cracked chimney in the living room was shored with heavy timbers and the University embarked on a program to repair the house. Stanford assembled a team to determine the factors that contributed to the seismic damage, evaluate the condition of the structure as the result of the earthquake, and prepare recommendations for the seismic repair. The purpose of this report is to provide Stanford University with the results of the work that has been performed by the team of consultants.

TEAM MEMBERS

The team assembled by Stanford University to work on the Hanna-Honeycomb House include the following:

Project Manager:

Jonathan Ryan
Facilities Management
Stanford University

Architects:

Architectural Resources Group
Pier 9, The Embarcadero
San Francisco, CA 94611

Partner-in-Charge, Stephen Farneth
Project Manager, Naomi Miroglio

Martin Eli Weil
Restoration Architect
2175 Cambridge Street
Los Angeles, CA 90006-4236

Structural Engineer:

Forell/Elsesser Engineers, Inc.
539 Bryant Street
San Francisco, CA 94107-1270
Partner-in-Charge, Eric Elsesser
Project Manager, Paul Rodler

Geotechnical Engineer:

J.V. Lowney and Associates
145 Addison Avenue
Palo Alto, CA 94301

Mechanical Engineer:

William Mah, P.E.
410 Townsend Street, Suite 40
San Francisco, CA 941107
METHODOLOGY

With the completion of the geotechnical report and the structural investigation, it was evident to the team that the primary thrust of the proposed project was to repair the seismic damage to the house and return the residence to its condition at the time of the earthquake. While the focus of the proposed project was primarily the seismic rehabilitation work that would prolong the life of the house and render it habitable, the project also involves substantive conservation issues. When it became apparent that the seismic structural repairs would in fact impact almost every type of material and architectural detail found in the house, garage, and terrace, it was decided that the architectural study would have to include conservation guidelines that would ultimately be applicable to the rest of these structures. As a result, this report includes not only the specific recommendations for each area affected by the structural repairs, but also includes more general recommendations that are pertinent to the conservation of the rest of the house.

The approach that the team has developed for the seismic repair of the house includes the following priority of work:

1. The house should be repaired so that it is habitable and safe for occupancy.

2. The seismic repair work should correct any injury that has occurred to the house, correct conditions that permitted the present damage and prevent substantive harm in the future.
3. The repair must meet the Stanford University performance goal which is to prevent collapse while allowing minor structural damage for an earthquake of a magnitude of 7.0 to 7.5.

4. The repair work should be carried out in a manner that will minimize demolition of original details of the house and not compromise the integrity of the original architectural members that remain.

5. The repair work should be designed so that the live oak trees and the Monterey cypress tree adjacent to the seismic damage will not be adversely affected by the seismic repairs.

6. The seismic repair work should be cost effective and appropriate to the level of work required to preserve the architectural integrity of the house.

EXECUTIVE SUMMARY

By the time the Loma Prieta Earthquake subsided on October 17, 1989, the Hanna-Honeycomb House, designed by Frank Lloyd Wright for Paul and Jean Hanna in 1937, had been seriously damaged. The fireplaces in the living room and the library were cracked at the base, terrace walls had rotated and cracked, the soil had settled causing the concrete terrace paving and interior floors to crack and doors, windows, and walls to move and become distorted.

The examination of the house and the historical documents concerning the construction and evolution of the house revealed that most of the damage could be traced to three major factors:

1. The architectural detailing that Wright had used was as innovative as the design of the house. In many cases, such as the 2-3/4" thick exterior and interior wall panels, the design was unconventional. Not only did Wright's walls look unlike the walls used in standard construction, they also performed in a different manner. In this case the walls provided no shear strength to brace the roof as would have occured in a conventionally built structure.

2. Many of the features in the house such as the brick chimneys, terrace walls and the roof were under-designed to meet the stresses caused by a major earthquake. The brick chimneys had no footings and were minimally reinforced. The terrace walls were built without footings and inadequate steel reinforcing in the concrete wall. The brick veneer was not tied to the concrete wall. The roof framing system was constructed with no lateral support.
except for the three brick chimneys. At the exterior faces of the house, the walls provide virtually no lateral support to the edge of the roof.

3. When the house was constructed, it was located on the side of a hill using inadequately reinforced retaining walls to hold back the fill on which the house was built. When the fill was brought in, it was not properly compacted. During the earthquake the uncompacted soil settled and caused cracking and movement in the house and on the terraces.

The Structural Engineers have designed a seismic repair scheme made up of six distinct components that will provide for the repair of the house and ensure that the house will sustain substantially less damage in any subsequent earthquake. These measures include:

1. Rebuilding the chimneys using appropriately designed footings and reinforced brick masonry.

2. Repair of the terrace walls including new footings and the use of soil anchors to stabilize existing walls where new footings will not be built.

3. Installation of a roof diaphragm, blocking and collectors to the provide a complete lateral load resisting system.

4. Installation of five cantilevered lateral bracing members to reinforce the roof.

5. Installation of two shear wall panels to provide lateral bracing where cantilevered lateral bracing members cannot be used.

6. Rebuilding the Garage retaining wall.

The proposed work will cause substantial modification to the architectural and structural integrity of the Hanna House as well as the adjacent architectural, mechanical, electrical and landscape features that will be impacted by the work. Due to the cultural/historical importance of the Hanna-Honeycomb House, its listing on the National Register of Historic Places and its designation as a National Landmark, the proposed work must be carried out in a manner that meets the accepted procedures for the conservation of an historic structure. In spite of these precautions, there will be a substantial loss of original materials. This includes the three brick chimneys, the concrete floors adjacent to the chimneys, concrete terrace paving on the living room terrace and a portion of the living room terrace wall.
INTRODUCTION

ADMINISTRATIVE DATA

The Board of Trustees of the Leland Stanford Junior University
The Board of Trustees of the Leland Stanford Junior University is the owner of the Hanna House. The Board has the responsibility for planning and implementing all work on the house and the site and assuring that this work is carried out within the framework of the goals and objectives of the University.

The Hanna House Board of Governors
The Hanna House Board of Governors are appointed by the Board of Trustees. It is the responsibility of the Board of Governors to review significant changes to the use and care of the buildings and grounds that constitute the Hanna House complex.

Federal Emergency Management Administration
The Federal Emergency Management Administration provides funds to repair the damage to the Hanna House that was caused by the Loma Prieta Earthquake. The FEMA guidelines provide that restorative work must be done through repairs or replacement to restore an eligible facility on the basis of its pre-design and current applicable standards.

Stanford has chosen to use the Uniform Building Code as its current applicable standard and can also use the State Historical Building Code since the Hanna House is designated as a National Landmark and is listed on the national Register of Historic Places.

All work funded by the Federal Emergency Management Administration must be reviewed and approved by the State Historic Preservation Officer to ensure that no federal funds will be used to adversely affect a building listed on the National Register of Historic Places or a National Landmark.

State Office of Historic Preservation
The State Historic Preservation Officer is the senior staff member of the State Office of Historic Preservation, Department of Park and Recreation. The State Historic Preservation Officer is responsible for reviewing all projects involving buildings listed on the National Register of Historic Places where federal funds are used.

LANDMARK STATUS

National Register of Historic Places
The National Register of Historic Places is the official list of the National cultural resources worthy of preservation. All nominations to the National Register are made through the State Historic Preservation Officer.

In 1977 Paul Hanna prepared the forms to nominate the Hanna-Honeycomb House to the National Register of Historic Places. Although the State Historic Preservation Officer signed off on the nomination form on November 11, 1977, the property was not placed on the National Register of Historic Places until June 19, 1989. The provision of Section 106 of the National Historic Preservation Act of 1966, requires that all federal agencies consider the effects of their activities on historic properties that are listed on the National Register of Historic Places. The
proposed use of federal funds administered by the Federal Emergency Management Agency for the repair of seismic damage to the Hanna House, is a situation where Section 106 of the Act applies. In this case the State Office of Historic Preservation has been assigned the role of reviewing the proposed work to ensure that federal funds will not be used to diminish the architectural/historical/culture integrity of the house.

**National Historic Landmarks**
The Hanna-Honeycomb House was designated as a National Landmark in 1989. National Landmarks include all historic areas in the National Park System along with those private properties listed on the National Register of Historic Places which are considered to be of national significance.

**American Institute of Architects Citation**
In 1960 the Frank Lloyd Wright Memorial Committee of the American Institute of Architects elected the Hanna House and sixteen other buildings designed by Wright for special notice at a special event honoring Wright at their annual convention. The Hannas received a plaque with the following inscription: "This structure designated by the American Institute of Architects as one of the 17 American Building designed by Frank Lloyd Wright to be retained is an example of his architectural contribution to American culture." In addition a set of photostatic copies of the original plans were made from the original drawings at Taliesin and deposited in the AIA archives. This citation by the American Institute of Architects does not convey any rights to the organization concerning the care of the house.
HISTORICAL BACKGROUND
Plan of the Hanna House, 1936
INTRODUCTION

The historical information on the house is based primarily on historical material found in Frank Lloyd Wright's Hanna House: The Clients Report, Second Edition, by Paul R. and Jean S. Hanna, examination of original construction and subsequent remodelling plans for the house and a review of photographs in the Hanna Archives. While there is a fairly good sense of the evolution of the house through the 1960's, the Hanna's book does not provide much information about the appearance of their house in the decade before they moved out in 1975. Except for the roof replacement in 1977 that is recorded in the book, there is little account of changes made by the University and the occupants during the period of 1975 to the present.

DESIGN AND CONSTRUCTION 1935 - 1937

From the time that Paul and Jean Hanna married in 1926, they began to plan for the day when they would build a home for themselves. They had initially been influenced by the tenets of modern architecture developed by the Bauhaus movement, however, after attending a lecture given by Frank Lloyd Wright in 1930, reading his book Modern Architecture and meeting with him in New York and at Taliesin, they decided that someday when they built a house it would be designed by Mr. Wright based on his philosophy of organic architecture. Upon being offered a position by Stanford University in 1935, they commissioned Frank
Lloyd Wright to design a house that would be built on land owned by the university. The house was to be designed according to a set of eleven principles they had established with the architect.

During his visit to Palo Alto, Wright talked about his notion of utilizing the hexagon in architecture, however, the Hannas were not prepared when the first sketches for their new home arrived. Upon reviewing the plans they found that Wright had designed a house for them that was a major departure from his earlier work. The project he proposed for the Hannas was a house using a hexagonal module. All rooms in the house would be formed by 120 degree and 60 degree angles.

After intensive work with the architect, considerable delay and without a complete set of plans and specifications, work began on construction of the house in January 1937 under the direction of Harold Turner the contractor. Working with Mr. Turner were a group of craftsmen who had never worked on a building that was so unorthodox in design or detailing. At various critical points within the construction process, the working drawings were insufficient or arrived after the work had been initiated. Through the fortitudes of the Hannas, the contractor and the workmen, the house was habitable by late 1937.

PERIODS OF MODIFICATION 1937-1975

During the thirty-eight years that the Hannas lived in their home, they carried out modifications to their home as the
circumstances of the family changed. The major changes were always made only after consultation with Frank Lloyd Wright. While the general appearance of the house and site continued to follow the precedents set by the initial work, the new features often are representative of the period in which they were added to the residence.

The first major change to the site involved the construction of a wing adjacent to the carport that contained guest quarters and a hobby shop. The design plans for the wing were prepared by Frank Lloyd Wright at Taliesin. The construction drawings and supervision of the construction were undertaken by Jack Seward who worked for the local architectural firm of Spencer and Ambrose. The cost of the new wing was $22,250.00. As the result of being built on the peak of the hill the addition did not suffer significant seismic damage during the 1989 earthquake.

In 1952 the Hannas built the driveway and parking area on the west side of the house. Frank Lloyd Wright designed the brick retaining wall and concrete steps that join the parking area to the west terrace. On the interior of their home, the Hannas covered the new wood ceilings in the living room and original dining room with saguran, a fabric that they had found in Manilla.

In 1953 the original linen Klearflax rugs were replaced with Woolturf carpeting. In the living room and entry the carpet was laid in the same configuration as the original rugs allowing a border of the scored concrete floor around the perimeter of the room.
With the departure of their three children, the Hannas began to consider remodeling the house to serve their needs as a couple. In 1956 they wrote to Frank Lloyd Wright to ask his help in planning the remodeling. The work that was carried out during 1957 replaced the four bedrooms, library and three bathrooms with an interconnected library, guest room and master bedroom, powder room, utility bath and enlarged master bathroom. The playroom was modified to serve as the new dining room.

In conjunction with the changes in room configuration and use, the following alterations were made to the house:

**Entry:**

1. Entry closet was replaced by double doors to the kitchen.

**Dining Room:**

1. Carpeting was laid on the concrete.
2. Aeroshades on sliding screens were added to the windows.
3. Glass doors were added to shelves to form enclosed cabinets.

**Library:**

1. Fireplace was built.
2. Built-in couch was remodeled.
3. Bookshelves were built
4. Two desks were constructed with a marra wood top supported by filing cabinets.
Master Bedroom:
1. Fireplace was built
2. Wall to wall carpet was laid.

Ceilings:
1. Saguran cloth was applied to all the ceilings in the house other than the living room and original dining room which were covered in 1952.

Living Room Terrace:
1. New footings were installed under the retaining wall.
2. The Terrace paving was jacked up.

In 1957, the planters adjacent to the dining room terrace were rebuilt. Prior to 1960, Mr. Hanna modified a planter box on the living room terrace into a fish pool, transforming three plowshare dishes into drip dishes.

In 1960 the Hanna's decided to build the summer house, pools and cascade that Frank Lloyd Wright had designed in 1936 but which had not been built. William Wesley Peters, the senior architect of Taliesin Associates, refined the design prior to construction.

As the Hanna's grew older they became concerned about the future of the residence that they had built, nurtured and enjoyed. They finally decided that they would like to give the site to Stanford University for use as a "residence of a distinguished visiting university professor".
In December 1966, they donated 20 per cent interest in the house to Stanford. In 1969 a 25 percent donation was made. In 1971 another 25 was given to the university. The final 30 percent was given to Stanford on February 21, 1974 despite the fact that a $500,000 endowment for the care of the house and a separate one million dollar endowment for a visiting professor program had not been funded. At that time the Board of Governors of the Hanna House was established.

In October 1975, Mr. and Mrs. Hanna moved out of their cherished home and settled nearby in a condominium on the Stanford Campus.

**PERIOD OF STANFORD OCCUPANCY 1975-1990**

Since there were no funds for visiting professors program, the University decided to use the Hanna House as the home of the University Provost on an interim basis until the endowment programs had been funded. In 1990 Nissan Motor Corporation donated $500,000 to Stanford for remodeling the Hobby Shop into a caretakers apartment, the caretaker's salary for improvements and maintenance of the house. Plans were prepared by Taliesin Associates for the work but it was not carried out.

Major changes known to have been made to the house and gardens since 1975 include the installation of a new roof covering in 1977, replacement of the saguran fabric on the ceiling of the living room with grasscloth and refinishing the
wood walls with a polyurethane or an alkyd varnish in 1981. The date of the installation of the aluminum window frames with tinted glass and altering the shelves in the library have not been determined. The swimming pool was added in 1987. Minor changes to the building include the installation of surface mounted wiring for a sound system, new appliances and new furnaces. For the last twelve years Erik Upmanis has been retained on an annual basis to treat the wood on the exterior of the house with a clear water repellent wood preservative. (See Architectural Section in Appendix for further information on the treatment of the wood.) In addition, the nursery firm of Mayne Tree Service has been retained to care for the oak trees and the Monterey cypress on the grounds. (See Landscape Section)

On October 1989, the Loma Prieta earthquake caused considerable damage to the Hanna House. As the result of the initial inspection the occupants moved out of the house, the fireplace in the living room was braced with heavy timbers and Stanford University embarked on a program to evaluate the condition of the house, prepare plans to repair the seismic damage, and to carry out the necessary construction. By the end of 1990 the evaluation of the condition of the structures and the site has been completed and the recommendations for repair of the seismic damage has been prepared.
EXISTING CONDITIONS SUMMARY
Existing Condition plan of the Hanna House
EXISTING CONDITIONS SUMMARY

SEISMIC DAMAGE

The damage that was sustained by the house and carport during the Loma Prieta earthquake include the following major items:

1. The fireplace in the living room was cracked in various areas. The damage to the fireplace was exacerbated by the lack of an appropriate footing, the absence of adequate steel reinforcing in the brick walls of the chimney and the fact that the house was built on uncompacted soil.

2. The fireplace in the library was cracked. The damage can be attributed to the absence of adequate steel reinforcing in the brick masonry above the foundation.

3. The fireplace in the Owner's bedroom has no visible cracks, however, the structural engineer believes it is a hazard because it has no footing and inadequate steel reinforcing. He recommends that it be rebuilt in order to become a reliable part of the proposed lateral load resisting system.

4. Floors in the living room and dining room cracked when the uncompacted soil moved.

5. Partition walls were displaced.

6. Certain windows, doors and cabinets in the house and carport are no longer aligned due to the movement of walls.
7. Terrace walls, in the living room and dining room terraces rotated, cracked and in one area, the brick veneer broke loose and crumbled.

8. The poured concrete terrace paving and steps cracked due to soil settlement.

9. Brick planter walls adjacent to the living room terrace cracked.

The seismic damage was exacerbated by the following pre-existing conditions of the house:

1. The brick chimneys were constructed of inadequately reinforced brick masonry.

2. The brick chimneys were not constructed with spread footings.

3. The walls of the house were not constructed with spread footings.

4. The terrace walls were not constructed with spread footings.

5. The major portion of the house was constructed on uncompacted fill that was held in place by terrace walls which did not have spread footings.
6. The house has no lateral load resisting system except for the unreinforced brick chimneys due to the fact that the thin wood batten walls have no shear capacity.

DEFERRED MAINTENANCE

The Hanna House like many of the Frank Lloyd Wright structures requires a significant maintenance program in order to deal with the unusual problems arising out of the special design choices, materials and detailing that were used to create the residence. From examination of the structures and the grounds it is apparent that Stanford has attempted to provide the type of maintenance commensurate with the cultural value, scale and use of the site. Yet, it is apparent that in many cases there has been deferred maintenance or inappropriate repairs to the house due to the unconventional nature of many of the problems that have developed. Some of the following issues appear to go back to the period when the Hannas occupied the house.

1. Many of the wood details on the exterior of the house have dried out and shrunk over the years. Rather than replace original members, gaps have been filled with various types of sealants.

2. Exterior wood details subject to excessive sunlight or water have become bleached and weathered. Some have been painted.

3. The surface of the interior woodwork is dull and there are nicks and scratches.
4. The finish of the hardware particularly on the exterior have become deteriorated.

5. The drainage system on the living room and dining room terraces have never completely resolved the problem by the fact that the terrace floors were not sloped when they were built.

6. The base of the oak trees adjacent to the living room terrace have been covered with earth.

7. Lighting fixtures and wiring have been added to the exterior of the house.

8. The terrace walls have been repaired with poor quality workmanship.

9. Floors have cracked due to settlement of the uncompacted fill.

**ONGOING OCCUPANT USE**

In order to provide facilities for a sound system throughout portions of the house, wiring was surface mounted on walls and ceilings and the cupboards in the entry were modified for large speakers. The book shelves have been altered in the library.
CONSERVATION OBJECTIVES
CONSERVATION OBJECTIVES

INTRODUCTION

The life of the Hanna House has not been static. After the house was constructed in 1937, the Hannas embarked on a lifelong relationship with their home. The care and attention that they gave to furnishing, landscaping and renovating their residence appears to have been an important aspect of their lives. The Hannas held Frank Lloyd Wright in high regard and continued to keep him involved in the evolution of their home. As they reached the end of their tenure as owners of the house they worked conscientiously to ensure that the special place that they and Frank Lloyd Wright had created would be preserved. Their gift of the Honeycomb House to Stanford University was a witness to their faith that the stewardship they had maintained for thirty-eight years would be honored by the institution that had been a major component in their life and the special place that they had built.

The gift of the house to Stanford in 1974 and the Hanna’s move to a new residence in 1975, marked the end of the unique relationship between the Hanna’s, Frank Lloyd Wright and the Honeycomb House. The changes and modifications that had been carried out during their occupancy embody the evolution of the Hanna’s lifestyle and aesthetic judgement, the maturation of Frank Lloyd Wright’s design sensibility and the changes in popular taste and design between 1937 and 1975.

During the fifteen years since the Hannas moved out of the Honeycomb House, Stanford University has maintained the buildings and the grounds in the manner in which they were received. There have been some changes to the site, but in general they have not altered the integrity of the house or the landscape. As the result of the earthquake, significant changes will be wrought on the house. It is therefore timely that the University consider not only the impact that the seismic repair will have on the house that the Hanna’s built, but on the long range goals for maintaining the unique character of the site and the manner in which these goals will be implemented.

In order to assist the Board of Trustees of Leland Stanford Junior University and the Hanna House Board of Governors in setting goals for the use and care of the Hanna House, the following proposed goals and standards are listed below for their review and consideration.

PROPOSED GOALS FOR OWNERSHIP AND UTILIZATION OF THE HANNA HOUSE

1. The Hanna House including the house and grounds will be held in perpetuity by the Trustees of the Leland Stanford Junior University.

2. The main house and garage will continue to be used as a residence.

3. The Hobby house will be used for purposes compatible to the residential characteristics on the site.
PROPOSED CONSERVATION STANDARDS

PRESERVATION

1. The Hanna House, including the site and the structures, is a unique architectural monument created by the architectural genius of Frank Lloyd Wright and the lifelong stewardship of Jean and Paul Hanna.

2. The site and structures will be preserved in its present evolutionary state recognizing the culture and historical value of the original structure built in 1937, the modifications made in 1950 and 1957 and the other changes made by the Hannas up to 1975 when they moved out of the house.

3. No part of the site and/or the structures will be restored to a period earlier than its evolutionary state in 1975.

4. Consideration will be given to removing modifications that have been made to the house between 1975 and 1990 and restoring details that were known to have existed in 1975.

5. Changes or additions that are required by the occupants of the site and buildings should be provided in a manner that does not significantly alter the appearance or condition of the site and structures.

6. Acknowledgement is made of the unique design details and construction practices which have caused ongoing deterioration to the site and the structures.

7. Recognition is given to the fact that due to the unique design of the Hanna House, certain repair and maintenance procedures may have to be more invasive than normal to preserve the visual integrity of the whole building.

8. Priority will be given to retention of existing historic materials in a deteriorated state until they can no longer function properly.

9. In order to correct seismic damage, priority will be given to solutions that preserve the material integrity of the evolutionary character of the site and structures up to 1975.

10. When original features must be removed to correct seismic damage or original unique design details and original construction practices, priority will be given to procedures that permit the feature to be moved intact or dismantled and reassembled after the repair work has been completed.

11. When an architectural feature cannot be moved intact or dismantled and reassembled, the new feature should be reconstructed matching the 1975 configuration, size, material, color and texture of the detail that was replaced.

12. All work proposed for the site and structures will be subject to review by the Hanna House Board of Governors.

13. The work on the site and structure will be in compliance with the Secretary of the Interiors Standards for Preservation Projects.
CONSERVATION OBJECTIVES

14. Maintenance records will be kept on all work carried out on the site and structures.

15. All work on the site and structures will be documented through the use of photo documentation, measured drawings and written narrative.

16. Copies of all written and iconographic material associated with the work on the site and structures shall be placed in the Hanna House archives.
STRUCTURAL SECTION
INTRODUCTION

This section describes the post Loma Prieta earthquake condition of the Hanna House. The Loma Prieta earthquake caused damage to several parts of the building and especially to the two large brick chimneys diminishing the seismic resistance of the structure. Portions of the roof are now endangered resulting in the evacuation of the house and the installation of shoring. Several remedial measures which comply with current applicable standards of safety have been considered. The requirement of providing a complete lateral load carrying system which can be installed without compromising the historic nature of the building leads to a recommended scheme presented below.

SOILS CONDITION

The existing soil conditions under the house are described by the Geotechnical Investigation by J.V. Lowney and Associates dated September 7, 1990. A layer of poorly compacted fill described in that report was used to level the site. The fill varies in thickness and reaches a maximum of 9" at the north terrace (the fill thickness profile is shown on Figure A)

EARTHQUAKE DAMAGE

Structural damage to the Hanna House was concentrated around the main fireplace and chimney, the library fireplace and chimney and several areas of wood wall framing, the dining room and living room retaining walls, and the carport retaining wall, and the slab-on-grade.

The main chimney was cracked near the floor line and the entire chimney has rotated slightly. Several bricks at the chimney corners were crushed or displaced. This chimney supports a significant portion of the roof so shoring has been installed to prevent collapse.

The library chimney also shows cracking around its perimeter just above the hearth level. This indicated over stresses during the 1989 earthquake and a loss of lateral load carrying capacity. This chimney also vertically supports a large portion of the roof structure.

A portion of the front brick retaining wall near the north end of the house rotated and lost its brick facing. This allowed the fill soil to settle under the patio and under the house at the living room. This ground movement has caused both vertical and horizontal movements of the slab on grade resulting in cracks at steps and within the hexagon slab pattern.

Non-structural elements were also damaged. Soil settlements caused cracking of the planter walls near the entrance and cracking of the concrete steps leading to the terraces. Partitions, doors, windows and cabinets were affected by racking of the flexible wood framing and by soil settlement in the living room area. A partition wall in the garage had buckled and now has a bowed shape. A large urn located near the driveway fell from its pedestal.
APPLICABLE CODES AND DESIGN CRITERIA

The repair of this building should attempt to meet two general goals. First, the seismic resistance of the structure must be restored to a level which can adequately protect the life safety of the occupants. Second, the structural repairs and modifications should be done in a cost effective manner with as little impact on the historic architectural features of this building as possible. Several building codes and published design guidelines have been consulted while developing the design criteria to be used for this project.

FEMA guidelines define permanent work as "that restorative work that must be done through repairs or replacement to restore an eligible facility on the basis of its pre-disaster design and current applicable standards." It also states that "if an applicant is willing to adopt a standard, either of its own development or based upon a national standard, FEMA will apply that standard to the restoration of the damaged facility." These statements require adherence to the building code requirements and design guidelines provided by the local jurisdiction. In this case, Stanford University has developed an approach which is based on the current Uniform Building Code (UBC).

The State Historical Building Code also provided guidelines which could be applied to this structure. Chapter eight of this code states: "A complete, continuous and adequate stress path, including connections, from every part or portion of the structure to the ground shall be provided for the required horizontal forces." The horizontal force required by this code for the upgrade of existing buildings is not explicitly defined but is left up to the local jurisdiction, which in this situation would be the 1988 UBC.

The Stanford performance goal is to prevent collapse, while allowing minor structural damage and moderate non-structural damage under a Richter Magnitude 7.0 to 7.5 earthquake on the Peninsula section of the San Andreas Fault. The method prescribed for meeting this goal is to apply the UBC 1988 lateral loads to the structure which must be provided with a complete lateral load resisting system. Compliance with detail requirements of the code which apply to new buildings is not always possible in an economically feasible restoration program. However, new elements added to the structure would be detailed to meet the code requirements and the overall strength and stiffness of the restored structure would be sufficient to resist the code prescribed seismic forced and drift limitations.

For all construction work, Stanford University must legally comply with the by-laws and regulations of Santa Clara County. The building code applicable for work in Santa Clara County is the 1988 edition of the Uniform Building Code (UBC) [1]. The 1988 UBC prohibits the use of brittle (non-ductile) lateral load resisting elements such as unreinforced masonry and promotes the use of well-detailed structures.

In order to reinstate the strength and stiffness of the building to: (i) its pre-1989 earthquake condition; (ii) to meet the minimum seismic requirements of Santa Clara County (the current applicable code); and (iii) to satisfy the requirements in the FEMA guidelines and the State Historical Building Code, the minimum strength of the repaired Hanna House is the design base shear.
specified by the 1988 UBC. Furthermore, a complete lateral load resisting system must also be provided, in so far as practical.

**EXISTING LATERAL FORCE RESISTING SYSTEM**

The Hanna House does not have a formal lateral load resisting system. The walls in this house are flexible and incapable of resisting lateral loads because they are made with non-standard 1 x 8 studs and battens which are not well attached to the slab. The flexible wood framing is inadequately tied to the chimneys which are the primary elements capable of resisting lateral loads. Damage to these elements during the Loma Prieta earthquake indicate that the building's capacity is now even lower than the inadequate pre-earthquake condition.

The main chimney was the most substantial and rigid lateral load resisting element before it was damaged by the earthquake. The cracking and rotation of the base of the chimney indicated that the current lateral load resistant capacity is significantly diminished.

The library chimney was also a rigid lateral load resisting element damaged by the earthquake. Although the signs of damage are less severe than in the main chimney, cracking all the way around the perimeter and displacement of bricks at the corners indicate that the mortar bond is severed and the lateral load capacity is also significantly diminished.

The third chimney in the bedroom is also a significant element in the lateral load resisting system. No cracking or other damage was noted after the Loma Prieta earthquake. Although this chimney has maintained its pre-earthquake capacity, a larger earthquake, or one of the same magnitude with a longer duration, could exceed the capacity of this unreinforced masonry element.

The pre-Loma Prieta earthquake capacity of this structure has been estimated at 7.3% which is only 40% of the force level suggested by the 1988 UBC for masonry structures. The earthquake damaged chimneys no longer have any flexural strength which reduces their ability to resist lateral forces by 40% to 3%g. The current capacity is therefore approximately 16% of the code required level.

**REMEDIAL MEASURES**

Several techniques could be used to repair the Hanna House and provide an adequate level of seismic resistance (see the applicable codes and design criteria section above). The options available and our recommendations are listed below. These recommendations are based on information gathered visually and by review of original design drawings. A testing program has been developed to verify foundation configurations and reinforcement locations. The results of this testing program may lead to a modification of the recommended repair techniques listed below for the bedroom chimney and the living room retaining wall.

1. Rebuild the main, library and bedroom chimneys. All three chimneys are rigid parts of the lateral force resisting system. The main and library chimneys are cracked and require rebuilding to current building standards. Although the bedroom chimney is not cracked, it should be rebuilt in order to become a reliable part of the lateral load resisting system. These three chimney
elements form the basic load path which is required by all applicable codes and guidelines referenced above.

The recommended rebuilding technique for the chimneys is to shore the roof and dismantle the chimneys which would be rebuilt with a new reinforced concrete foundation and vertical reinforced core. The original bricks, or specially made replacement bricks, would be built up as facing, restoring the original appearance. Anchorage for the roof framing to provide the necessary load path could easily be provided within this work.

Core drilling the chimneys to provide new grouted reinforcing bars was considered but is not recommended because a variety of construction problems make this option less desirable. The main problem with core drilling is that the required foundation work would be done with the chimney in place resulting in a very large excavation with extensive shoring and underpinning. Also, mounting a drill rig over these chimneys would require elaborate scaffolding and roof reinforcement, and water from the drilling operation would be difficult to contain. Finally, providing anchorage for roof support members would cause significant sections of the chimneys to be dismantled even with the core drilled reinforcing technique.

A testing program has been developed to verify our assumption that insufficient reinforcing steel exists in the library chimney which is a more recent addition to the house. The recommended rebuilding of that chimney may be modified if significant amounts of reinforcing are found.

2. Anchor the roof to the chimneys and add a plywood roof diaphragm. The recommended approach is to anchor all roof beams which are supported on the chimneys, add blocking and ties to create collector lines and add a new 1/2” plywood layer to the roof to provide an adequate diaphragm. This work is required for any solution which could be considered "a complete lateral load resisting system".

3. Provide lateral resistance for unrestrained portions of the roof diaphragms. The addition of new lateral load resisting elements is required to provide a complete system to provide resistance for the roof diaphragms away from the chimneys. Each section of the multi-level roof must be anchored sufficiently to prevent lateral movements and rotation under seismic loading. The recommended lateral force resisting system is a combination of new plywood shear walls and vertical cantilevered steel posts anchored to concrete foundations.

It is structurally feasible to use shear wall elements exclusively. However, various architectural features such as folding doors, windows, clear-story windows and very thin wall elements would be compromised by extensive use of plywood shear walls. The combined shear wall and cantilever post layout shown on Figure S1 utilizes shear walls where possible and posts in the architecturally sensitive brace locations.

4. Repair the front retaining wall. The only feasible option for repair of the north end of the retaining wall supporting the living room terrace which was damaged by the Loma Prieta earthquake is replacement with a new brick faced concrete wall. Soil under the house would be temporarily stabilized with shoring until new
fill can be compacted behind the new wall and a new patio slab cast-in-place. The balance of the front retaining wall along the living room and the dining room terrace must be stabilized to prevent down slope movement of the soil under the house. The most economic solution which is also sensitive to the historic preservation goals of the project is to install soil anchors through the existing walls.

Test pits will be excavated near the dining room terrace to verify that the foundation is configured as shown on the original plans. If a more substantial footing than is expected or a second wall footing at the building line is found, soil anchors at this terrace wall would not be necessary.

Other techniques for stabilizing the fill under the house were considered and found to be either more expensive or not feasible. These options include removal and recompacktion of the fill which would require that much of the house be shored or dismantled. This option was dismissed as too expensive and architecturally disruptive. Soil grouting was also considered but is not technically feasible with the clay soil used as fill.

5. Repair the garage retaining wall. This wall failed during the Loma Prieta earthquake and now has a noticeable bowed shape. It must be removed and replaced with a new wall and foundation which will conform to current design requirements.

6. Repair and strengthen the dining room flitch plate. Soil movement in this area has caused the dining room doors not to operate properly. We recommend reworking and reinforcing these supporting members.

SUMMARY AND CONCLUSIONS

The Hanna House can be repaired and a complete lateral load resisting system installed by completing the recommended work noted above. Repair of damaged elements includes the three main chimneys, the front retaining wall and the garage retaining wall. The balance of the structural work involves installing a complete lateral load resisting system. Roof ties, blocking and the new plywood roof diaphragm could be hidden within the ceiling spaces. The new steel posts could be hidden within existing closets and storage spaces. New plywood shear walls would create slightly thicker wall sandwiches and require some modifications. However, locating these walls in unobtrusive locations would mitigate the architectural impact.

The work noted above is recommended to meet the FEMA and Stanford design guidelines which call for repair of damaged elements and installation of a complete lateral load resisting system. The elements of this solution attempt to meet these safety goals while respecting the historic value of Frank Lloyd Wright's architectural design.
REFERENCES


HANNA HOUSE STANFORD
EXISTING CONDITION SECTION & DETAILS
FIGURE A
WALL REPAIR OPTION #1 - SOIL ANCHORS

WALL REPAIR OPTION #2
HANNA HOUSE STANFORD
EXISTING CONDITION PLAN
FIGURE A
ARCHITECTURAL SECTION

INTRODUCTION

The seismic repair scheme for the Hanna House will involve the implementation of six distinct components: three rebuilt chimneys and footings, terrace wall repair, roof diaphragm and blocking, cantilevered columns and footings, shear walls, and carport retaining wall repair. While each of the six components of the structural repair scheme has significant affect on the primary architectural or structural element involved there will also be extensive impact on all of the architectural elements that are adjacent to each of the primary architectural features. For example, when the main chimney is rebuilt there will be an impact on the adjacent concrete floor, walls, ceiling, roof framing, roof covering and mechanical and electrical systems which must be protected in place or removed and rebuilt in conjunction with the new fireplace.

In addition to the damage caused by the earthquake, Hanna House also suffers from a broad range of deterioration that is the result of constructing the house on uncompacted soil, unique design features that do not conform to standard construction practices, deferred maintenance, and ill considered maintenance and alterations. The rectification of these issues impact features in the house that were also damaged by the earthquake as well as those areas which were left unscathed.

The purpose of the Architectural Section is to provide an overview of the architectural implications of the proposed seismic repair scheme and the particular conservation issues that are evident in the house. The comprehensive report on each of the architectural exterior and interior building elements has been placed in the Repair and Conservation of Historic Features Section.

OUTLINE SCOPE OF WORK

The following is an outline of the scope of work for the installation of the new structural repair scheme, the repair of earthquake damage and related conservation work for each building element.

Documentation
Prior to carrying out the work, all impacted elements should be documented according to HABS/HAER Standards which include photo documentation and measured drawings.

Terrace Walls
New Structural Work
1. Remove existing brick at each soil anchor location and reinstall over recessed anchor with new mortar to match the existing. Remove and rebuild concrete paving and contiguous brick planters along length of terrace wall for installation of concrete pilasters and grade beam for soil anchor system.

Repair of Earthquake Damage
1. Reconstruct earthquake damaged northern portion of the terrace wall to match the original.
2. Repoint earthquake cracked mortar joints.
3. Replace earthquake cracked bricks with new brick to match the existing.

Conservation of Building Materials
1. Repoint deteriorated mortar joints.

Terrace Paving
New Structural Work
1. Remove dining room terrace paving for installation of concrete pilasters and grade beam for soil anchor system.

Repair of Earthquake Damage
1. Remove earthquake damaged living room terrace paving and steps and rebuild to match the original.

Conservation of Building Materials
1. Repair concrete cracks.

Exterior Walls
New Structural Work
1. Label, dismantle, modify as required and reassemble exterior wood walls in their original location for installation of the following components of the structural system:
   - Chimneys
   - Shear Walls
   - Cantilevered Columns and Footings
   - Roof Diaphragm and Blocking

Repair of Earthquake Damage
1. Repair displaced walls.

Conservation of Building Materials
1. Replace metal screws with brass screws to match the original.
2. Replace deteriorated caulk.
3. Treat wood.

Windows and Doors
New Structural Work
1. Label, dismantle and reassemble windows in their original location for installation of the following components of the structural system:
   - Chimneys
   - Shear Wall
   - Roof Diaphragm and Blocking

Repair of Earthquake Damage
1. Repair windows and doors which are out of alignment.
2. Retain and stabilize living room terrace doors.
3. Repair of the deflected flitch plate over the dining room windows and doors may require that they be modified.

Conservation of Building Materials
1. Replace deteriorated wood members which are no longer performing effectively with new wood to match the original.
2. Remove sealant and install new weatherseal at window glazing.
3. Refinish hardware.
4. Treat wood.
Eave/Fascia
New Structural Work
1. Label, dismantle, modify as required and reassemble eave and fascia boards in their original location for installation of the following components of the structural system:
   - Chimneys
   - Shear Walls

Repair of Earthquake Damage
1. Repair of the deflected flitch plate over the dining room windows and doors may require modification of the existing eave and fascia.

Conservation of Building Materials
1. Repair open joints.
2. Treat wood.

Roof
New Structural Work
1. Remove existing roofing and flashing for installation of the following components of the structural system:
   - Chimneys
   - Shear Walls
   - Cantilevered Columns and Footings
   - Roof Diaphragm and Blocking

Repair of Earthquake Damage
1. Repair deflected flitch plate over dining room windows and doors.

Planters Contiguous to the Building
New Structural Work
1. Remove existing brick and reinstall in new mortar to match the existing for installation of the following components of the structural system:
   - Shear Walls
   - Cantilevered Columns and Footings
   - Garage Retaining Wall

Repair of Earthquake Damage
1. Reconstruct the earthquake damaged planter walls to match the original wall.
2. Repoint earthquake cracked mortar joints.
3. Replace earthquake cracked bricks with new bricks to match the existing.

Conservation of Building Materials
1. Repoint deteriorated mortar joints.

Floors
New Structural Work
1. Sawcut, remove and rebuild the concrete flooring to match the existing for installation of the following components of the structural system:
   - Chimneys
   - Cantilevered Columns and Footings

Repair of Earthquake Damage
1. Retain earthquake damaged floor and repair cracks.
Conservation of Building Materials
1. Refinish floors.

Interior Walls
New Structural Work
1. Label, dismantle and reassemble interior wood walls in their original location for installation of the following component of the structural system:
   • Chimneys
2. Protect interior walls in place for installation of the following component of the structural system:
   • Cantilevered Columns and Footings

Repair of Earthquake Damage
1. Repair displaced walls.

Conservation of Building Materials
1. Refinish wood.

Chimneys
New Structural Work
1. Remove the three existing chimneys.
2. Remove adjacent architectural elements which tie into chimneys:
   • Floors, Interior and Exterior Walls, Windows, Ceiling, Casework, Fixtures and Equipment, Eaves/Fascias, Roofing and Flashings
3. Rebuild the chimneys with new brick and mortar to match the existing.

Ceilings
New Structural Work
1. Label, dismantle and reassemble ceilings in their original location for installation of the following components of the structural system:
   • Chimneys
   • Cantilevered Columns and Footings

Conservation of Building Materials
1. Replace grasscloth wallpaper with saguran cloth.

Casework
New Structural Work
1. Dismantle intact and reinstall casework in their original location for installation of the following component of the structural system:
   • Chimneys

Repair of Earthquake Damage
1. Repair doors and drawers which are out of alignment.

Conservation of Building Materials
1. Refinish wood.

Fixtures and Equipment
New Structural Work
1. Label, dismantle and reassemble ceiling light fixtures in their original location for installation of the three chimneys.
2. Remove and reinstall kitchen stove and hood for installation of the main chimney.
Conservation of Building Materials

1. Replace existing plastic lenses in ceiling light fixtures with glass lenses to match the original.

2. Refinish wood.
MECHANICAL SECTION
MECHANICAL SECTION

INTRODUCTION

This section summarizes the impact of the structural damage to the mechanical systems as observed by the mechanical engineer during a site visit on October 14, 1990. The mechanical systems included the heating system and plumbing.

EXISTING CONDITIONS

The heating system was originally installed in 1937 by the Electrogas Furnace and Manufacturing Co. of San Francisco. The original system used a single gas-fired, forced warm air furnace. The heating air is distributed by three separate ducts in order to provide three individual zones.

Zone 1 includes the living room, entry, library, and kitchen. Zone 2 is the play room. Zone 3 serves the bedrooms and bathrooms. The ducts are located below the floor inside a narrow service tunnel. The supply air registers are located in the walls near the floor.

The single furnace has been replaced with three smaller individual furnaces. Each serves a single zone. The furnaces were manufactured by Ruud (Model UGGD-10NC-JR, 100,000 input BTUH). The units were not dated, however, installation appears to have been within the past 5 or 6 years. The furnaces should last another 12 to 15 years if properly maintained.

The connections to the existing ductwork were accomplished with new ductwork and a new return air plenum. Aside from these new duct connections, the remainder of the system is the original ductwork.

The water heater was manufactured by Hoyt (Model 75, 54.6 GPH recovery rate, 75 gallon storage, 65,000 input BTUH). Those portions of the copper water piping that were examined appear to be in good condition.

It was noted that some of the threaded joints in the steel gas piping in the mechanical room were coated with a sealant. This may have been repair work. A slight whiff of natural gas odorant was detected, indicating a very small leak still exists.

To improve the seismic requirements for the mechanical equipment it is recommended that the gas flex tubing connections to the furnaces and water heater be extended to allow greater movement. The water heater should be braced.

After the reconstruction work is completed, the interior of the ductwork should be cleaned with blowers and vacuum cleaners.

IMPACT OF REPAIRS OF SEISMIC DAMAGE

This is a summary of the impact on the mechanical systems due to the proposed seismic repairs.

Main Fireplace - The rebuilding of the main fireplace and chimney in the living room will impact the heating system since the supply air outlets were built into the fireplace walls. These
outlets need to be rebuilt during the reconstruction. In addition, the combustion flues for the water heater and furnaces as well as the flue for the kitchen stove are located inside the chimney and need to be incorporated into the reconstruction.

Tunnel - Excavations for the footings for the main and library foundations will impact the existing mechanical ducts located in the utility tunnel. These ducts should be removed and replaced following completion of the chimneys.

Cantilevered Columns/New Footings - The excavation for the footing of the steel column in the guest room may impact the existing return air duct located beneath the dining room couch. This existing duct would need to be removed for excavation of the footing and a new duct installed following completion of the structural work. This duct should be relocated as required to connect with the existing return air grille built into the couch.
ELECTRICAL SECTION
ELECTRICAL SECTION

EXISTING BUILDING SYSTEMS

Electrical Service and Power System:
The existing service and meter is located in an electrical closet located on the exterior east wall of the hobby shop behind the kitchen. From this location, the entire complex is served with a 200 AMP service at 120/240V, 1 Phase, 2 Wire. Refer to Single Line Diagram on attached SK-1. The main Hanna House is served by a 60 AMP/2-Pole disconnect switch terminating to a 60 AMP main fuse box and a 24 circuit panel located in the kitchen.

The hobby shop is served by three panels located in the same service closet. The other loads such as the swimming pool, fountain and irrigation system are served by a 100 AMP-pole disconnect switch and an exterior panel located west of the hobby shop.

There are exposed power cables in closets that are not stapled tight to walls and might be unsafe and hazardous if tripped or pulled.

With the exception of the panel in the main house, all existing electrical equipment is fairly new and made from present manufacturing standards. The existing panel in the main house is old and antiquated but can still be used and kept in place for the existing load. The only drawback is that replacement parts might be difficult to find later for ease of maintenance.

Lighting System:
The existing interior lighting systems primarily utilized incandescent lamps with the fixtures recessed and architecturally designed with the ceiling. In most rooms, fluorescent cove lighting is predominant as additional supplemental lighting.

The exterior lighting under soffits is provided by recessed incandescent fixtures with drop opal lenses, square in shape with soft curves at the corners. In certain areas, the drop lens is in the way of the terrace door swing due to the low soffit ceiling. Also, exterior bullet type fixtures are used in some areas and are also mounted on trees. These fixtures are connected with exposed cables that are draped over the roof and trees. This installation is unsafe and possibly hazardous.

Receptacles:
Most receptacles are two-prong ungrounded type with brass plates except in the kitchen and bathrooms where receptacles are three-prong ground type. All devices are brown finish except for a receptacle in the library that is on a surface raceway and is ivory finish.

Telephone, Security Alarm, Audio/Speaker and Cable TV Systems:
The telephone system service is located in an exterior service closet with the electric service equipment. The entire facility is served from this point. Security Alarm System main control panel is located in a closet near the main entry door with a keypad mounted on the exterior wall of the closet. Motion detectors are strategically located in the entire house to detect entry at any location.
The Audio/Speaker System is set up with the amplifier located in the library and speakers are located in the loft over the kitchen and in the cove in the master bedroom. Controls are wired in the same locations.

The cable TV system is fed at outlets in the TV room and kitchen.

The exposed signal cables are all over the house with pigtails and terminations specifically located in the kitchen, library shelves and head wall at master bedroom.

Miscellaneous Equipment such as fountain pump, swimming pool and irrigation systems. The electrical equipment serving the fountain pump, swimming pool equipment and irrigation systems has been installed fairly recently and is adequate for the capacity. As previously noted and shown on drawing sheet SKE-1 the panel is a weatherproof type located on the southeast corner of hobby shop.

**IMPACT OF REPAIRS OF SEISMIC DAMAGE**

Terrace walls:
Replace broken conduits and wiring for landscaping lighting damaged by the earthquake along the north front terrace wall.

Fireplace and Chimney Reconstruction
Main Fireplace - Remove existing receptacles (total of 5) in built-in couch and walls around main fireplace including kitchen. Replace the 2-prong ungrounded receptacles with 3-prong grounded type and reinstall with existing brass cover plate. Also, remove and reinstall one (1) wall mounted lighting fixture over the kitchen door from the entry. Remove and reinstall all signal and communication wires and cables running at kitchen work desk, south end of kitchen.

Library Fireplace - No electrical system affected.

Bedroom Fireplace - Remove and reinstall two (2) receptacles, one exterior and one inside bedroom next to wardrobe that are affected by this repair work.

Foundation work affecting utility tunnel due to new footings:
Based on our visual observation, the electrical system running inside the tunnel is in conduit except for telephone wiring. The system in conduit can remain in place and be maintained during excavation and construction of the new footings. The exposed telephone wiring should be removed and replaced after work is done.

Roof Diaphragm:
Exposed wiring on roof for exterior lighting shall be removed. The wiring should be replaced with a concealed wiring in the roof framing prior to the installation of the roof diaphragm. The exposed wiring on the trees should be replaced with appropriate cables that are suited for use in exposed exterior areas and stapled on the trees. This work occurs in the north and south terraces where there are exterior lighting on trees.
LONG TERM ELECTRICAL RECOMMENDATIONS

The following recommendations are related to the long term use of the building and are not a part of the seismic repair work.

Electrical Service and Distribution System:
It is assumed that the existing system will remain as it is unless any load such as exterior lighting is added to the house. The new circuits should be connected to the panel serving the fountain pump, irrigation system and swimming pool.

For future added load in the main house, it is recommended that the existing 24-circuit panel be replaced with a 30-circuit panel, reusing existing panel enclosure to maintain the original installation. Likewise, the existing 60 Amp fuse main shall be increased to 100 Amp fuse main and feeder wires from the main service equipment replaced with existing conduit being reused.

Lighting System:
Existing interior fixtures shall remain. Relamp all burned-out incandescent or fluorescent lamps.

Exterior soffit fixture with opal drop lens will be replaced with a recessed lens to clear door swing.

Exposed wiring on the trees throughout the site for exterior lighting should be rewired in conduit or liquid-tight cables.

Landscaping fixtures that are broken at their stem will be replaced and reinstalled to original condition.

Receptacles:
Replace all 2-prong ungrounded receptacles with 3-prong grounded type, brown finish with the existing brass cover plate reused. Receptacles within 6 feet of sinks in kitchen and in toilets will be replaced with ground fault interrupter (GFI) types. These recommendations are safety and code requirements.

Signal Systems:
Existing signal systems to remain except all exposed wiring and cables to be concealed for aesthetic and safety reasons.

Fountain Pump, Swimming Pool Equipment and Irrigation Systems:
All existing equipment and wiring to remain since all are in good condition and installed in conformance to code.
INCOMING UNDERGROUND P&G SERVICE

P&G & E KWHR METER

MAIN SERVICE DISCONNECT
200AMP/120/240V, 1PHASE, 3WIRE

EXISTING WIREWAY

50AMP/2POLE MAIN DISC. SWITCH

EXISTING LOAD CENTER
TYPE PANELS SERVING
GUEST HOUSE & HOBBY
SHOP

100AMP/2POLE MAIN DISC. SWITCH

PANEL - MAIN HOUSE

PANEL - FOUNTAIN PUMP POOL AND IRRIGATION

NOTE: RECOMMENDATION FOR FUTURE LOAD IN MAIN HOUSE IS TO REPLACE 50AMP/2POLE MAIN DISCONNECT SWITCH AND PANEL TO A NEW 100AMP/2POLE MAIN WITH ADDITIONAL CIRCUITS IN NEW 100AMP PANEL

HANNA HOUSE
STANFORD UNIVERSITY
PALO ALTO, CA

PETE 0. LAPI.D & ASSOCIATES
CONSULTING ENGINEERS
839 MARKET ST., STE. 900 SAN FRANCISCO, CA 94103

SCALE NOT TO SCALE
DATE NOV. 26, 1990
DRAWN BY JD/J/POL

JOB NO. 90111

EXISTING SINGLE LINE DIAGRAM

SHEET NO. SKE-1
LANDSCAPE SECTION
LANDSCAPE SECTION

INTRODUCTION

The garden and grounds surrounding the Hanna House date back to the late 1930's when the house was built. Subsequent additions to the house and the garden have necessitated alterations to the landscape in the 1950's and 60's. The present requirements for seismic repair and/or reconstruction will also require changes to the grounds, especially in relation to the major oak trees (Quercus lobata) near the house and the large Monterey cypress (Cupressus macrocarpa) in the breezeway.

The intent of this report and its recommendations is to ensure that the garden and landscape are maintained as nearly as possible in the appearance during the period of the 1960's and 70's when the garden matured and its design complimented the house and the lifestyle of the Hanna family. There should be no attempt to redesign the garden so that its character and appearance are noticeably altered. However, there may be minor changes due to structural modifications to the damaged retaining walls, to ensure the longevity of the major trees and to correctly prune overgrown shrubs.

This report, then, focuses first on evaluating the present condition of the garden, especially the five trees (one Monterey Cypress and four Valley Oaks) surrounding the house. Second, the report evaluates the impacts of the options proposed to reconstruct or renovate the house, garage and retaining walls which were damaged in the October 1989 earthquake. Finally, the report makes recommendations for techniques to be used during the process of reconstruction to preserve and protect these trees. The latter will include some maintenance procedures. However, detailed maintenance guidelines will be included in a separate report to be prepared at a later time. It must be emphasized that the health and continued life of these trees is not only contingent on care during the reconstruction process but also on sound long-term maintenance including some minor redesign to the areas beneath the trees. It is imperative that the Landscape Management Report be accomplished as soon as possible so that certain critical procedures can be implemented as soon as possible.

SITE HISTORY

Prior to constructing the house in 1937, the site consisted of a grassy knoll dotted with native Valley Oaks and one lone Monterey Cypress. This tree had been planted by persons unknown or possibly as a volunteer seedling planted by birds. This natural oak savanna was typical of the landscape of the Stanford lands. The trees were spaced well apart due to limited available moisture, cattle grazing, and occasional grass fires. The force of the prevailing westerly wind is evident in the lean of the trees to the east.

This landscape typifies the Mediterranean type climate of the region. Vegetation depends upon the limited precipitation of winter rains stored in the clayey soil and in underground aquifers.

After the flush of growth in the spring and early summer, soil moisture is depleted, grasses die and the trees go into a summer
dormant period. During this period oaks are particularly susceptible to increased soil moisture especially near their trunks. Fortunately the soil on this site is well drained and relatively fertile as evident in the relatively good health of the trees.

The siting of the house by Frank Lloyd Wright and the development of the garden dominated by irrigated lawn was typical of the work of both architects and landscape architects in California earlier in this century. Little was known about the impact of construction and lawn irrigation on oaks and other trees at that time. For its time, the house is sited sensitively taking advantage of the shade and bold sculptural qualities of the trees. Only one small oak was removed which was located "in the center of the living room-to-be, a sickly tree without potential" (Hanna, 1981)

The cypress stood where the breezeway was to be built. Despite gloomy predictions that this "large, bark-beetle infested tree would soon die", Wright designed the breezeway and steps around the tree in an attempt to preserve it. This required cutting away four vertical feet of soil on three sides of the tree and the removal of a substantial portion of the root system, perhaps as much as 60-70%. Evidence of what was a very large buttress root on the south side of the tree can be seen today. After over 50 years it is even more remarkable that this tree has survived.

Construction of the house, its surrounding pavement and terrace walls have had similar impacts on the Valley Oaks in three locations. The living room terrace and its retaining wall (which was severely damaged in the 1989 earthquake) were built within a few feet of two large oaks. Approximately half of their root systems was covered by the terrace and house. Irrigated lawn was installed below the trees and the grade of the lawn appears to have been raised about 12" or more above the original grade.

The long bedroom wing was built very close to another large Valley Oak at the south end. A concrete terrace was built very close to the tree leaving very little soil space around the trunk. There is evidence that the grade was raised around the trunk and filled with rock. Three large trapezoidal openings are filled with pebbles surrounding a triangular sculpture pad, in the terrace, therefore most of the root system of this tree is covered by building and pavement.

Above the rear patio on top of the knoll is another Valley Oak. A portion of the root system was removed when the building pad was excavated, retaining walls built and the waterfall and pool installed. A small lawn surrounds the eastern side of the tree although it has been held several feet back from the trunk.

The garden is planted very simply with introduced (exotic) plants, without any attempt to create a native or natural garden. The garden is typical of the 1950's and 60's in that the simple plant palette of juniper and ivy surrounding the lawn with few flowers creates a lush, effect that is both functional and decorative, providing a rich green setting for the red brick house and simple backdrop for outdoor activities.
EXISTING CONDITIONS

CYPRESS TREE

Despite spending 50 years contained in a high brick walled planting space, the tree is in surprisingly good health and in stable condition. This is largely due, no doubt, to the expert care given it by Mayne Tree Service. It appears to suffer from Cypress Bark Canker disease which commonly affects cypress planted inland, away from its preferred coastal habitat. Spraying for the bark beetle and regular fertilization has kept the tree from declining.

The lack of root space prevents the tree from growing actively and, thus, is in a stable, but stagnant state. It can be maintained in this way for some time, perhaps 10-15 years. Eventually it will decline and die. There is no way to ascertain when that might happen. Nevertheless, due to its size and important relationship to the house, every effort should be made to keep the tree as long as possible.

The brick retaining wall on the south side is bowed outward, no doubt due to pressure from the root system. This is further evidence that the tree needs more root space.

VALLEY OAKS

North Terrace

The two trees below the high brick retaining wall are in only fair condition. This is no doubt due to a combination of detrimental factors including 50 years of buried roots beneath the terrace and house, raised grade below the walk, summer irrigation for the lawn and the presence of water mold fungi and oak root fungus at the base, (due to summer irrigation and the raised grade).

Fortunately, the trees have been well-maintained by Mayne Tree Service through a program of pruning, spraying for oak moth caterpillars and for pit scale, and for attempting to keep the basal area dry by installing wooden boxes.

The proximity of the tree to the damaged brick wall is of great concern. One tree is actually resting on the wall and both hang over the terrace considerably. Both trees are within three feet of the base of the wall which will make repair and/or reconstruction difficult.

South Terrace

This Valley Oak at the end of the bedroom wing is by far the most magnificent and significant tree on the property. Its long tortuous limbs are typical of the species and form a great spreading canopy to shade the house and terrace. One large limb has been propped with a steel post which is essential to support that portion of the tree. An appropriate number of guy wires have been installed in the tree to support other limbs.

In general the tree is in excellent condition despite the coverage of most of the root system with the house and pavement. There is evidence that the grade has been raised as much as two feet around the trunk. Such a raise in grade almost always results in destruction of the bark and cambium layer (growth tissue) which slowly kills a tree.
Patio Tree
The Valley Oak which sits above the ornamental pool and waterfall is in fairly good condition despite the loss of a substantial portion of its root system during past grading and construction activities. However, the irrigated lawn is detrimental to the long-term health of the tree, even though the area around the trunk is barren of grass.

The tree has evidence of Oak Mildew disease scattered all through its new foliage. This may be due to poor timing of an ammonium based fertilizer in the spring or to a relationship between a fluke of weather and other fertilizer timing.

Tree at Driveway
This tree is in relatively weak condition due to asphalt pavement covering much of its root system and to the grade having been raised around the trunk on the uphill side. Although this tree is outside the influence of reconstruction work, it nevertheless is a significant tree and should not be ignored. Specific recommendations to help improve its health will be included in the Landscape Management Report.

OLIVE TREES (across parking lot below house)
These trees form a valuable screen between Hanna House and the immediate neighbors. The trees are in fair condition due to an apparent infection of Verticillium Wilt causing dieback of upper branches. This disease does not generally kill trees. But, because of the importance of these trees as a buffer screen, their care should not be ignored. Specific recommendations for both treatment of the disease and replanting will be included in the Landscape Management Report.

MISCELLANEOUS PLANTS
The entire garden is in fairly good condition but the juniper along the west side are overgrown. Careful thinning is needed to renew their growth and to reduce their size and massiveness. Recommendations for this work and for other aspects of the garden such as the lawn will be made in the Landscape Management Report.

IMPACTS OF REPAIRS OF SEISMIC DAMAGE
There are two places where proposed structural changes will have a direct impact on the trees and landscape. The Cypress tree in the raised brick planting bed and the two Valley Oaks below the north terrace wall. The following discussion evaluates the likely impact of the various proposed structural solutions and makes recommendation to minimize the effects of seismic repair or reconstruction on the trees. Recommendation for other landscape changes and maintenance not related to the seismic upgrade will be included in the Landscape Management Report.

CYPRESS TREE PLANTER

New Structural Work
The proposed reconstruction of the retaining wall along the garage side of the tree should have only a moderate impact on the tree depending on the manner in which excavation and reconstruction is accomplished. The roots of the tree certainly fill
Cypress tree planter

Oak trees at north terrace wall
the planting bed and are no doubt matted against the retaining walls. The root space for this tree is so small that removal of a significant portion of roots would seriously affect the health and longevity of the tree. This means that little or no excavation in the rootball is possible. Further, enlargement of the root space by reconstructing the outer, bowed wall a foot or so further from the trunk would greatly enhance the longevity of the tree.

Once the existing wall at the carport is removed, the extent and condition of the rootball can be determined. It is expected that most of the roots occur in the top two to three feet of soil because that is where air and moisture are present. (The greatest percentage of roots normally occur in the top 18-24" of soil for most trees). Therefore, the greatest impact to the root system most likely will be from the new wall rather than the footing.

The new wall will entail construction of wood forming that will require space now occupied by tree roots and soil. This will necessitate excavation of 6-8" into the root zone to accommodate the forming wood. Such excavation could be seriously detrimental to the tree. I cannot be certain that shaving off of even 3-6" of roots won't hurt the tree. Some minor root pruning should stimulate new root growth, however, and could help invigorate the tree once new backfill soil is added.

Since the rootball and soil volume is probably very dense, it may be possible to form only the outer side of the wall and footing, thereby reducing or eliminating the need for excavation. If this is feasible, the root and soil mass should be covered with a sheet of plywood to provide a smooth surface to pour against and to protect the roots from fresh concrete which is very calcareous.

**Recommendations**

1. All demolition and grading work should be done by hand. If significant large roots over 1" in diameter are encountered while excavating for the footing, it may be necessary to bridge the root or roots with a pier and grade beam type of footing. The landscape architect or consulting arborist should be consulted for a recommendation before proceeding with work if large roots are encountered.

2. Maximum excavation for the inner wall forms should be 6". Such excavation should be done by hand very carefully so as to disturb the roots and soil as little as possible. Fine matted roots should be cut or shaved off using a sharp spade or mattock. The soil should be relatively moist, not dry.

3. If elimination of the inner form is possible, a maximum of 2" of excavation should be done, just enough to accommodate the thickness of the wall and plywood shoring.

4. If a drainline is uncovered during excavation, it should be replaced with the same type of drainage system.

5. The exposed roots should be covered with burlap and kept wet every day until the new wall is built. If that becomes an extended period, plywood sheets should be installed and a backfill mix placed between the roots and the plywood.
OAKS AT NORTH TERRACE

New Structural Work
Of the two options being considered for the high retaining wall, Option #2 will have the most detrimental impact on the trees. Therefore, it is strongly urged that Option #1 be employed and coordinated with the structural seismic repair work.

1. Option #1 - Soil Anchors:
   This option appears to require little work on the outside of the wall and no excavation. If so, there should be no adverse impact on the trees other than that possible damage from workmen and their equipment as they work around the trees. The trees should be protected from damage to the bark, surface roots and any branches. Otherwise this solution, if feasible, is the most desirable technique for repairing the wall.

2. Option #2 - Rebuilt Wall:
The excavation and footing required for this option will have a major impact on the two oaks. The spread footing extending four feet out from the wall will necessitate removal of both trees if installed as shown in detail 8/S4 on the structural drawings.

   An alternative is to use a pier and grade beam footing to bridge over the base of the one tree and any large buttress roots or roots over 4" diameter of both trees. All demolition and grading must be done by hand to prevent damage to the root systems and the trunks.

   For either option overhead limbs must be protected from damage by construction equipment so that limbs are not broken or the bark damaged. The rebuilt wall should be designed to accommodate the leaning trunk of the closest tree and the large limb of the other. A pipe support should be incorporated into the wall to ensure continued stability of this tree and limb. A temporary support is necessary for the leaning tree closest to the wall.

   Also for either option, the grade at the base of both trees (outside the wood boxes) should be lowered to original grade thereby eliminating the need for the boxes. This new grade should slope downward to provide positive drainage away from the wall and the trunks. The lawn and its irrigation system should be removed out to the dripline of these trees.

Recommendations
1. It is recommended that Option #1 be employed to stabilize the retaining wall with the least impact on the trees.

2. If Option #2 is used, a pier and grade beam footing must be used to bridge buttress roots and any other large roots over 4" diameter.

3. Drilling for piers should be done only in locations where no roots exist as determined by probing down to the required depth using a small diameter steel rod.

4. All excavation should be done by hand including drilling holes for the piers. When large diameter roots (over 2" diameter) are encountered, they should be left undisturbed until either the landscape architect or consulting arborist can inspect the excavation and recommend how to proceed.
5. Any roots which must be cut are to be cut using a pruning saw (over 1" diameter) or loppers (under 1" diameter).

6. For either of the seismic repair options, the following measures must be employed to protect the trunks and root systems.
   a. Trunks should be wrapped with wire and lathe snow fencing to 8' above grade. Three wraps of such fencing tied to itself and the trees will serve as efficient protection for the trunks to prevent damage during wall demolition and reconstruction.
   b. An 8" thick layer of wood chips should be laid over all areas beneath the trees where equipment and workers will be located. This material should be added as often as necessary to maintain an 8" thick layer to cushion the impact of men and equipment and to prevent soil compaction.
   c. Any low overhead limbs which might be damaged by equipment should be wrapped with 3" thick foam rubber secured with duct tape.

7. The leaning tree closest to the wall should be supported by a prop or props during demolition and reconstruction of the wall. The exact method should be determined in consultation with the landscape architect or consulting arborist prior to beginning demolition work.

8. Four inch galvanized steel posts with caps (similar to that supporting the limb of the tree at the south end of the house) should be incorporated into the new wall and/or terrace to support the leaning tree and the large overhanging limb of the larger tree.

9. After all structural work is completed, the wooden boxes around the base of these trees are to be removed, and the soil is to be excavated at least 12" deep in all directions around the trunks to reach the original grade or large flaring buttress roots. After such excavation the consulting arborist should inspect the roots and remove the patches of oak root fungus from infected places on the trunk or roots.

10. The soil should be graded so that the surface slopes smoothly away from the base of the trees toward the existing lawn to achieve positive drainage.

11. The lawn and irrigation system should be removed from within the dripline of these trees. A revised planting plan will be included in the Landscape Management Report.
SEISMIC REPAIR COST ESTIMATE
The preliminary cost summary below includes the structural, architectural, mechanical, electrical and landscape costs related to the seismic repair of the Hanna House. (Refer to the Appendix for the detailed cost estimate worksheet.)

**BREAKDOWN**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>% OF TOTAL</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General requirements</td>
<td>14.1%</td>
<td>$254,000</td>
</tr>
<tr>
<td>2. Layout, Protection, Supervision</td>
<td>10%</td>
<td>180,000</td>
</tr>
<tr>
<td>3. Testing and survey</td>
<td>2%</td>
<td>36,000</td>
</tr>
<tr>
<td>4. Hazardous materials</td>
<td>.6%</td>
<td>11,500</td>
</tr>
<tr>
<td>5. Demolition</td>
<td>7.5%</td>
<td>135,000</td>
</tr>
<tr>
<td>6. Structural repair</td>
<td>33.9%</td>
<td>607,000</td>
</tr>
<tr>
<td>7. Masonry work</td>
<td>6.9%</td>
<td>123,500</td>
</tr>
<tr>
<td>8. Sitework</td>
<td>1.5%</td>
<td>28,000</td>
</tr>
<tr>
<td>9. Finish Carpentry</td>
<td>6%</td>
<td>107,000</td>
</tr>
<tr>
<td>10. Waterproofing</td>
<td>3.9%</td>
<td>69,000</td>
</tr>
<tr>
<td>11. Doors and window finishes</td>
<td>2.2%</td>
<td>39,000</td>
</tr>
<tr>
<td>12. Plumbing, HVAC, electrical</td>
<td>2.5%</td>
<td>41,000</td>
</tr>
<tr>
<td>13. Fee</td>
<td>9.1%</td>
<td>163,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$1,794,000</strong></td>
</tr>
</tbody>
</table>
GENERAL CONSIDERATIONS FOR IMPLEMENTATION OF WORK
GENERAL CONSIDERATIONS FOR IMPLEMENTATION OF WORK

PROTECTION OF THE HOUSE AND SITE

During the work that is projected to correct seismic damage to the house almost every section of the garage and house interior and exterior will be impacted. Particular consideration needs to be given to the protection and care to those portions of the house where work will be carried out. Due to its unique design, use of materials and methods of construction the house is extremely fragile. Whereas buildings using conventional construction can withstand the normal wear and tear of the construction process, the materials and finishes used on the Hanna House cannot. They can be easily damaged with no opportunity to conceal the corrective work if it is carried out.

On the grounds of the house the hardscape features such as the concrete terraces, paving, and the brick walls cannot be easily repaired. The four oak trees and the Monterey cypresse are extremely vulnerable to damage due to the proximity of the roof systems through the branches of the construction. No loss of roofs, trunks and branches is acceptable.

Included in the construction package, will be specific instructions for providing the care and protection not only for the house, but also for the grounds in general and specific architectural details and landscape features.

STORAGE AND PROTECTION OF MATERIALS DURING CONSTRUCTION

In order to execute much of the work to repair the seismic damage to the house and garage it will be necessary to dismantle a variety of brick, wood, glass, and fiberboard, architectural features, hardware and casework. Some details can be disassembled into a number of small units. Other items such as doors, windows and casework will be removed intact. Some of the items, such as the built-in living room couch are extremely large. In general, these items are fragile or have fragile finishes that require that they be stored in weather tight, clean, and secure storage buildings. The issue of security will be important since a number of these architectural elements have considerable monetary value apart from their cultural value. There is a ready market for certain individual items. All features removed from the house need to stored in a manner that will allow for easy identification and retrieval for reinstallation. The order in which features will be removed is not necessarily the order in which they are reinstalled.

IDENTIFICATION OF ARCHITECTURAL ELEMENTS AND MATERIALS

All architectural features in the house and garage which are to be dismantled will be identified and keyed to plans and elevations to insure reinstallation in their original location. The manner and materials which are used to identify the dismantled features must fulfill certain requirements. The markings must survive the storage and retrieval procedure. The markings will be reversible and not cause damage to the element. The identification must be easily read in order to facilitate storage and retrieval.
REPAIR AND CONSERVATION OF HISTORIC FEATURES
REPAIR AND CONSERVATION OF HISTORIC FEATURES

INTRODUCTION

The work of this section addresses the impact of the proposed structural repair system on the original features of the building. Recommendations are given for carrying out the work required for construction of the new structural system and the repair of other earthquake damage which occurred throughout the house. In addition, evaluation of the current condition of the building has been carried out and general recommendations have been given to guide the conservation and rehabilitation of the building.

The building exteriors and interiors are divided by individual building elements. For each of the building elements this section considers the following items:

1. Description of Original Materials
2. Existing Conditions
3. Earthquake Related Repairs
4. Conservation Recommendations

Description of Original Materials
This section describes the original appearance of each element.

Existing Conditions
This section describes the general deterioration of materials and features and specific earthquake damage.

Earthquake Related Repairs
This section includes a description of the repair work required for each of the building elements impacted by installation of the structural repair system.

Recommendations for the repair of earthquake damage are included to ensure that this work is carried out with materials and techniques that will not jeopardize the architectural integrity of the building. This work should be carried out immediately.

Conservation Recommendations
This section deals with the issues that are related to the long term preservation of the building and includes general recommendations for the conservation of original materials as well as for the repair and rehabilitation of individual elements and features. This is work that should be carried out as soon as there are available resources, but does not have to be part of the proposed seismic repair work.

LEVELS OF INTERVENTION

Given the unusual nature of the original design and construction of the Hanna House, the unusual circumstances of the original house and site and the extraordinary impact of the seismic damage to this structure, work is being proposed that are variations of the standard procedures that would normally be taken in the conservation of a building of this stature. The following levels of intervention will be used throughout this report as well as in the preparation of contract documents.
Dismantle Intact: In general, the removed feature will maintain its complete existing configuration as it appears in the house.

Dismantle: Disassemble the feature into its component elements.

Remove: Demolish the feature in such a manner that it cannot be reconstituted using the original materials, such as roofing, brick, masonry and concrete paving.

Reinstall: Replace the feature which has been removed intact in its original position in the house.

Reassemble: The component elements of the feature are to be put back together and replaced in their original position in the house.

Rebuild: Construction of a feature that existed in the house using new materials. The external appearance of the new feature will replicate the external appearance of the original element.
EXTERIOR BUILDING ELEMENTS

TERRACE WALLS

DESCRIPTION OF ORIGINAL WORK

The terrace walls are constructed of brick veneer on concrete retaining walls. The brick courses are laid in a running bond with a header course forming the cap. All inside and outside corners are constructed with an interlocking brick detail. The brick is a wire-cut common San Jose red brick. Yellow color variations occur in brick units which were caused during the firing process and are the result of the proximity of individual bricks to the heat source. The brick is laid in a cement mortar colored to match the brick. The vertical joints are narrow and flush with the face of the brick and the horizontal joints are raked to a depth of 3/4". These construction details are typical for all masonry elements throughout the building.

EXISTING CONDITION

General

The hard fired brick and the dense Portland cement mortar construction of the terrace walls has generally held up well against the effects of weathering. There is extensive efflorescence staining the wall. Efflorescence is a white film on the surface of the bricks due to crystallization of soluble salts. This occurs throughout the wall where the brick is subjected to water drainage from the terrace paving and planters. It also occurs at the base of the wall directly above grade. There is also evidence of exfoliation, where the surface of the brick has peeled off in thin layers. Exfoliation occurs when the crystallization, instead of occurring on the surface of the brick, takes place below the surface, which breaks down the material and causes it to peel. This condition occurs primarily at the north terrace walls.

The cement mortar joints exhibit surface erosion in locations at the north terrace wall and at the base of the wall above the natural grade. This erosion occurs primarily in the vertical joints. The mortar joints also have extensive areas of surface efflorescence, as well as limited areas of staining due to biological growth.

Repair work to the terrace walls has been carried out, including repointing and brick replacement, which does not match the original level of craftsmanship that appears throughout the house. This is most noticeable at the dining room terrace walls. The horizontal mortar joints are not straight and there is repointing which does not match the color of the original mortar or tooling and which has been applied so that it extends across the face of the brick.

Earthquake Damage

The earthquake caused the brick facing on the northernmost portion of the terrace wall to collapse as well as various cracks throughout the wall. The cracks occur primarily in the mortar joints but occasionally they extend through individual bricks. At the present time it is not possible to determine if the concrete wall under the brick veneer is cracked.
EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work for the terrace walls, based on the structural information for the original building available to the engineers at this time, is to rebuild the north end of the retaining wall at the living room terrace and to stabilize the remainder of the wall through the installation of soil anchors.

1. Rebuild Terrace Wall
The existing northern portion of the terrace wall will be removed and replaced with a new reinforced concrete retaining wall and footing with a brick veneer that will match the detail and configuration of the existing wall.

Ideally, the new wall would be rebuilt using the original bricks. Due to the hard Portland cement mortar used in the original construction, however, it does not appear to be feasible to remove the existing bricks without damaging them. Prior to making a final decision on this matter tests on the brick removal should be carried out. If it is not possible to rebuild the wall with the existing brick, new bricks which match the original should be used. (Refer to the Chimney section for the recommended procedure for finding replacement bricks.)

The brick should be installed in new mortar that matches the existing which is tooled to match the original joints. In order to develop the new mortar mix, the original mortar used in the construction of the walls will be analyzed to determine the composition of the mix, and the size and type of sand and pigments used. A new mix will be developed based on the results of this analysis for use in the rebuilding, as well as on all future work carried out on the terrace walls.

The construction of the new retaining wall will impact the oak trees adjacent to the wall. (Refer to the Landscape Section for recommendations for protection of these trees.)

2. Soil Anchors
Soil anchors with a reinforced concrete pilaster and grade beam system behind the wall will be installed to stabilize the existing terrace wall.

Existing bricks and mortar will need to be removed for reinstallation at each soil anchor. This removal work should be carried out in such a manner that it does not damage the individual bricks or the adjacent material. Due to the hard Portland cement mortar, it may be necessary to utilize a technique which involves sawcutting the mortar joints in those areas where bricks are to be removed. A jig must be set up and a blade must be used which is narrower than the existing mortar joint to ensure that no damage is caused to the original bricks. The mortar that remains on the bricks following this operation should then be carefully chipped away. Tests should be carried out on site to determine the feasibility of this method.

The soil anchors will be recessed behind the face of the existing brick wall. The bricks which have been removed will be saw cut and installed as thin face brick.
If it is not possible to remove the existing bricks without damaging them, new bricks should be installed at the soil anchors which match the original.

The concrete paving along the entire length of the terrace wall and brick planters which tie into the wall will need to be removed for installation of the concrete pilasters and continuous grade beam. The concrete paving should be replaced with new paving to match the original. (Refer to the Terrace Paving section.) The brick planters should be rebuilt according to the procedures described above.

**Repair of Earthquake Damage**

The earthquake damaged northern portion of the terrace wall should be reconstructed to match the original wall. The bricks from the collapsed wall have been stored on site. To the extent possible, the excess mortar should be removed and the brick reused in the reconstruction. Where additional bricks are needed to complete the wall they must match the original in size, color and texture as well as general strength and porosity. (Refer to the Chimney section for the recommended procedure for finding replacement bricks.)

There is electrical conduit, a gas meter and water lines adjacent to the portion of the wall to be reconstructed. (Refer to the Electrical and Mechanical sections for recommendations for these elements.)

The earthquake cracks which occur in the mortar joints in the terrace walls should be repointed with the new mortar mix developed to match the existing and tooled to match the original joints. The earthquake cracks which occur through bricks should be evaluated on an individual basis. Bricks with hairline to moderate size cracks should remain and should be carefully monitored for future expansion. Bricks with large cracks should be removed and replaced with new brick that match the original size, color and texture as well as general strength and porosity. Removal of brick units should be carried out according to the procedure developed for installation of the soil anchors.

**CONSERVATION RECOMMENDATIONS**

**Masonry**

The efflorescence, exfoliation, mortar joint deterioration and biological staining is a result of moisture penetration in the terrace walls.

Prior to carrying out any work on the walls the source of moisture and the nature of the deterioration process must be determined. This will require additional study and laboratory analysis.

1. A detailed survey should be carried out to record the condition of the walls, including the location and severity of efflorescence, exfoliation and mortar joint deterioration.

2. Laboratory analysis should be carried out on the brick. X-ray diffraction tests should be conducted to identify the specific salts present in the wall, and water absorption tests should be conducted to determine the porosity of the brick.
3. Laboratory testing should be carried out to determine the nature of the biological staining.

Drainage
The extent of the deterioration in the walls off of the terraces indicates that drainage of the terrace slabs may be the principal source of water into the wall. Measures should be taken to address this problem. (Refer to Terrace Paving Section)

Following further analysis of the deterioration process and mitigation of the moisture penetration problems the following work should be carried out on the terrace walls.

Cleaning
1. Efflorescence should be removed by brushing with a stiff natural fiber brush. This should be carried out as often as the efflorescence reoccurs.
2. General cleaning should be carried out with either a low-pressure water wash or a chemical restoration cleaner. The specific method should be developed based on the identification of salts in the laboratory analysis and tests conducted on site.

Repointing
1. All deteriorated or cracked mortar joints should be repointed using mortar which matches the color and texture of the existing mortar and should be tooled to match the existing joints.
2. Following stabilization of the terrace walls and repointing of all cracked and open mortar joints as part of the earthquake related repairs, the walls should be carefully monitored for future movement. Cracks which develop in the mortar joints should be repointed.

Brick Replacement
1. The individual exfoliated brick should be monitored closely to determine whether the condition of the exposed surface of the brick stabilizes as a result of reducing the amount of moisture the wall is exposed to.
2. If the brick surface continues to erode this presents a source of water penetration into the wall. The existing brick should be removed and replaced with a new brick which matches the original in size, color and texture, as well as general strength and porosity.

Correction of Past Repairs
Research should be carried out to document all repair work which has been carried out on the terrace walls as well as the nature of the problem that necessitated the repairs.
1. All mortar joints which have been improperly repointed should be removed and repointed with the new mortar which has been developed to match the existing, and tooled to match the original joints.
2. Areas of brick replacement or reconstruction which has been carried out on the terrace walls after 1975 should be removed. These areas should be rebuilt with brick that matches the original and mortar that matches the color, texture and tooling of the original joints. This work should be done according to the procedures developed for brick replacement and repointing in Earthquake Related Repairs.
TERRACE PAVING

DESCRIPTION OF ORIGINAL WORK

The terrace paving is constructed of two 3 1/2" layers of reinforced concrete, separated by a slip sheet of building paper. This forms a continuous flooring throughout the exterior terraces and the interior spaces with the hexagonal scored units, measuring 2'-2" on each side, establishing the basis for which the interior and exterior building walls were constructed.

The original specifications called for the concrete to have an integral colored finish of iron oxide and lamp black. Although this was not carried out, notes which appear on early photographs in the Hanna archives indicate that the color of the terraces matched the color of the brick. This suggests that a painted or stained finish that was originally applied to the concrete surface has subsequently worn off.

EXISTING CONDITION

General

Where the concrete paving has been constructed over fill, such as at the living room and dining room terraces, the floor exhibits differential settlement and cracking in the slab and the concrete steps. This condition is most severe at the living room terrace. In the areas where the concrete paving was constructed over natural or cut grade, such as at the east terraces, the settlement and cracking is less severe.

The living room and dining room terraces both show evidence of past repair work to the slabs and modifications to improve their drainage. The north western area of the living room terrace and steps has been replaced and an opening has been made in the brick terrace wall for drainage of water. The dining room terrace has been modified for installation of floor drains which carry water out through pipes in the brick wall. Individual hexagonal units have been replaced with new concrete. This new concrete does not match the color and texture of the original, and saw cuts made during removal of the original concrete extend into the adjacent original units.

Deterioration in the materials at the base of the building and at the terrace walls indicates that there continues to be drainage problems in the terrace slabs in spite of modifications made to improve the situation.

The existing color of the concrete terraces is a natural grey cement. It appears that the original painted or stained finish was not maintained, and notes which appear on photographs in the Hanna archives indicate that the finish had faded over the years. The finish was completely worn off by 1975.

Earthquake Damage

The earthquake caused soil settlement at the living room terrace area. This ground movement resulted in severe settlement and cracking in the concrete slab and steps.
View of living room terrace

View of dining room terrace
EARTHQUAKE RELATED REPAIRS

New Structural Work

The concrete paving at the dining room terrace will be removed for installation of the concrete pilasters and grade beam for the soil anchor system.

The terrace paving should be rebuilt to match the color, texture and scored hexagonal pattern of the original. The original concrete slab will be analyzed to determine the composition of the mix. A new mix will be developed based on the results of this analysis for use in the rebuilding of the terrace paving in order to match the color and texture of the original paving.

The new terrace should be constructed with positive slope to provide adequate drainage, floor drains to carry water away from the terrace and beyond the terrace wall and expansion joints to allow for future movement of the slab.

Repair of Earthquake Damage

1. Living Room Terrace

The earthquake damaged living room terrace and steps should be removed and rebuilt to match the existing according to the procedures described above.

CONSERVATION RECOMMENDATIONS

Concrete

Crack Repair

Cracks in the concrete have been caused by earthquake movement, soil settlement and the absence of expansion joints in the original 1937 construction of the house. In addition, cracks have developed in the score lines of the concrete paving which appear to have become natural control joints.

Prior to development of a crack repair program, a detailed survey should be conducted to record the existing cracks. Consideration should then be given to determine if the crack will be left as a natural control joint, repaired as a rigid joint or repaired to allow continuing movement of the building.

1. No additional work will be performed on cracks that will be left to act as natural control joints.
2. All rigid joints will be repaired with a cementitious patching compound utilizing traditional methods and materials in order to match the color, texture and ability to age of the adjacent concrete.
3. Crack repairs to allow for continuing movement of the building should include an elastomeric joint in conjunction with the cementitious repair to allow for both future movement and visual integrity with the adjacent existing materials.

Drainage

Drainage of the exterior terraces is extremely important in terms of the conservation of the building materials at the base of the
building and at the terrace walls. The roof was designed and constructed to have no gutters or downspouts to carry water away from the building and roof runoff falls directly onto the terraces. These terraces, however, were designed and specified to be finished flat with no pitch. The wood doors, windows and walls were constructed directly on the terrace paving and steps. Since the terraces do not drain water away properly, the doors and windows exhibit significant weathering at the base. In addition, the brick terrace walls, where drainage of the terrace paving is directed, also exhibit deterioration.

1. An observation program during rainy weather should be initiated to determine the actual drainage behavior and patterns to guide decisions for future action on this issue.
2. Where terrace paving has to be rebuilt, the steps and terrace should be designed and built to provide a positive slope away from the house and provisions should be made to take this drainage through and away from the terrace walls.
3. Where the existing concrete paving is to be left in place, additional work will be required to maintain the finish on the base of the wood doors, windows and walls.

Correction of Previous Repairs
1. The concrete mix established through analysis of the original concrete should be utilized in the new repair.
2. Repairs to the terrace paving which do not match the original concrete should be replaced with new concrete to match the color, texture and scored hexagonal pattern of the existing.
3. Previously cracked concrete which has been repaired but which has failed again should be removed and replaced using the repair methods described in Concrete Crack Repair.

New Concrete Work
In order to reduce future cracking expansion joints should be installed in all new concrete work.

WALLS

DESCRIPTION OF ORIGINAL WORK

The 2 3/4" exterior walls are constructed of 7/8" x 11" redwood boards with 1/2" x 2" recessed battens. The boards and battens are joined together by a tongue and groove connection and are attached to the 1 x 8 framing with exposed brass screws through the recessed battens only. The slotted screws are installed with the slots in a horizontal position. At the 120 degree and 60 degree corners of the walls the boards and battens are joined to vertical wood ties by a tongue and groove connection. The walls are attached to the concrete slab through a zinc strip embedded in the scored hexagonal units which fits into a slit at the bottom of the wall panel.

The original specifications called for no paint or stain of any kind to be applied to the exterior woodwork. Construction photographs show the application of a Rezite sealer to the wood prior to installation. No research has been carried out to document subsequent treatments that the Hannas carried out to maintain the wood. Mr. Erik Upmanis, who has been retained by the University to treat and maintain the exterior wood, reported that when he began work on the house in 1977 it was
Exterior walls under construction

View of wood board and batten siding

Earthquake damage at exterior storage closet
evident that the wood had been maintained with natural oils and had never been stained.

EXISTING CONDITIONS

General

The exterior redwood walls show evidence of weathering, which includes raised grain, warping, and split and cracked wood. In addition, the wood is darkened in some locations. These conditions vary in severity according to orientation and location on the building and subsequent exposure to water and sun. Weathered wood occurs primarily at the base of the building throughout the house and garage directly above the concrete mat, brick planters and paving where the wood is exposed directly to water. Weathering due to sun exposure occurs where the wood is not protected from the sun by the deep roof overhangs or the oak trees. These conditions are most severe on the south and west walls of the building. Severely weathered wood also occurs at the base of the upper roof walls, where the wood is warped and split, and in some cases is working lose from its nailing. The wood walls at the garage which extend beyond the protection of the garage roof are severely weathered and many boards are lose and in some cases missing.

The original brass screws have been replaced with steel screws in some locations and this has caused dark stains on the recessed battens.

Black caulk has been applied to the wood at the base of the building in an apparent attempt to provide a weatherseal. The caulk that has been applied in large quantities is dried out and cracking. Caulk that has also been applied in conjunction with painted metal flashing at the base of the walls above the planters is also dried out.

The exterior wood currently is being treated with a clear water repellent wood preservative. The walls at the upper roof have a painted finish which was apparently applied to protect severely weathered wood.

Earthquake Damage

The earthquake caused the wood wall at the garage to buckle and it now has a bowed shape. Wood walls at the garage and forecourt storage closets and the north end of the living room were displaced and are now in a racked position.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the exterior wood walls includes the removal and rebuilding of the three chimneys, and the installation of shear walls, cantilevered columns and footings, and the roof diaphragm.

1. Chimneys
The exterior wood walls which tie into the three chimneys which are being removed and rebuilt should be carefully labeled, dismantled and stored for reassembly in their original location.
Prior to dismantling, the elements that make up each of the wall panels should be identified to ensure reassembly in their existing location. The walls should then be dismantled by removing the screws in the recessed battens. The wood should be carefully handled to ensure there is no damage to the tongue and groove connections between the boards and battens as well as the tongue and groove connections to the vertical ties. The wood and the screws should be stored according to conservation standards and procedures. The 1 x 8 framing members of the walls should be dismantled only where required to provide working space for the masons.

Following rebuilding of the chimneys, the walls should be reassembled with all elements in their original location. The wood should be inspected once it has been reassembled and refinished where necessary to match the condition of the wood prior to the work.

2. Shear Walls
Where shear walls are proposed the exterior boards and battens need to be dismantled for installation of the 1/2" plywood over the existing framing. In addition, the vertical ties at each end of the wall and therefore the flanking board and batten walls will also need to be dismantled. This dismantling should be carried out according to the procedures described for work at the chimneys.

The installation of the plywood shear wall will increase the thickness of the wall by 1/2". Due to this increased thickness the existing tongue and groove joinery of the board and battens will not be able to be reassembled into the existing corner vertical ties. New vertical ties will need to be milled in a new shape to accommodate the boards and battens joining at the face of the new wall. The new corner ties should be milled out of new redwood which matches the existing and should be finished to match the adjacent existing wood.

Following installation of the shear walls, the new vertical ties should be installed and the board and battens should be reassembled in their original locations. The wood should be inspected once it has been reassembled and refinished where necessary to match the condition of the wood prior to the work.

The walls have existing electrical wiring and outlets located in the walls. (Refer to the Electrical Section for recommendations for this work.)

3. Cantilevered Columns and New Footings
Cantilevered columns and footings are proposed for installation at the garage and forecourt storage closets. This will require dismantling all of the closet walls and framing to provide working access to excavate the footings and install the steel columns.

The wood boards and battens should be carefully dismantled, labeled and stored for reassembly in their original location according to the procedures described for work at the chimneys.

The storage closets have existing electrical wiring and fixtures located on the walls. Refer to the Electrical Section for recommendations for this work.
4. Roof Diaphragm
Installation of the new roof diaphragm will necessitate removal of the existing roofing and flashing at all roofs. The wood details at the base of the walls of the upper roof will need to be removed or dismantled. Where the wood at the base of the walls is severely weathered, warped, cracked and rotten, it should be replaced with new wood to match the existing. The new wood should be finished to match the existing finish on the adjacent wood. Where the wood is not severely deteriorated it should be labeled, dismantled and stored for reassembly according to the procedures described for work at the chimneys.

5. Garage Retaining Wall
The proposed retaining wall at the garage will require dismantling of the wood boards and battens which are attached to the existing concrete wall as well as the two upper windows.

The wood boards and battens should be carefully labeled, dismantled and stored for reassembly in their original location over the new concrete retaining wall according to the procedures described for work at the chimneys.

Construction of the proposed retaining wall and footing at the garage will also have an impact on the existing Monterey Cypress tree in the adjacent planter. (Refer to the Landscape Section for recommendations to protect the tree.)

Repair of Earthquake Damage

The earthquake damaged walls will be repaired through construction of the proposed structural work.

CONSERVATION RECOMMENDATIONS

Wood

The weathered condition of the wood throughout the building is primarily a result of the exposure of the wood to moisture and sunlight.
1. The increase in the moisture content in the wood causes swelling and shrinkage and this, in conjunction with temperature changes due to exposure to sun, causes cracks, checks and warping.
2. Raised grain is a result of differential swelling and shrinkage between the soft wood and the hard wood due to moisture. In addition, exposure of the wood to ultraviolet light causes a breakdown of the natural oils in the wood, and once the surface loses strength the softer wood is easily eroded.

The severity of the weathered wood throughout the building can be attributed to a number of characteristics of the original construction which affect the exposure of the wood to water and sunlight.
1. The exterior wood was specified to have no finish of any kind and the redwood, which is a softwood, when left unfinished is naturally susceptible to surface erosion.
2. The roofs were designed with no gutter or downspout system to carry roof runoff away from the building.
3. The wood walls, doors and windows were designed to sit directly on the concrete terraces and steps, where they are exposed to roof backsplash and the roof and site water runoff.
Deterioration of wood at base of wall above planter

Earthquake damage - bowed garage wall
Since it is recommended that the characteristics of the original design of the building are to be preserved, the exterior wood will continue to be subjected to extreme exposure to water and sunlight. Therefore, the wood must be maintained with a treatment which will increase its resistance to moisture and sunlight, while retaining its natural unfinished appearance. In addition, all measures which can be taken to reduce excess moisture should be carried out wherever possible.

Wood Treatment
The wood is currently being treated with a clear water repellent wood preservative which provides a protective coating while maintaining the natural redwood appearance. The preservative contains fungicide to prevent the growth of mildew, silicone to provide a water repellent to reduce the absorption of water, and a linseed oil which replenishes the woods natural oils to prevent drying out. A summary of this treatment program is included at the end of this section.

Drainage
(Refer to the Terrace Paving Section.)

Recommendations
Although the weathered wood walls have lost surface material, and in some cases are warped or stained, in general the wood appears to be quite sound, and no replacement is recommended. The condition and treatment of the wood should be carefully monitored through the following measures.

1. A survey should be carried out of the exterior walls to record the condition of each wood member. The severely weathered boards and trim should be carefully monitored. If it is determined that the deteriorated wood, such as the wood trim at the base of the walls, has become a weathersealant problem it should be replaced with new wood to match the original.

2. The annual maintenance program currently being carried out by Mr. Erik Upmanis should be increased to a semi-annual program. Inspections should be conducted in the spring and fall of each year. The spring inspection would provide the opportunity to evaluate how the wood has been affected by the winter rains and which areas require treatment for protection from the summer sun. The fall inspection would provide the opportunity to evaluate how the wood has been affected by the summer sun and which areas require treatment for the winter season.

3. Maintenance records should be established for the current treatment program. This should include the following information.
   - Photographic documentation should be compiled of the condition of the wood in 1977 prior to treatment.
   - Records should be established to document each of the specific preservatives which have been applied to the wood and an evaluation of their advantages and disadvantages.
   - The annual treatment should be recorded including the type of treatment and the location it is applied.

Screws
The steel screws should be removed and replaced with brass screws to match the original.

Caulking
The deteriorated caulking at the base of the building is visually obtrusive and should be removed. Inspections should be carried
out to determine the condition of the wood at the base where the caulking has been applied.
1. Where the wood is severely deteriorated and the cause of weathersealant problems it should be replaced.
2. Where the wood trim is not severely deteriorated the caulking should be removed and new repairs should be made with a less visually obtrusive weathersealant system.

Painted Wood
In order to make recommendations for the treatment of the painted wood at the upper roof walls, further research is required in order to determine when this paint was applied.
1. If the paint was applied prior to 1975 then the wood should remain painted. If this is the case, paint analysis should be carried out to determine the chronology of the paint colors.
2. The following procedure should be followed if the wood was not painted prior to 1975:
   - Determine if the finish on the wood can be restored and maintained in a manner that will protect the wood from additional deterioration.
   - Consider whether the appearance of the stripped wood with a new translucent coating will detract from the visual integrity of the exterior.

Current Wood Treatment
The wood is being treated with a clear water repellent wood preservative annually.
The condition of the wood in 1977, according to photographs taken by Mr. Upmanis prior to beginning any work, was extremely poor. The previous wood treatment had worn off, the surface was visibly dried out and there was evidence of extensive water staining.

The initial treatment Mr. Upmanis carried out involved removal of the dead wood surface with a natural fiber brush until sound wood was exposed. The entire exterior was then treated with a clear water repellent wood preservative. The wood which was painted at the time of this work, the upper roof walls and windows, was repainted. In addition, Mr. Upmanis also made recommendations for removal of sprinklers adjacent to the building which were watering the surface of the walls.

Subsequent to this initial treatment of the wood, Mr. Upmanis has been retained to maintain the wood on an annual basis. This involves a visual inspection of all the exterior wood and an evaluation of its condition. The current linseed oil based preservative treatment tends to yellow through exposure to ultraviolet light and forms a brittle surface. Where this appears on the wood surface, it is removed by brushing with a natural fiber brush and preservative is reapplied. The wood is also evaluated for its ability to repel water. Where water does not bead on the surface, preservative is reapplied. Typically, reapplication of preservative is required every year to the base of the walls, doors and windows, and fascia boards. Other areas, such as the eave soffits have not required retreatment since 1977.

The wood is responding well to the treatment of the wood preservative, and the deterioration process appears to have stabilized. According to Mr. Upmanis, there is no evidence of wood fibers when the surface of the wood is brushed prior to reapplication of the preservative each year.
Transom windows at upper lantern

Transom windows at upper lantern over entry

Fixed windows at dining room terrace

Living room terrace doors
WINDOWS AND DOORS

DESCRIPTION OF ORIGINAL WORK

The windows and doors throughout the house are constructed of redwood frames with plate glass window glazing.

The windows and doors which make up window walls are full wall height and their configuration corresponds to the shape of the hexagonal scored units in the concrete floor. The window sections are installed directly on the concrete slab or brick planter walls. They are attached to the concrete slab through a zinc strip embedded in the joint of the scored hexagonal unit. The doors are installed to appear identical to the windows. The bottom door rail rests directly above the concrete on a thin threshold.

The transom windows at the upper roof are fixed. The construction detailing is similar to the doors and windows with the exception of windows along the western wall above the kitchen which are constructed with wide vertical and horizontal muntins.

The casement windows are also constructed with similar detailing to the doors and windows.

Glazing

The plate glass window glazing was set into the wood door and window frames with wood trim. This glass was originally set in putty, which was then covered with the wood strips.

Hardware

The hardware was originally specified to be invisible type black iron made of black iron.

Wood Finish

The wood doors and windows were originally finished to match the wood walls with no paint or stain finish.

EXISTING CONDITION

General

Door and Window Frames

In general, the redwood window and door frames exhibit similar conditions of weathering as the wood walls. This includes raised grain, and split and cracked wood. The weathered wood is most severe at the base of the doors and windows directly above the concrete where the wood is exposed to water and on the south and west sides of the house and where the wood is not protected from the sun by the deep overhangs. The most severely weathered wood occurs at windows along the west wall of the living room, the dining room terrace doors and windows, and on the west and south wall of the master bedroom. Cracked and split wood also occurs in doors at hinge locations such as at the master bedroom doors. In some cases this wood has been face nailed, and caulking has been installed in vertical cracks.

Wood trim has come loose at the transom windows at the upper roof and in some cases is missing.
Glazing and Sealant
The glazing is in intact throughout the building. Black sealant has been applied to all door and window glazing in an attempt to weatherseal the joints where the wood members have shrunk. Although the sealant appears to be in good condition, it is visually obtrusive. The sealant extends beyond the edge of the wood frame at all sides and corners, and the black color is not compatible with the natural finish of the wood.

Hardware
Aside from the entry doors, all doors are operable from the interior only. The doors are operated primarily by bronze lever activated vertical rods which extend into the sill and head of the door frame. A bronze knob and face plate and closure is mounted on the exterior of the entry doors. On the interior face the panic hardware is surface mounted. All of the bronze hardware throughout the house is worn.

The existing door and casement window hinges are painted metal. The painted surface is deteriorated.

The original size and placement of the hardware for the living room terrace doors appears not to have been sufficient to support the weight of the doors. The weight of the doors has caused deformation of the wood frames. Wheels were added to the bottom of the doors to facilitate opening and closing them. These wheels appear in a 1962 photograph. Weatherstripping has been added to the base and head of the doors to seal the openings caused by the deformation and racking.

Wood Finish
The doors and windows throughout the building have been treated with a clear water repellent wood preservative. The transom window frames and trim at the upper roof as well as the living room windows along the west wall have a painted finish.

Aluminum Storefront Window
A black aluminum framed tinted glass wall has been installed on the exterior of the living room windows along the west wall. The base is anchored into the terrace wall and the head is attached to the eave soffit. This was installed to provide shade for these windows. No research has been carried out to determine when the aluminum storefront was installed.

Earthquake Damage
Where the earthquake caused displacement of the concrete slab the doors and windows are out of alignment.

The roof framing above the 28 foot wide opening over the dining room terrace doors and windows has deflected and prevents the doors from opening and closing properly.

Settlement of the concrete floor at the living room terrace doors and windows has caused them to be severely out of alignment. There are large openings at the base and head of the doors and windows.
EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the doors and windows includes the removal and rebuilding of the three chimneys, and the installation of the shear walls and the roof diaphragm.

1. Chimneys
The windows which tie into the three chimneys which are being removed and rebuilt will need to be carefully labeled, dismantled and stored for reassembly in their original location.

The interior and exterior wood trim should be dismantled by carefully loosening the nailed connections without causing damage to the wood. The windows should be carefully dismantled and protected to ensure that there is no breakage of glass during dismantling, transportation or storage.

Following rebuilding of the chimneys, the windows and trim should be reassembled in their original location. The wood trim should be reattached with non-corrosive nails through the original nail holes. The wood should be inspected and refinished or painted where necessary to match the condition of the wood prior to the work.

2. Shear Wall
The casement window in the west wall of the living room where the new shear wall is proposed will need to be carefully labeled, dismantled and stored for reassembly in its original location.

The installation of the plywood over the existing framing will increase the thickness of this wall by 1/2". Due to this increased thickness, the existing frame will not be able to be reassembled in the new wall. A new redwood frame will need to be made to match the profile and detailing of the existing frame to fit the width of the new wall.

The existing casement window should be reinstalled in the new wood frame. The existing wood trim and window should be refinished and the new wood frame finished to match.

3. Roof Diaphragm
The installation of the proposed roof diaphragm will necessitate removal of the existing roofing and flashing. In order to remove the existing flashing, the wood trim below the fixed transom windows at the upper roof will need to be labeled, dismantled and stored for reassembly in their original location. This work should be carried out according to the procedures described above for wood trim.

Repair of Earthquake Damage

The doors which are out of alignment should be restored to operation without extensive removal of existing material or repositioning of existing hardware.

The deflected flitch plate over the dining room terrace doors and windows should be repaired. The frames, doors and windows

This work should be carried out according to the procedures described above.
Painted deteriorated wood at upper lantern window

Caulk repair of wood and glazing at dining room terrace windows

Detached wood trim at upper lantern windows
may have to be modified as a result of realigning the structural members.

The earthquake damaged concrete floor below the living room terrace doors and windows will be retained in its present position. These doors will not be modified in order to compensate for the uneven surface of the floor due to the extent of original construction that would be required to be removed. It is recommended that the doors and windows not be reconditioned to make them operable since this would require removal of extensive amounts of original material and repositioning of original hardware. It is recommended that the doors be fixed in place. Concealed weatherstripping should be installed at the base and head of the doors and windows to provide a weathertight installation.

CONSERVATION RECOMMENDATIONS

Wood
The cause of the weathered surface of the wood doors and windows and the recommendation for conservation has been discussed in the Exterior Wall Section.

Glazing and Sealants
The existing window sealant is visually obtrusive and should be removed. The existing water infiltration problem will then need to be addressed.

In order to provide proper weathersealing where the wood trim has shrunk it will be necessary to either replace wood members, or utilize an alternative sealant application which does not unduly compromise the appearance of the windows.

Horizontal muntins and trim which are severely deteriorated should be removed and replaced with new members that match the original profile. They should be properly installed to provide a complete weatherseal. Where replacement of wood muntins and trim is not recommended, new weathersealant using a backer rod to compensate for the wood shrinkage should be installed. The sealant should match the color of the adjacent wood. The new installation should not significantly alter the appearance of the original doors and windows.

Hardware
The deteriorated hardware should be removed and refinished. The interior bronze hardware should be polished and finished to match the original finish. Paint analysis should be carried out to determine the color of the original hinges and the painted metal door and window hinges repainted. The removal of the hinges should be carried out with great care in order not to damage the weathered wood door stiles during dismantling or reinstallation.

Wood Trim
Where door and window trim has become detached it should be reattached with non corrosive nails. Where door and window trim is missing it should be replaced with new trim to match the wood and profile of the original, but which is finished to match the adjacent wood finish.
Painted Wood
In order to make recommendations for the treatment of the painted wood window frames, further research is required in order to determine when this paint was first applied. (Refer to Exterior Wall Section.)

Aluminum Storefront Window
The aluminum storefront window should be removed. A new shading device should be installed on the exterior of the building to provide protection for the wood.
EAVE/FASCIA

DESCRIPTION OF ORIGINAL WORK

The eave, which includes an inner fascia board, soffit and outer fascia board, is constructed of redwood. Trellises within the flat roof are also constructed with redwood fascias to match the eaves. There is no gutter and downspout system at the eaves.

EXISTING CONDITION

General

The wood at the inner fascia board and eave soffit is well protected by the deep overhangs and is in excellent condition. The outer fascia boards and the trellises exhibit weathering which includes split and cracked wood and raised grain. Weathered wood is most severe on the south and west sides of the building where the wood is not protected from the sun by the oak trees. The joints at the corner of the eaves and between soffit boards are open in some locations. The surface of the outer fascia boards and trellises is stained black by nails at some locations.

The trellis openings above the entry and east and west terraces have been filled in with wire glass in an attempt to keep water from draining off the roof at these locations. The glass in the east terrace trellis was installed by the Hannas and appears in a photograph taken in 1962. No research has been carried out to determine when the glazing in the other locations was installed.

Earthquake Damage

The deflected flitchplate over the dining room terrace doors and windows has caused deflection in the eave.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the eaves and fascias includes removal and rebuilding of the three chimneys and installation of the 1/2" plywood shear walls.

1. Chimneys

The inner fascia boards, eave soffits and outer fascia boards that tie into the three chimneys should be carefully labeled, dismantled and stored for reassembly in their original location after the chimneys are rebuilt.

Prior to dismantling, the inner fascia boards, eave soffits and outer fascia boards need to be identified to ensure reassembly in their existing location. The wood should then be dismantled by carefully loosening the nailed connections without causing damage to the wood.

Following rebuilding of the chimneys, the fascias and eave soffits should be reassembled in their original location. All of the wood members should be reassembled with non corrosive nails through the original nail holes. If nail holes need to be filled, they should be filled with a wood putty and stained to match the finish of the adjacent wood. The wood should then be inspected
and refinished where necessary to match the condition of the wood prior to the work.

2. Shear Walls
It will be necessary to dismantle the inner fascia board and trellis fascia boards at each roof framing member along the length of the shear wall. At the north wall of the living room the inner fascia board of the sloped roof will also be dismantled. (See procedures described for work at the chimneys.)

The installation of the plywood shear wall will increase the thickness of the wall by 1/2". Due to this increased thickness, the existing fascia boards will not fit in their original locations. The trellis fascia boards will need to be cut back 1/2". The fascia boards at the walls on either side of the new shear wall will have to be dismantled and lengthened or shortened as necessary to provide a tight joint with the fascia boards on the shear wall.

Following installation of the shear wall and modification of the existing fascia boards, the wood fascia units should be reassembled in their original locations using the procedures described above.

Repair of Earthquake Damage

Repair of the deflected flitch plate above the dining room terrace windows may necessitate dismantling the eave soffit and fascia. This work should be done according to the procedures described above.

CONSERVATION RECOMMENDATIONS

Wood
The wood at the eaves and fascia are currently being treated with a clear water repellent wood preservative. (Refer to Exterior Walls, Conservation Recommendations for a summary of this treatment program.)

Open Joints
The open joints in the corners of the eaves and between boards should be repaired by installing a piece of neoprene in the joint so that it is recessed behind the face of the boards. The neoprene should be colored to match the adjacent wood.

Trellis Glazing
Further research should be carried out to determine when the entry and west trellises were enclosed with wire glass. If they were installed prior to 1975 they should remain. If they were installed after 1975 a determination will need to be made whether it should be retained due to their ability to keep water away from the affected areas.
REPAIR AND CONSERVATION OF HISTORIC FEATURES

ROOF

DESCRIPTION OF ORIGINAL WORK

A copper foil roof was originally installed on the house. The continuous narrow lengths of copper foil were lapped like shingles over wood strips which followed the line of the rafters. This roof was not built according to Frank Lloyd Wright's design which called for horizontal ridges in the copper running parallel with the line of the eave. Photographs indicate that the roof failed by 1942 and was replaced soon after with built-up roofing.

The existing built-up red gravel roof was installed in 1977 over the main gable roof, the upper gable roof, the flat roof and trellis framing. Painted metal flashing occurs at the roof edge, chimneys and walls of the upper roof.

EXISTING CONDITIONS

General

The roof appears to be in fair condition. There is evidence of past repairs and intermittent water stains on the interior ceilings adjacent to the chimneys. Exposed electrical wiring has been draped on top of the roof.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the existing roofing and flashing includes the installation of a new roof diaphragm and blocking, shear walls, cantilevered columns and rebuilding the three chimneys.

1. Roof Diaphragm and Blocking

The new roof diaphragm, blocking and ties will require removal of the existing roofing and metal flashing. It will also require removal of limited areas of existing roof planking for installation of the new blocking and ties from above.

The installation of the new blocking and ties will need to be done very carefully in order not to damage the ceiling fiberboard attached directly to the underside of the roof framing.

Following completion of the proposed structural system installation, a new built-up roof and new painted metal flashing should be installed to match the built-up roof which was on the house in 1975. Further research is required to determine the specific nature of that roof.

The removal of the existing roofing for installation of the proposed structural work will impact the exposed electrical wires which are draped across the roof. (Refer to the Electrical Section for recommendations for this work.)

Blocking and ties will be installed at the edges of the roof opening where the Monterey Cypress tree extends through the roof. This opening is currently too small for the size of the tree, and should be enlarged. (Refer to the Landscape Section for requirements for protection of the trees during the work.)
Original copper foil roof

Existing built-up roof and trellis glazing
2. Shear Walls
New blocking will be installed in the roof framing to tie the new shear walls into the new roof diaphragm. Access for this work will be provided through removal of the fascia boards. The method of attachment between the shear wall and the blocking is critical and should be developed to minimize the impact on the adjacent trellis framing.

3. Cantilevered Columns
The installation of the cantilevered columns and footings will require removal of the existing wood plank sheathing to install the columns from above. Blocking and ties will be installed which will anchor the new roof diaphragm to the new columns.

4. Chimneys
The removal and rebuilding of the three chimneys will necessitate removal of roof framing which ties into the existing masonry. This removal is necessary to provide working space for the masons. The removal of the roof framing should be kept to a minimum.

PLANTERS CONTIGUOUS TO THE BUILDING

DESCRIPTION OF ORIGINAL WORK

The brick planters are constructed of concrete walls with a brick veneer in a similar manner to the terrace walls. The brick courses are laid in a running bond with a header course forming the cap. Where the concrete planter walls form the base for the wood building walls the brick cap continues along the length of the wall below the wood.

EXISTING CONDITION

General

The conditions which occur in all of the brick planters is similar to those observed in the terrace walls. There is extensive efflorescence staining on the brick and mortar joints. The cement mortar is cracked and missing in some locations. There is surface erosion of the mortar at the base of the walls and staining due to biological growth. There is also evidence of previous repairs. This includes repointing that does not match the original color, texture or tooling. Notes on drawings from the remodelling work carried out in 1957 call for rebuilding the broken planter at the south end of the dining room terrace.

Earthquake Damage

The earthquake caused extensive cracking in the brick planters throughout the site. These cracks occur in the mortar joints and in some cases through the brick units. It also caused severe displacement in the planters at the entry and living room terrace.
Construction of Cypress tree planter

Efflorescence and cracked mortar joints at entry planter
INTERIOR BUILDING ELEMENTS

FLOORS

DESCRIPTION OF ORIGINAL WORK

Concrete
The interior concrete slab, constructed in a similar manner as the exterior slab, forms a continuous flooring throughout the interior spaces of the house. The hexagonal scored units, measuring 2'-2" on each side, form the basis for which the interior walls and features are constructed.

The original finish on the concrete was a painted or stained coating which was colored to match the brick. This finish was applied instead of the integral colored concrete finish which was originally specified.

Carpet
The original floor covering in the entry, living, dining and playroom was a goldenrod and blue linen Klearflax carpet laid so that the scored concrete flooring was exposed at the edges of these rooms. This was replaced in 1953 with a off-white and beige Woolturf carpeting which was laid in the same manner.

The Woolturf carpet was also installed in the library, guest bedroom and master bedroom and bathroom where it was laid over the entire floor.

Resilient Tile
The original specifications called for a resilient tile named Linotile for the kitchen floor. The color of the Linotile was to match the golden color of the carpet. A 1962 photograph from the Hanna archives shows a linoleum tile floor in the kitchen with notes saying the flooring had subsequently been removed and the concrete floor exposed.

Tile
It is believed that the tile flooring in the powder room and utility bathroom was installed over the concrete when these spaces were remodelled in 1957. The tile is a 10" hexagonal quarry tile with a mat glaze to match the color of the painted concrete.

EXISTING CONDITIONS

General
Concrete
Where the concrete floor has been constructed over fill the floor and steps exhibit differential settlement and cracking. This condition is most severe in the living room. Where the concrete flooring was constructed over natural or cut grade the cracking and settlement is less severe.

The existing paint finish on the concrete floor is worn and flaking in traffic areas.

Carpet
An off white looped carpeting has replaced the wall to wall Woolturf carpet in the guest bedroom, master bedroom and
Installation of metal bars in scored concrete slab

Settlement of concrete floor in living room
EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the brick planter walls includes the installation of the shear walls, cantilevered columns and footings at the exterior storage closets and the new garage retaining wall.

1. Shear Walls

The proposed shear walls will anchor into the back wall of the brick planters at the north and west living room walls. The detail of this connection has not yet been developed, but it appears that the brick cap will need to be dismantled to provide anchorage of the new shear wall to the existing concrete retaining wall. If this is required, the dismantling and reassembly of the existing brick should be carried out according to the procedure outlined for dismantling and reassembling bricks for the soil anchor installation in the Terrace Wall Section.

2. Cantilevered Columns and New Footings

Cantilevered columns and new footings are proposed for the exterior storage closets at the garage and forecourt. The existing storage closet at the garage ties into the adjacent brick planter, and dismantling of the closet and excavation for the footing should be carried out very carefully in order not to damage the brick planter.

The existing storage closet at the forecourt is constructed with a brick base. This brick should be removed for installation of the new footing. (Refer to the Terrace Wall section for the recommended procedures for this work.)

3. Garage Retaining Wall

Rebuilding the damaged retaining wall at the garage will impact the adjacent brick planter. The brick cap at the top of the existing concrete wall need to be dismantled and reassembled. Where the brick planter walls tie into the garage wall which is to be removed and rebuilt, this work will need to be carefully executed in order not to damage the brick wall which is to remain.

Repair of Earthquake Damage

The earthquake cracks which occur in the mortar joints in the brick planter walls should be repointed with new mortar to match the existing joints. (Refer to Terrace Wall Section.)

The brick planters which have suffered severe displacement at the entry and living room terrace should be rebuilt to match the original. The original brick should be reused if possible. If that is not possible, new brick should be used which match the original in size, color and texture as well as general strength and porosity. (Refer to the Chimney section for the recommended procedure for finding replacement bricks.) The mortar to be used in rebuilding the wall is to match the existing, and should be pointed to match the existing joints.

CONSERVATION RECOMMENDATIONS

Masonry

The efflorescence and mortar joint deterioration and staining is a result of moisture penetration in the brick walls of the planters. As was recommended for the terrace walls, further research
should be carried out on the brick planter walls to determine the specific nature of the deterioration.

Measures should be taken to reduce the amount of moisture to which the planter walls are subjected. Plants should be limited to those that do not require large amounts of water. An evaluation should be made of the maintenance of the current plants to determine if the fertilizers being used are contributing to the efflorescence staining.

Following further analysis of the deterioration process and mitigation of the moisture penetration problems the planter walls should be cleaned and repointed. (Refer to the Terrace Walls, Long Term Recommendations for specific recommendations on this work.)

Correction of Past Repairs
Research should be carried out to document all repair work which has been carried out on the planter walls as well as the nature of the problem that necessitated the repairs. These previous repairs which have been improperly carried out or which were installed after 1975 should be removed and replaced. (Refer to Terrace Walls, Conservation Recommendations for specific recommendations for this work.)

Monterey Cypress Tree Planter
According to the Landscape Architect, the size of the existing planter at the Monterey Cypress tree restricts the root system and thus presents a danger to the long term health of the tree. The recommendation is that the east planter wall be moved to provide for additional root space. Although this represents an alteration of the original brick planter wall, the Cypress tree was a significant feature in the original siting and design of the house. The modification is necessary to provide for the growth of the tree. The planter wall could be moved to the east approximately 22 1/2", one half of the hexagonal unit and would then line up with the north portion of the wall. (Refer to the Landscape Section for additional recommendations on this issue.)
bathroom. This carpeting appears to have been recently installed and is in good condition.

Tile
The tile flooring in the powder room and utility bathroom is in good condition. The mat glaze finish is intact and the grout joints are sound.

Earthquake Damage
The earthquake caused soil settlement at the living room area. This ground movement resulted in severe settlement and cracking in the concrete slab and cracks in the steps leading to the dining room.

EARTHQUAKE RELATED REPAIRS

New Structural Work
The proposed structural work which will impact the concrete floor includes the removal and rebuilding of the three chimneys and the new footings for the cantilevered steel columns.

1. Chimneys
The concrete floor adjacent to the three fireplaces will be removed for the removal of the existing footings and the excavation of new foundations.
In order to keep the loss of the original floor to a minimum, only the hexagonal units above the new foundation will be removed.

No floor will be removed to provide additional work area since hand excavations can be carried out within the footing area. The concrete should be cut along the existing score lines of the hexagonal units and removed. Care must be taken during this operation in order not to overcut into the existing flooring that is to remain.

Following completion of the rebuilt chimneys new concrete flooring will be installed to match the color, texture and configuration of the adjacent original floor. The mix for the new concrete will be developed based on laboratory analysis of the existing concrete. The new concrete should be finished to match the finish which was on the floor in 1975. If possible, this work should be done in conjunction with refinishing of the floors in the entire room.

2. Cantilevered Columns and New Footings
The concrete flooring and carpeting will need to be removed in the guest bedroom and master bathroom closets for excavation of the footings for the proposed cantilevered columns.

The removal of this flooring will be restricted to the inside face of the interior closet walls which are to remain. The footing excavations will be dug out by hand.

Following installation of the footing and column, new concrete will be installed to match the color, texture and configuration of the original floor. The carpeting should be reinstalled over the new concrete.
**Repair of Earthquake Damage**

Measures will be taken to repair the cracks in the living room floor. The uneven surfaces will be left in place.

**CONSERVATION RECOMMENDATIONS**

The floor finishes throughout the house should be restored to the state they were in when the Hannas moved out of the house in 1975. Research should be carried out to document the history of finishes which have been installed on the floors throughout the house and to determine the nature of the finishes which existed in 1975.

**Concrete**

Paint analysis should be carried out on the existing concrete floor finish in order to determine the material, color and method of application of the finish which existed in 1975. Based on the results of this analysis the existing floors throughout the house should then be refinished.

**Carpet**

The existing carpet in the guest bedroom and master bedroom and bathroom should remain since it is in good condition and it follows the installation method of the carpet which existed when the Hannas lived in the house.

A new carpet should be installed in the entry, library, living room and dining room. The type of carpet could be one that meets the needs of the current occupants, but it should be laid in the manner the carpet was originally installed. This includes keeping the concrete floor at the edges of the room exposed in the entry, living room and dining room, where the relationship between the hexagonal floor pattern and the walls and windows was intended to be clearly visible. The carpet should be laid wall to wall in the library.

**Tile**

Further research should be carried out to determine when the existing tile flooring in the powder room and utility bathroom was installed. If it was installed prior to 1975 it should be retained. If it was installed after 1975, it should be removed and replaced with flooring to match the floor the Hannas installed.

**WALLS**

**DESCRIPTION OF ORIGINAL WORK**

The interior walls are constructed in the same manner and of the same material as the exterior walls and consist of exposed redwood boards with recessed battens.

The original interior wood finish, according to documents in the Hanna archives was a wax based finish. Correspondence between the Hannas and Frank Lloyd Wright documents that the interior wood walls were refinished with a wax base varnish in 1956. In 1981, according to a conversation with Mr. Erik Upmanis, it appears that a polyurethane varnish was applied to the interior wood throughout the house.
During major remodelling by the Hannas in 1957, alterations were carried out to the interior walls in the library, bedrooms and bathrooms.

EXISTING CONDITIONS

General

The interior walls are generally in good condition, however, mechanical damage was observed at the base of the walls in traffic areas. This damage includes scratched and gouged wood. Some of these marks appear to be old and have been refinished others appear to be fresh. There is overstaining of the floor finish at the base of the walls in some locations. There are large dark stains at the base of the kitchen fin wall facing the living room.

Earthquake Damage

The earthquake caused movement in the walls throughout the interior exposing unvarnished edges and causing closet doors not to open and close properly.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the interior walls includes the removal and rebuilding of the three chimneys and the installation of the cantilevered columns and footings in the closets.

1. Chimneys

The interior wood walls that tie into the three chimneys will need to be carefully labeled, dismantled and stored for reassembly in their original locations. (Refer to the Exterior Wall section for the recommended procedure for this work.)

2. Cantilevered Columns and New Footings

The installation of the cantilevered columns and excavation for the new footings in the interior closets will be carried out with the closet walls in place.

The walls should be protected from abrasion and soiling during excavation and installation of the structural work. The existing shelves and the closet doors should be dismantled and stored for reinstallation.

Following completion of the cantilevered columns and footing installation, the interior of these closets should be repainted to match the existing and the shelves and closet doors should be reinstalled.

There is existing electrical wiring and outlets located in the closet walls. (Refer to the Electrical Section for recommendations for their protection.)

Repair of Earthquake Damage

The walls which have been displaced by the earthquake where unvarnished edges have been exposed should be refinished. The refinishishing of this wood should be carried out in a similar manner as for the wood walls impacted by the chimneys.
The doors which are out of alignment and which do not open and close properly should be readjusted. This repair should be carried out without extensive removal of existing material or repositioning of existing hardware.

CONSERVATION RECOMMENDATIONS

The wood finishes throughout the house should be restored to the state they were in when the Hannas moved out of the house in 1975. Research should be carried out to document the history of finishes which have been installed on the walls throughout the house and to determine the nature of the finishes which existed in 1975. In addition, research should be carried out to document the physical alterations to the interior walls.

If research confirms that the existing finish is a polyurethane varnish it should be removed. This would require stripping the wood with a chemical stripper in order not to damage the soft wood through mechanical stripping, and tests should be carried out to develop a successful stripping method. A new wax based finish should be applied to the wood which matches the finish which existed in 1975.

CHIMNEYS

DESCRIPTION OF ORIGINAL WORK

Main Chimney

The massive irregular shaped main fireplace and chimney in the living room is constructed of brick which is detailed in a manner similar to the masonry construction on the exterior of the house. The fireplace is approximately twenty four feet long and forms the east wall of the living room and the west wall of the kitchen. The brick hearth at the center of the wall steps down from the level of the floor. A vertical iron fireplace fixture stands in the hearth, and above the hearth is a cantilevered brick hood. The chimney has been constructed around internal vents as well as supply and return air ducts for the heating system located in the basement. Openings in the brick chimney walls serve as the supply and return registers for the living room, kitchen and entry.

A coating appears to have been applied to the masonry, and a sheet metal spark arrester has recently been installed.

Library Chimney

The library fireplace and chimney was constructed in 1957 when the library was remodelled. The fireplace carries through the detailing of the original brick construction, and also contains internal heating ducts and openings in the brick for air supply and return. The hearth is raised with a small cantilevered brick hood and recessed fire screen. In the concrete floor below the existing raised hearth is the brick outline of the hearth constructed in
Main fireplace and chimney under construction

View of main fireplace and chimney from living room

Iron fireplace fixture
View of main chimney from entry

View of main chimney from kitchen
1937. The remainder of the fireplace was designed but was not built at that time due to budget constraints.

A coating appears to have been applied to the masonry, and a sheet metal spark arrester has recently been installed.

**Bedroom Chimney**

The Bedroom fireplace and chimney was also constructed in 1957 during remodelling of the bedrooms. While the design is different from the main fireplace it shares similar construction detailing.

A coating appears to have been applied to the masonry, and a sheet metal spark arrester has recently been installed.

**EXISTING CONDITION**

**General**

Prior to the earthquake the brick chimneys were in good condition. A coating which has been applied to the exterior face of the chimneys is currently flaking.

**Earthquake Damage**

Refer to the Structural Section for a description of earthquake damage.

**EARTHQUAKE RELATED REPAIRS**

**New Structural Work**

The new structural repair system proposes removing the three existing brick chimneys and rebuilding them using entirely new materials.

1. **Chimneys**

The three existing chimneys and footings will be removed and replaced with reinforced chimneys on new foundations built of reinforced concrete faced with a brick veneer that will match the detail and configuration of the existing chimneys. The new concrete core will be constructed around new mechanical vents and ducts to replace the existing.

In order to ensure that the chimneys will exactly match the appearance of the existing, prior to removal they will be recorded utilizing measured drawings and metric photographs that will show the details and location of elements, templates to provide the horizontal configuration at all levels and an engineered survey that documents all key horizontal points and vertical heights. Prior to removal of the chimneys, the iron fireplace fixture and associated connections in the main chimney and the fireplace screens in the library and Bedroom chimneys should be dismantled intact and stored for reinstallation in the rebuilt chimneys.

Ideally, the new chimneys would be rebuilt using the original bricks. Due to the hard Portland cement mortar used in the original construction, however, it does not appear to be feasible
View of library chimney from entry

View of library fireplace and chimney

View of bedroom fireplace
to remove the existing bricks without damaging them. Prior to making a final decision on this matter tests on the brick removal should be carried out. If it is not possible to rebuild the chimneys with the existing brick, new brick which matches the existing should be used. In order to find replacement bricks research should be carried out to locate the original supplier of both the 1937 and the 1957 bricks to determine if matching bricks are still available. If brick from the original suppliers is not available, and if no standard brick can be found to match, custom bricks should be made and used in the rebuilding.

The brick should be installed in new mortar that matches the existing which is tooled to match the original joints. In order to develop the new mortar mix, the original mortar used in the construction of the walls will be analyzed to determine the composition of the mix, and the size and type of sand and pigments used. The new mortar mix will be developed based on the results of this analysis for use in the rebuilding.

The rebuilt chimneys should include new flashing installed in the mortar joints to replace the flashing which is to be removed. Dampers and spark arresters which were not included in the original chimneys should be installed in the new chimneys.

Research should be carried out on the existing coatings on the interior and exterior of the masonry chimneys in order to determine the nature and the year of application of the finish. If the coatings were applied prior to 1975 they should be reapplied on the new masonry.

CEILINGS

DESCRIPTION OF ORIGINAL WORK

Originally, all of the ceilings in the house were covered with Nu­wood, a wood fiberboard material, which was attached directly to the underside of the roof framing. Narrow redwood trim marking strips were installed over the seams between the fiberboard panels which carried out the diagonal line of the hexagonal floor pattern on the ceiling.

In 1952 the Hannas installed fabric over the fiberboard ceiling panels in the living room and dining room. The fabric, which was pasted directly to the fiberboard, was a natural woven fabric from Manila called saguran. In 1957, during remodelling of the house, additional cloth was ordered and installed on the ceilings in the library, utility bathroom, guest room and master bedroom and bathroom.

According to discussions with Mr. Erik Upmanis, he repaired water damaged ceilings throughout the house in 1981. This involved removal of saguran cloth in the living room, dining room and library, and repair of the fiberboard ceiling in the water damaged areas. The ceiling repairs were carried out with drywall tape and patching compounds, and the panels were renailed to the roof framing. Asian grasscloth wall paper was installed in the areas where the original saguran fabric was removed.

The original finish on the redwood marking strips and ceiling soffit trim was a wax based finish to match the wood walls. It is believed that the wood trim at the ceiling soffits was refinished in

Asian grasscloth wall paper was installed in the areas where the original saguran fabric was removed.

 According to discussions with Mr. Erik Upmanis, he repaired water damaged ceilings throughout the house in 1981. This involved removal of saguran cloth in the living room, dining room and library, and repair of the fiberboard ceiling in the water damaged areas. The ceiling repairs were carried out with drywall tape and patching compounds, and the panels were renailed to the roof framing. Asian grasscloth wall paper was installed in the areas where the original saguran fabric was removed.

The original finish on the redwood marking strips and ceiling soffit trim was a wax based finish to match the wood walls. It is believed that the wood trim at the ceiling soffits was refinished in

1981 with a polyurethane varnish in conjunction with the refinishing of the wood throughout the house.

EXISTING CONDITIONS

General

The original fiberboard ceilings in the entry, kitchen and powder room are generally in good condition, however, there are water stains on the ceiling in the entry adjacent to the chimney.

The saguran fabric covered ceilings in the guest room, master bedroom and bathroom are in good condition. The fabric is well adhered to the fiberboard in most areas, however, there are locations where it is coming loose at seams and under marking strips. The fabric is also frayed at exposed seams and ceiling edges in some locations.

The grasscloth wallpaper covered ceiling, although in good condition, does not match the color or weave of the original saguran cloth.

Earthquake Damage

The movement of the chimneys, interior walls and casework caused by the earthquake impacted the ceilings. The roof framing and ceiling along the west wall of the main chimney appears to have settled.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work which will impact the ceilings includes removal and rebuilding of the three chimneys as well as the shoring required for this operation, and installation of the cantilevered columns and footings and blocking and ties in the roof framing.

1. Chimneys

The removal and rebuilding of the three chimneys, as well as installation of the roof shoring required for these operations, will require removal of the ceiling panels adjacent to the chimneys to provide work space for the masons.

The wood marking strips and ceiling trim in these areas adjacent to the chimneys will need to be labeled, carefully dismantled and stored for reassembly.

Ideally, the ceiling in the area adjacent to the chimneys should be dismantled in large panels with the cloth intact, labeled and stored for reassembly in their original location. This should be done by cutting the ceiling panel along the line of the nearest marking strip and loosening it from the roof framing. In order to study the feasibility of this procedure investigations will need to be made into the method of attachment between the ceiling panel and the roof framing.

If it is not possible to dismantle the ceiling panels with the fabric intact, they should be removed and replaced with new fiberboard
panels to match the existing. In those areas where the original saguran fabric covering is intact the fabric should be taken off the fiberboard prior to removal of the panels and reinstalled on the new fiberboard panels. The fabric should be removed by dissolving the paste through steaming or the use of a solvent. If it is not possible to remove the fabric from the ceiling panels without damage to the fabric, the new fiberboard panels should be covered with new cloth that matches the original saguran fabric.

In those areas where new grasscloth wallpaper exists it would be preferable to replace the wallpaper with cloth throughout the room in conjunction with this work.

2. Cantilevered Columns and New Footings
The ceiling in the guest bedroom and master bathroom closets should be removed for installation of the new steel columns. The ceilings in these closets are constructed of sheets of wood which are painted white. These panels should be dismantled and stored for reassembly in their original locations. They should be repainted following completion of the work.

Light fixtures are installed in the closet ceilings. (Refer to the Electrical Section for recommendations for this work.)

3. Blocking and Ties
The installation of the blocking and ties in the roof framing will be carried out from above and will not require removal of the ceiling. Great care will need to be taken during installation of this work to ensure no damage occurs to the fiberboard ceiling. In addition, when the roof has been removed for installation of the diaphragm and blocking, measures will need to be taken to protect the exposed ceiling from weather.

CONSERVATION RECOMMENDATIONS
The ceiling finishes should be restored to the state they were in when the Hannas moved out of the house in 1975. This would involve removing the grasscloth wallpaper which was installed in 1981 and replacing it with new saguran cloth.

According to conversations with Paul Hanna prior to his death, additional bolts of the saguran cloth had been ordered during the remodelling of the house in 1957 and had been kept in storage. These bolts have not been found, but further attempts should be made to locate them. If this extra cloth is not located, research should be carried out to find the original source for the cloth in order to determine whether matching cloth is still available. If the original source for the cloth is no longer available new cloth to match the original should be installed to replace the wallpaper.

CASEWORK
DESCRIPTION OF ORIGINAL WORK
The original casework installed in the house included built-in cabinets and shelves, closets and cupboards throughout the house, and built-in couches in the living room, library and playroom.
Built-in fireside couch in living room

Built-in fireside couch and shelves in library
The original casework is constructed of redwood that appears to have been finished with a wax based finish to match the wood walls. The cabinets, cupboards and closets are detailed with the doors and drawers that fit flush with the frames. The drawer and door pulls are narrow angled redwood strips and the doors are installed with piano hinges.

In 1957, during remodelling of the house, modifications were made to the original casework in the library and new casework was installed throughout the new guest room and master bedroom and bathroom. In general, these additions were detailed in a similar manner and constructed of the same materials as the original casework.

EXISTING CONDITIONS

General

The wood at the base of the built-in couches and the exposed edges and corners of counters and shelves is extremely nicked, scratched and gouged. The wood at the base of cabinets, closets and cupboards also shows sign of wear. The shelves in the library have been cut and the desks have been removed.

The casework was apparently refinished with a polyurethane varnish in conjunction with refinishing of all the interior wood in 1981. Brush strokes are evident in the finish and there is poor coverage at corners and edges.

Earthquake Damage

The earthquake caused movement in the casework causing the closet and cupboard doors and drawers not to open and close properly.

EARTHQUAKE RELATED REPAIRS

New Structural Work

The proposed structural work that will impact the casework includes the removal and rebuilding of the three chimneys.

1. Chimneys

The built-in fireside couch and shelves in the living room, the cabinets and pantry cupboard in the kitchen and the closet in the entry that ties into the main chimney, the built-in fireside couch and shelves in the library, and the wardrobe closet in the master bedroom which ties into the chimney should be dismantled intact and stored for reinstallation.

Prior to dismantling the individual pieces of casework, all movable interior shelves and rods should be labeled, dismantled and stored for reinstallation. In addition, the doors and drawers should be bound in their closed position so no movement or damage is caused to these elements during transport to and from storage.

The casework should be refinished to match the finish which was on the wood in 1975. If at all possible, this work should be done in conjunction with refinishing of the wood in the entire room.
Further research is required to confirm the nature and the year of application of the existing wood finish. Following completion of the new chimneys the casework pieces should be reinstalled in their original location.

Electrical wiring and outlets are located within the individual pieces of casework. (Refer to the Electrical Section for recommendations for this work.)

Repair of Earthquake Damage

The doors which are out of alignment should be restored without extensive removal of existing material or repositioning of existing hardware.

CONSERVATION RECOMMENDATIONS

The wood finishes throughout the house should be restored to the state they were in when the Hannas moved out of the house in 1975. Research should be carried out to document the history of finishes which have been applied to the casework throughout the house and to determine the nature of the finishes which existed in 1975. In addition, research should be carried out to document the history of casework installation and modification that the Hannas carried out throughout their tenure in the house.

FIXTURES & EQUIPMENT

DESCRIPTION OF ORIGINAL WORK

Light Fixtures
The original light fixtures consisted primarily of recessed fixtures in the ceiling soffits and concealed lamps installed on top of the ceiling decks. Task lighting was provided by wall, floor and table lamps. The recessed fixtures were detailed with a redwood trim with Czechoslovakian glass lens.

The original glass lens in the recessed ceiling fixtures have been replaced with prism plastic lenses in the library and master bedroom. New downlights have been installed in the living room ceiling soffit.

Kitchen Equipment
No research has been carried out on the original kitchen equipment. The existing kitchen equipment includes a Maytag four-burner stove and oven with a hood above which vents through the chimney and a Kitchen Aid under counter dishwasher. The installation date of this equipment has not been documented.

Plumbing Fixtures
The original plumbing fixtures were specified to be porcelain enameled iron. Construction photographs indicate that the original bathtubs in all bathrooms were sunken into the floor slab.
In 1957, during remodelling of the house, the bathrooms underwent alterations and a new master bathroom was installed. All of the existing bathroom fixtures and features appear to have been installed at that time.

**EXISTING CONDITION**

**General**

The existing light fixtures appear to be in good condition, and the kitchen and Plumbing fixtures appear to be in good working order.

**Earthquake Damage**

The earthquake caused no significant damage to the light fixtures, kitchen equipment or plumbing fixtures.

**EARTHQUAKE RELATED REPAIRS**

**New Structural Work**

The proposed removal and rebuilding of the three chimneys and the necessary removal of the ceiling panels adjacent to the masonry will impact the existing recessed light fixtures. The removal and rebuilding of the main chimney will impact the kitchen equipment adjacent to the main chimney.

**Chimney**

Ceiling panels will need to be dismantled to provide working space for construction of the new chimneys. The recessed light fixtures located in these panels, which includes the wood trim, glass lenses, recessed metal boxes and associated wiring should be labeled, dismantled and stored for reinstallation in their original locations. The glass lenses will need to be carefully protected during transport to ensure that no breakage occurs.

Following completion of the new chimneys and reassembly of the ceiling panels the light fixtures should be reassembled. Where the lenses have been replaced with plastic prism lenses, they should be replaced with new glass to match the original. Further research is required to determine the nature of the original glass. The wood trim should be inspected and refinished with a wax based finish.

The existing kitchen stove which is adjacent to the main chimney will need to be removed and stored for reinstallation. The hood which is attached to the masonry will also need to be removed and stored for reinstallation and reconnection to a new vent in the new chimney.

**CONSERVATION RECOMMENDATIONS**

Research should be carried out to document the physical alterations as well as the history of the fixtures and finishes in the kitchen and bathrooms.

The existing kitchen and bathroom fixtures, which appear to have been installed prior to 1975 should be retained until they no longer function in good working order. At that time, they should be replaced with a new fixture which is compatible with the house.
Permanent features and finishes in the kitchen and bathroom which were installed by the Hannas prior to moving out of the house in 1975 should be retained and properly maintained.

View of master bathroom
CONSERVATION COST ESTIMATE
The preliminary cost summary below includes those costs related to the long term conservation of the Hanna House. (Refer to the Appendix for the detailed cost estimate worksheet.)

**BREAKDOWN**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General requirements</td>
<td>$ 64,300</td>
</tr>
<tr>
<td>2. Testing and survey</td>
<td>57,500</td>
</tr>
<tr>
<td>3. Sitework</td>
<td>36,800</td>
</tr>
<tr>
<td>4. Concrete and masonry</td>
<td>78,200</td>
</tr>
<tr>
<td>5. Finish carpentry</td>
<td>56,300</td>
</tr>
<tr>
<td>6. Doors and windows</td>
<td>58,600</td>
</tr>
<tr>
<td>7. Finishes</td>
<td>37,900</td>
</tr>
<tr>
<td>8. Electrical</td>
<td>19,500</td>
</tr>
<tr>
<td>9. Fee</td>
<td>40,900</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 450,000</strong></td>
</tr>
</tbody>
</table>
COST ESTIMATE WORKSHEET
SECOND REVISION PRELIMINARY BUDGET ESTIMATE #1

DATE: February 8, 1991

PROJECT: 1900148

Hanna House
Stanford University

Attention: Jonathan Ryan

VIA FAX/MAIL

SCOPE OF WORK


PRELIMINARY BUDGET ESTIMATE
APPROXIMATELY: $1,794,000

ALTERNATE #1

Allowances for deferred maintenance and conservation of original materials (see attached breakdown).

APPROXIMATELY: $450,000

ESTIMATE INCLUDES:

1. General requirements, including supervision, clean up, layout of the work, protection of finishes, temporary job site office, tools and equipment, temporary telephone, and permit fees.

- continued -

ACCEPTED

PLANT CONSTRUCTION COMPANY
2. Photogrammetry of three chimneys, HABS photos and an engineered photographic survey.


4. Removal of existing systems to facilitate the installation of the new structural work, including:
   - ceiling panels
   - chimneys
   - roofing
   - miscellaneous trim
   - cabinets
   - walls
   - doors and windows

5. All above materials to be stored for reuse including brick from selected locations.

6. Structural demolition as necessary for new footings and retaining walls.

7. Shoring, including:
   - existing roof structure at three chimneys and dining room door header
   - earth at new footings (temporary) and retaining walls (permanent)

8. Site clearing as necessary to install soil anchors.

9. Concrete reinforcement of west retaining wall behind soil anchors.

10. Excavation and backfill.

11. Concrete patching of existing floors adjacent to the new work and repair of slab cracks.

- continued -
12. Concrete work, including:
   - formwork
   - reinforcing steel
   - finishing

13. Five new concrete piers, all 13 feet deep. We assume existing soil conditions are 1-2 feet of fill and 3-13 feet of clay or native soil.

14. Sixteen 8" x 20' DCP soil anchors. We include no provisions to penetrate existing foundation walls.

15. Asphalt patching at carport and terrace retaining wall.

16. Foundation drainage at new terrace retaining wall.

17. Landscaping allowance.


20. Rough carpentry, including blocking and backing for millwork.

21. Repair and replacement of ceilings, walls, cabinets, shelving, doors and trim at areas affected by the structural upgrade.

22. Rebuilding the main, library and bedroom fireplaces and chimneys. Fireplaces will consist of reinforced concrete faced with a brick veneer to match existing. We assume all bricks will be new and include no provisions to salvage or reuse existing bricks. All existing fireplace hardware will be reused.

23. Patching brick at soil anchors and planters and pointing cracked joints.

- continued -
24. Addition of 1/2" plywood sheathing to the existing roof diaphragm. We assume new plywood will be installed directly over existing 1" sheathing and will not require edge blocking. At locations to receive new straps and blocking, we include removal of existing 1" sheathing and patching with new plywood.

25. New built-up roofing and related galvanized sheetmetal flashings.

26. New wire glass and frames at trellises.

27. Allowances to strengthen the header above the dining room sliding doors.

28. New shearwalls at two locations.

29. An allowance for wood treatment and painting flashings.

30. Mechanical, plumbing and electrical modifications as required by the structural repair.

31. Contractor's fee, taxes and contingency.

**ESTIMATE EXCLUDES:**

1. Irrigation.

2. Paving for drainage of existing asphalt surfaces.

3. Architectural, engineering or other consultants' fees.

4. Relocation of any utilities either above or below grade.

5. Waterproofing of subsurface areas or dewatering.

6. Underpinning.

7. Termite or dry rot repair.

8. Any floor preparation or leveling.

9. Any work performed on an overtime and/or premium time basis.

10. Telephone, audio or computer equipment and wiring.

- continued -

ACCEPTED

By ___________________________  By ___________________________
11. Any work required as a result of existing historic tunnels under site.

This is a preliminary budget estimate made in advance of final plans, specifications, competitive subcontractor bids, or review by the various City agencies. It is based on present day costs and commencing the work at this time. It is intended for budgeting purposes only.

GAH:ks

cc: Naomi Miroglio
    Paul Rodler
    David G. Plant

ACCEPTED

By ____________________________

G. A. Heckscher
<table>
<thead>
<tr>
<th>GENERAL DESCRIPTION</th>
<th>LOC</th>
<th>ORDER QUANTITY</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT</th>
<th>COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 INCLUSION/EXCLUSIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXCLUSION</td>
<td>DE-WATERING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12001 GEN.REQUIREMENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESTIMATING</td>
<td>160.00 hr</td>
<td></td>
<td></td>
<td>42.55 hr</td>
<td></td>
<td>6,808</td>
</tr>
<tr>
<td>COORD. &amp; PLANNING</td>
<td>52.00 WK</td>
<td>3/HR/WK</td>
<td></td>
<td>200.10 WK</td>
<td>52.00 WK</td>
<td>6,405</td>
</tr>
<tr>
<td>PROJECT MANAGER</td>
<td>52.00 WK</td>
<td>2/HR/WK</td>
<td></td>
<td>1,508.80 WK</td>
<td>52.00 WK</td>
<td>76,458</td>
</tr>
<tr>
<td>PROJECT FOREMAN</td>
<td>52.00 WK</td>
<td>3/HR/ WK</td>
<td></td>
<td>1,924.54 WK</td>
<td>52.00 WK</td>
<td>100,076</td>
</tr>
<tr>
<td>SUBMITTALS</td>
<td></td>
<td></td>
<td></td>
<td>1,360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE SECURITY</td>
<td></td>
<td></td>
<td></td>
<td>5,175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIELD OFFICE</td>
<td></td>
<td></td>
<td></td>
<td>5,750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROJECT SIGNAGE</td>
<td></td>
<td></td>
<td></td>
<td>220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPORARY POWER</td>
<td></td>
<td></td>
<td></td>
<td>7,243</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPORARY WATER</td>
<td></td>
<td></td>
<td></td>
<td>3,910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPORARY TOILETS</td>
<td>52.00 WK</td>
<td></td>
<td></td>
<td>43.13 WK</td>
<td>52.00 WK</td>
<td>2,243</td>
</tr>
<tr>
<td>TEMPORARY TELEPHONE</td>
<td>52.00 WK</td>
<td></td>
<td></td>
<td>172.50 WK</td>
<td>52.00 WK</td>
<td>8,570</td>
</tr>
<tr>
<td>JOBSITE SAFETY</td>
<td></td>
<td></td>
<td></td>
<td>5,750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLEANUP PROGRESSIVE</td>
<td>52.00 WK</td>
<td>20/HR/ WK</td>
<td></td>
<td>750.49 WK</td>
<td>52.00 WK</td>
<td>39,025</td>
</tr>
<tr>
<td>FINAL CLEANUP</td>
<td></td>
<td></td>
<td></td>
<td>6,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEBRIS BOXES</td>
<td>52.00 WK</td>
<td></td>
<td></td>
<td>175.95 WK</td>
<td>52.00 WK</td>
<td>9,149</td>
</tr>
<tr>
<td>TOOL/EQUIPMENT RENTALS</td>
<td></td>
<td></td>
<td></td>
<td>29,900</td>
<td></td>
<td>322,064*</td>
</tr>
<tr>
<td>1130 FBI INVESTIGATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEC INVESTIGATIONS LABOR</td>
<td>160.00</td>
<td></td>
<td></td>
<td>45.99</td>
<td></td>
<td>7,358*</td>
</tr>
<tr>
<td>1140 SURVEYING</td>
<td></td>
<td></td>
<td></td>
<td>11,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURVEYING BUDGET</td>
<td></td>
<td></td>
<td></td>
<td>11,500*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1150 TESTING &amp; INSPECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TESTING &amp; INSPECTION BUDGET</td>
<td></td>
<td></td>
<td></td>
<td>17,250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200 PERMIT COSTS</td>
<td></td>
<td></td>
<td></td>
<td>17,250*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUILDING PERMIT</td>
<td></td>
<td></td>
<td></td>
<td>11,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1220 G.C. BONDING</td>
<td></td>
<td></td>
<td></td>
<td>11,500*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEN.CONTRACTOR BONDING</td>
<td></td>
<td></td>
<td></td>
<td>15,525</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1300 LAYOUT</td>
<td></td>
<td></td>
<td></td>
<td>11,037</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAYOUT LABOR</td>
<td>240.00</td>
<td></td>
<td></td>
<td>45.99</td>
<td></td>
<td>11,037*</td>
</tr>
<tr>
<td>1350 PHOTOSHOPGRAPHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHOTOSHOPGRAPHS BUDGET</td>
<td></td>
<td></td>
<td></td>
<td>34,655</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1550 FINISH PROTECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISH PROTECT MATERIALS</td>
<td>1244.00</td>
<td></td>
<td></td>
<td>37.52</td>
<td></td>
<td>9,200</td>
</tr>
<tr>
<td>FINISH PROTECTION LABOR</td>
<td></td>
<td></td>
<td></td>
<td>46,580</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1570 WEATHER PROTECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEATHER PROTECTION MATERIALS</td>
<td>306.00</td>
<td></td>
<td></td>
<td>37.52</td>
<td></td>
<td>2,300</td>
</tr>
<tr>
<td>WEATHER PROTECTION LABOR</td>
<td></td>
<td></td>
<td></td>
<td>11,483</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1650 SCAFFOLDING</td>
<td></td>
<td></td>
<td></td>
<td>13,783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAFFOLDING BUDGET</td>
<td>3.00 LOC &amp; FIREPLACES</td>
<td>1,300.00 LOC</td>
<td></td>
<td>4,140</td>
<td></td>
<td>4,140*</td>
</tr>
<tr>
<td>2010 HAZARDOUS MATERIALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAZARDOUS MATERIALS BUDGET</td>
<td></td>
<td></td>
<td></td>
<td>11,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Indicates item is part of a larger total.
<table>
<thead>
<tr>
<th>Description</th>
<th>Loc</th>
<th>Order</th>
<th>Specific Description</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ORDER SPECIFIC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UNIT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2050 SALVAGE</strong></td>
<td></td>
<td></td>
<td>ALLOW,RENT/HAND SALV/MAL</td>
<td>11,500</td>
<td>11,500</td>
</tr>
<tr>
<td><strong>BUDGET FOR SALVAGE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2110 EXTERIOR FINISH DEMO</strong></td>
<td></td>
<td>1168.0</td>
<td>SHEATHING &amp; ROOF JOISTS</td>
<td>2.25</td>
<td>2,630</td>
</tr>
<tr>
<td><strong>EXTERIOR FIN. DEMO.LABOR</strong></td>
<td></td>
<td>80.0</td>
<td>REM.HRD REV. DINRM.8RS.</td>
<td>43.99</td>
<td>3,479</td>
</tr>
<tr>
<td><strong>2170 WALL DEMOLITION</strong></td>
<td>REV</td>
<td>72.0</td>
<td>REMOVE BLOCK WALL PANELS</td>
<td>37.52</td>
<td>2,702</td>
</tr>
<tr>
<td><strong>WALL DEMO LABOR</strong></td>
<td></td>
<td>32.0</td>
<td>@ NEW SHEAR WALLS</td>
<td>45.99</td>
<td>1,472</td>
</tr>
<tr>
<td><strong>WALL DEMO LABOR</strong></td>
<td></td>
<td>48.0</td>
<td>@ EXT.TUBE STL COLS.</td>
<td>45.99</td>
<td>2,207</td>
</tr>
<tr>
<td><strong>WALL DEMO LABOR</strong></td>
<td></td>
<td>32.0</td>
<td>@ INTER.TB STL WLS.</td>
<td>45.99</td>
<td>1,472</td>
</tr>
<tr>
<td><strong>2160 CEILING DEMOLITION</strong></td>
<td></td>
<td>99.0</td>
<td>PANELS @ MAIN CHIMNEY</td>
<td>45.99</td>
<td>3,679</td>
</tr>
<tr>
<td><strong>CEILING DEMO LABOR</strong></td>
<td></td>
<td>24.0</td>
<td>CLG PANELS @ LIBRARY CHIM</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td><strong>CEILING DEMO LABOR</strong></td>
<td></td>
<td>16.0</td>
<td>CLG PANELS @ BEDRM CHIM.</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td><strong>CEILING DEMO LABOR</strong></td>
<td></td>
<td>24.0</td>
<td>@ EXT.TUBE STL COLS.</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td><strong>CEILING DEMO LABOR</strong></td>
<td></td>
<td>16.0</td>
<td>@ INTER.STL COLS.</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td><strong>CEILING DEMO LABOR</strong></td>
<td></td>
<td>16.0</td>
<td>@ SHEAR WALLS</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td><strong>2220 CARPET DEMO</strong></td>
<td></td>
<td>9.0</td>
<td>@ TOILET ROOM COUNTER</td>
<td>45.99</td>
<td>368</td>
</tr>
<tr>
<td><strong>2240 TILE DEMOLITION</strong></td>
<td></td>
<td>12.0</td>
<td>TERRACE DOORS</td>
<td>45.99</td>
<td>552</td>
</tr>
<tr>
<td><strong>DOOR DEMO</strong></td>
<td></td>
<td>6.0</td>
<td>@ EXT.TB STL COLS.</td>
<td>45.99</td>
<td>276</td>
</tr>
<tr>
<td><strong>DOOR DEMO</strong></td>
<td></td>
<td>16.0</td>
<td>SLIDERS @ DINING RM</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td><strong>DOOR DEMO</strong></td>
<td></td>
<td>2.0</td>
<td>CLST DR/DRM RM DR HDR FTG</td>
<td>45.99</td>
<td>92</td>
</tr>
<tr>
<td><strong>2255 TRIM DEMO</strong></td>
<td></td>
<td>60.0</td>
<td>@ MAIN CHIMNEY</td>
<td>45.99</td>
<td>2,759</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>60.0</td>
<td>@ LIBRARY CHIM.</td>
<td>45.99</td>
<td>2,759</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>24.0</td>
<td>@ BEDRM CHIM.</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>49.0</td>
<td>@ EXT.TUBE STEEL COLS.</td>
<td>45.99</td>
<td>2,207</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>32.0</td>
<td>@ INTER.STL COLS AREAS</td>
<td>45.99</td>
<td>1,472</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>49.0</td>
<td>@ SHEAR WALLS</td>
<td>45.99</td>
<td>2,207</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>24.0</td>
<td>MISC.TRIM @ DIN RM DR HDR</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>16.0</td>
<td>REM.MISC @ CLST W/FTG</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td><strong>TRIM DEMO LABOR</strong></td>
<td></td>
<td>70.0</td>
<td>@ PERIM.FOR NEW FLASHING</td>
<td>45.99</td>
<td>3,219</td>
</tr>
<tr>
<td><strong>2260 CABINETRY DEMO</strong></td>
<td></td>
<td>120.0</td>
<td>REN.(E)CABS @ MAIN CHIM.</td>
<td>45.99</td>
<td>5,519</td>
</tr>
<tr>
<td><strong>CABINETRY DEMO LABOR</strong></td>
<td></td>
<td>40.0</td>
<td>@ LIBRARY CHIM.</td>
<td>45.99</td>
<td>1,840</td>
</tr>
<tr>
<td><strong>CABINETRY DEMO LABOR</strong></td>
<td></td>
<td>40.0</td>
<td>@ BEDRM CHIM.</td>
<td>45.99</td>
<td>1,840</td>
</tr>
<tr>
<td><strong>CABINETRY DEMO LABOR</strong></td>
<td></td>
<td>40.0</td>
<td>INTER.STL COLUMNS</td>
<td>45.99</td>
<td>1,840</td>
</tr>
<tr>
<td><strong>2300 HARD DEMOLITION</strong></td>
<td></td>
<td>26.0</td>
<td>TERR.SLAB &amp; RET.WALL</td>
<td>56.29 CY</td>
<td>1,463</td>
</tr>
<tr>
<td><strong>DEBRIS HAULING</strong></td>
<td></td>
<td>26.0</td>
<td>TERR.SLAB &amp; RET.WALL</td>
<td>17.25 CY</td>
<td>449</td>
</tr>
<tr>
<td><strong>DEBRIS CARTAGE</strong></td>
<td></td>
<td>65.0</td>
<td>@ FIREPLACE SLABS</td>
<td>28.75 LNF</td>
<td>1,859</td>
</tr>
<tr>
<td><strong>CONCRETE SAWCUTTING</strong></td>
<td></td>
<td>81.0</td>
<td>@ TUBE STL FTG</td>
<td>6.05 LNF</td>
<td>632</td>
</tr>
<tr>
<td><strong>CONCRETE SAWCUTTING</strong></td>
<td></td>
<td>8.0</td>
<td>SML FTG FOR DIN RM OR HDR</td>
<td>8.05 LNF</td>
<td>64</td>
</tr>
<tr>
<td><strong>VERTICAL CONCRETE DEMO</strong></td>
<td></td>
<td>12.0</td>
<td>@ (E)TERR.RET.WALL</td>
<td>433.77 CY</td>
<td>4,953</td>
</tr>
<tr>
<td><strong>HORIZONTAL CONCRETE DEMO</strong></td>
<td>REV</td>
<td>12.0</td>
<td>630#WEST TERRACE SLAB</td>
<td>337.72 CY</td>
<td>4,053</td>
</tr>
<tr>
<td><strong>HORIZONTAL CONCRETE DEMO</strong></td>
<td></td>
<td>14.0</td>
<td>TERRACE SLAB &amp; STAIRS</td>
<td>262.67 CY</td>
<td>3,677</td>
</tr>
<tr>
<td><strong>HAND CHIPPING</strong></td>
<td></td>
<td>20.0</td>
<td>@ SLABS BELOW CHIMNEYS</td>
<td>450.29 CY</td>
<td>9,006</td>
</tr>
<tr>
<td><strong>HAND CHIPPING</strong></td>
<td></td>
<td>12.0</td>
<td>B/MENT/LNS. WLS/SLAB/CL.</td>
<td>450.29 CY</td>
<td>5,404</td>
</tr>
<tr>
<td><strong>HAND CHIPPING</strong></td>
<td></td>
<td>10.0</td>
<td>FLAS ADJ CHIMNEYS</td>
<td>450.29 CY</td>
<td>4,503</td>
</tr>
<tr>
<td>LOCAL</td>
<td>DESCRIPTION</td>
<td>ORDER QTY</td>
<td>SPECIFIC DESCRIPTION</td>
<td>UNIT COST</td>
<td>TOTAL COST</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-----------</td>
<td>----------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>2300</td>
<td>HARD DEMOLITION (CONT.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>HAND CHIPPING</td>
<td>CY</td>
<td>@ TUBE STL COL FTGS</td>
<td>450.29 CT</td>
<td>1,351</td>
</tr>
<tr>
<td>.50</td>
<td>HAND CHIPPING</td>
<td>CT</td>
<td></td>
<td>450.30 CT</td>
<td>225</td>
</tr>
<tr>
<td>20.00</td>
<td>HAUL HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ SLABS BELOW CHIMNEYS</td>
<td>37.52 CT</td>
<td>750</td>
</tr>
<tr>
<td>13.00</td>
<td>HAUL HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ MINTUNNEL MLS/SLAB/CL</td>
<td>37.50 CT</td>
<td>450</td>
</tr>
<tr>
<td>10.00</td>
<td>HAUL HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ FLRS ADJACENT CHIMNEYS</td>
<td>37.53 CT</td>
<td>375</td>
</tr>
<tr>
<td>3.00</td>
<td>HAUL HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ TUBE STL COL FTGS</td>
<td>37.52 CT</td>
<td>113</td>
</tr>
<tr>
<td>.50</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CT</td>
<td></td>
<td>37.54 CT</td>
<td>19</td>
</tr>
<tr>
<td>20.00</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ SLABS BELOW CHIMNEYS</td>
<td>17.25 CT</td>
<td>343</td>
</tr>
<tr>
<td>12.00</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ MINTUNNEL MLS/SLAB/CL</td>
<td>17.25 CT</td>
<td>207</td>
</tr>
<tr>
<td>10.00</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ FLRS ADJACENT CHIMNEYS</td>
<td>17.25 CT</td>
<td>173</td>
</tr>
<tr>
<td>3.00</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CY</td>
<td>@ TUBE STL COL FTGS</td>
<td>17.25 CT</td>
<td>52</td>
</tr>
<tr>
<td>.50</td>
<td>CARRY HAND CHIP CONCRETE</td>
<td>CT</td>
<td></td>
<td>17.26 CT</td>
<td>21</td>
</tr>
</tbody>
</table>

| 2330  | STRUCTURAL SHORING | |  | |
|-------|-------------------|-----------------|-------------------|----------|------------------|
| 40.00 | Structural Shoring Mat'L | REV | MAIN CHIMNEY | 920 |
| 570.00| Structural Shoring Mat'L |  | LIBRARY CHIMNEY | 575 |
| 570.00| Structural Shoring Mat'L |  | BASEMENT CLGS/WALLS | 575 |
| 570.00| Structural Shoring Mat'L |  | NEW DINING RM DR HDR | 575 |
| 90.00 | Structural Shoring Labor |  | MAIN CHIMNEY | 45.99 |
| 570.00| Structural Shoring Labor |  | LIBRARY CHIMNEY | 45.99 |
| 570.00| Structural Shoring Labor |  | BEDROOM CHIMNEY | 45.99 |
| 570.00| Structural Shoring Labor |  | BASEMENT CLGS/WALLS | 45.99 |
| 40.00 | Structural Shoring Labor |  | NEW DINING RM DR HDR | 45.99 |

| 2390  | BRICK/BLOCK DEM | |  | |
|-------|-----------------|-----------------|-------------------|----------|------------------|
| 5.00  | BRICK/BLOCK DEM | LOc  | Misc.Planters @ New Wk | 575.00 Loc | 2,875 |
| 12.50 | BRICK/BLOCK DEM |  | SOIL ANCHORS | 112.37 | 2,165 |
| 103.00| BRICK/BLOCK DEM |  | Three Chimneys | 75.05 | 1,550 |
| 7.50  | BRICK/BLOCK DEM |  | Terr.Ret.Wall | 75.05 | 572 |
| 3.00  | BRICK/BLOCK DEM |  | Gar.Ret.Wl Planter Area | 75.05 | 223 |
| 40.00 | Tools/Equipment |  |  | 431.25 Wk | 1,725 |
| 112.00| HAUL DEBRIS |  |  | 46.91 CT | 5,263 |
| 112.00| CARGATE |  |  | 17.25 CT | 1,932 |

| 2400  | SPECIAL FOUNDATIONS | |  | |
|-------|---------------------|-----------------|-------------------|----------|------------------|
| 6.00  | Soil Stabilization | REV | Add'L. Soil Anchors | 1,610.00 Loc | 9,660 |
| 16.00 | Soil Stabilization |  | Soil Anchors | 1,610.00 Loc | 23,760 |

| 2420  | EARTH SHORING | |  | |
|-------|---------------|-----------------|-------------------|----------|------------------|
| 590.00| Earth Shoring Budget |  | Main Chimney Fto/Piers | 23.00 SF | 13,455 |
| 580.00| Earth Shoring Budget |  | Misc. B/Mintunnel Walls/Tunnel | 11.50 SF | 1,760 |
| 550.00| Earth Shoring Budget |  | Terrace Wall | 23.00 SF | 12,690 |
| 252.00| Earth Shoring Budget |  | Misc. Planters | 11.50 SF | 2,889 |

| 2450  | CAISSONS | |  | |
|-------|----------|-----------------|-------------------|----------|------------------|
| 5.00  | Hand Dug Pier Budget |  |  | 16,790.00 EA | 83,950 |

| 2510  | SITE CLEARING | |  | |
|-------|---------------|-----------------|-------------------|----------|------------------|
| 2.875| Site Clearing |  | Soil Anchors | 2.875 |

<p>| 2515  | EXCAVATION | |  | |
|-------|-------------|-----------------|-------------------|----------|------------------|
| 240.00| Excavation Budget |  | (E)Terr.Ret.Wall | 57.50 CT | 13,800 |
| 240.00| Excavation Budget |  | Terr.Ret.Wall | 40.25 CT | 9,560 |
| 13.00 | Hand Excavation | REV | Bond Beams | 75.05 CT | 976 |
| 82.00 | Hand Excavation |  | Chimneys | 75.05 CT | 6,154 |
| 13.00 | Hand Excavation |  | @ Tube Fto | 75.05 CT | 976 |
| 1.00  | Hand Excavation |  | SF Fto For Din RM DR HDR | 75.05 CT | 75 |
| 13.00 | Hand Excavation Hauling | REV | Bond Beams | 37.52 CT | 488 |
| 82.00 | Hand Excavation Hauling |  | Chimneys | 37.52 CT | 3,077 |
| 13.00 | Hand Excavation Hauling |  | @ Tube Fto | 37.52 CT | 488 |
| 1.00  | Hand Excavation Hauling |  | SF Fto For Din RM DR HDR | 37.52 CT | 38 |</p>
<table>
<thead>
<tr>
<th>GENERAL ORDER SPECIFIC UNIT</th>
<th>DC</th>
<th>ORDER</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2515 EXCAVATION (CONT.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARTAGE</td>
<td>REV</td>
<td>13.00 CY</td>
<td>BOND BEAMS</td>
<td>17.25 CY</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td>CARTAGE</td>
<td></td>
<td>82.00 CY</td>
<td>CHIMNEYS</td>
<td>17.25 CY</td>
<td>1,415</td>
<td></td>
</tr>
<tr>
<td>CARTAGE</td>
<td></td>
<td>13.00 CY</td>
<td>@ TUBE STL FTGS</td>
<td>17.25 CY</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td>IMPORT BACKFILL MATERIALS</td>
<td></td>
<td>1.00 CY</td>
<td>@ TUBE STL FTGS FOR DIN RM OR HDR</td>
<td>17.25 CY</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>IMPORT BACKFILL MATERIALS</td>
<td></td>
<td>32.00 CY</td>
<td>@ MAIN/LIBRARY CHIMNEYS</td>
<td>30.71 CY</td>
<td>988</td>
<td></td>
</tr>
<tr>
<td>HAND BACKFILL</td>
<td>REV</td>
<td>6.00 CY</td>
<td>BOND BEAMS</td>
<td>56.29 CY</td>
<td>338</td>
<td></td>
</tr>
<tr>
<td>HAND BACKFILL</td>
<td></td>
<td>32.00 CY</td>
<td>@ MAIN/LIBRARY CHIMNEYS</td>
<td>56.29 CY</td>
<td>1,801</td>
<td></td>
</tr>
<tr>
<td>HAND BACKFILL</td>
<td></td>
<td>4.00 CY</td>
<td>MISC.NEAR TB STL FTGS</td>
<td>56.29 CY</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>2540 ROCK, SAND &amp; GRAVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAND &amp; GRAVEL BED BUDGET</td>
<td></td>
<td>840.00 SF</td>
<td>@ TERR SLAB &amp; PAVING</td>
<td>1.44 SF</td>
<td>1,208</td>
<td></td>
</tr>
<tr>
<td>2560 ASPHALT PAVING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC PAVING (10000SF)</td>
<td></td>
<td>440.00 SF</td>
<td>REGRADE-ASPHALT RET. HL NK</td>
<td>6.90 SF</td>
<td>3,036</td>
<td></td>
</tr>
<tr>
<td>AC PAVING (8000SF)</td>
<td></td>
<td>200.00 SF</td>
<td>OVERLAY (E) CARPORT AREA</td>
<td>6.70 SF</td>
<td>1,380</td>
<td></td>
</tr>
<tr>
<td>2580 LANDSCAPING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LANDSCAPING BUDGET</td>
<td>REV</td>
<td></td>
<td>ALLOWANCE</td>
<td>ALW</td>
<td>2,300</td>
<td></td>
</tr>
<tr>
<td>LANDSCAPING BUDGET</td>
<td></td>
<td></td>
<td>ALLOWANCE</td>
<td>ALW</td>
<td>19,550</td>
<td></td>
</tr>
<tr>
<td>2850 FOUNDATION DRAINAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOUNDATION DRAINAGE BUDGET</td>
<td></td>
<td></td>
<td>@ NEW TERR.,RET.,WALL</td>
<td>1,150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3050 CONCRETE FOUNDATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION BUDGET</td>
<td>REV</td>
<td>8.00 CY</td>
<td>1441F BOND BEAM</td>
<td>345.00 CY</td>
<td>5,170</td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION COMPLETE</td>
<td></td>
<td>33.00 CY</td>
<td>CHIMNEY FOOTINGS</td>
<td>345.00 CY</td>
<td>11,385</td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION COMPLETE</td>
<td></td>
<td>11.00 CY</td>
<td>TUBE STL FTGS</td>
<td>345.00 CY</td>
<td>3,795</td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION COMPLETE</td>
<td></td>
<td>13.00 CY</td>
<td>@ GARAGE RET. WALL</td>
<td>345.00 CY</td>
<td>4,485</td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION COMPLETE</td>
<td></td>
<td>26.00 CY</td>
<td>@ NEW TERR.,RET.,WALL FTGS.</td>
<td>345.00 CY</td>
<td>8,970</td>
<td></td>
</tr>
<tr>
<td>CONC. FOUNDATION COMPLETE</td>
<td></td>
<td>1.00 CY</td>
<td>@ TUBE STL FTGS FOR DIN RM OR HDR</td>
<td>345.00 CY</td>
<td>3,250</td>
<td></td>
</tr>
<tr>
<td>3150 CONC. SLAB ON GRADE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLAB ON GRADE BUDGET</td>
<td>REV</td>
<td>530.00 SF</td>
<td>WEST TERRACE SLAB</td>
<td>7.28 SF</td>
<td>4,586</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>10.00 CY</td>
<td>@ NEW TERR.,SLAB</td>
<td>73.69 CY</td>
<td>737</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>10.00 CY</td>
<td>SLABS ADJACENT CHIMNEYS</td>
<td>73.69 CY</td>
<td>737</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>10.00 CY</td>
<td>@ NEW TERR.,SLAB</td>
<td>91.98 CY</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>SLAB ON GRADE REBAR</td>
<td></td>
<td>10.00 CY</td>
<td>@ NEW TERR.,SLAB</td>
<td>80.50 CY</td>
<td>805</td>
<td></td>
</tr>
<tr>
<td>SLAB ON GRADE REBAR</td>
<td></td>
<td>10.00 CY</td>
<td>@ NEW TERR.,SLAB</td>
<td>80.50 CY</td>
<td>805</td>
<td></td>
</tr>
<tr>
<td>SLAB ON GRADE ACCESSORIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLAB ON GRADE FINISHING</td>
<td></td>
<td>400.00 SF</td>
<td></td>
<td>2.30 SF</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>1376.00 SF</td>
<td></td>
<td>2.30 SF</td>
<td>3,165</td>
<td></td>
</tr>
<tr>
<td>CONCRETE PUMP</td>
<td></td>
<td>1.00 EA</td>
<td>@ TERRACE</td>
<td>920.00 EA</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>CONCRETE PUMP</td>
<td></td>
<td>2.00 EA</td>
<td>@ INTER.Floor &amp; Adj.Chimneys</td>
<td>920.00 EA</td>
<td>1,840</td>
<td></td>
</tr>
<tr>
<td>3200 CONCRETE WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>12.00 CY</td>
<td>TUNNEL WALLS</td>
<td>73.69 CY</td>
<td>884</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>152.00 CY</td>
<td>FULL HT CHIMNEY WALLS</td>
<td>73.69 CY</td>
<td>14,149</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>25.00 CY</td>
<td>@ NEW TERR.,RET. WALL</td>
<td>73.69 CY</td>
<td>1,842</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>3.00 CY</td>
<td>@ GARAGE RET. WALL</td>
<td>73.69 CY</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>12.00 CY</td>
<td>TUNNEL WALLS</td>
<td>45.99 CY</td>
<td>552</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>152.00 CY</td>
<td>FULL HT CHIMNEY WALLS</td>
<td>45.99 CY</td>
<td>8,830</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>25.00 CY</td>
<td>@ NEW TERR. RET. WALL</td>
<td>45.99 CY</td>
<td>1,150</td>
<td></td>
</tr>
<tr>
<td>PLACE CONCRETE</td>
<td></td>
<td>3.00 CY</td>
<td>@ GARAGE RET. WALL</td>
<td>45.99 CY</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL REBAR</td>
<td></td>
<td>12.00 CY</td>
<td>TUNNEL/B-MENT WALLS</td>
<td>30.50 CY</td>
<td>966</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL REBAR</td>
<td></td>
<td>152.00 CY</td>
<td>FULL HT @ CHIMNEYS</td>
<td>201.25 CY</td>
<td>38,640</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL REBAR</td>
<td></td>
<td>25.00 CY</td>
<td>@ NEW TERR.,RET. WALL</td>
<td>201.25 CY</td>
<td>5,031</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL REBAR</td>
<td></td>
<td>3.00 CY</td>
<td>@ GARAGE RET. WALL</td>
<td>201.25 CY</td>
<td>604</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL FORMWORK</td>
<td></td>
<td>600.00 CSF</td>
<td>TUNNEL/B-MENT WALLS</td>
<td>8.05 CSF</td>
<td>4,894</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL FORMWORK</td>
<td></td>
<td>561.00 CSF</td>
<td>@ CHIMNEYS</td>
<td>11.50 CSF</td>
<td>65,102</td>
<td></td>
</tr>
<tr>
<td>CONCRETE WALL FORMWORK</td>
<td></td>
<td>1352.00 CSF</td>
<td>@ NEW TERR.,RET. WALL</td>
<td>7.48 CSF</td>
<td>10,106</td>
<td></td>
</tr>
</tbody>
</table>
### General Description

<table>
<thead>
<tr>
<th>Description</th>
<th>LOR</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200 Concrete Walls (Cont.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Wall Formwork</td>
<td>165.00 CSF</td>
<td>@ Garage Retaining Wall</td>
<td>1.44 SF</td>
<td>1,233</td>
<td></td>
</tr>
<tr>
<td>Concrete Wall Finishing</td>
<td>334.00 SF</td>
<td>Tunnel WLS/B-Ment WLS</td>
<td>1.44 SF</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>Concrete Wall Finishing</td>
<td>165.00 SF</td>
<td>@ Garage Retaining Wall</td>
<td>1.44 SF</td>
<td>237</td>
<td></td>
</tr>
<tr>
<td>Concrete Pump</td>
<td>5.00 EA</td>
<td>Chimneys</td>
<td>920.00 EA</td>
<td>4,600</td>
<td></td>
</tr>
<tr>
<td>Concrete Pump</td>
<td>3.00 EA</td>
<td>@ Terr.Ret.Walls/FTGS</td>
<td>920.00 EA</td>
<td>2,760</td>
<td></td>
</tr>
<tr>
<td>Concrete Pump</td>
<td>2.00 EA</td>
<td>@ Garage Retaining Wall</td>
<td>920.00 EA</td>
<td>1,840</td>
<td></td>
</tr>
</tbody>
</table>

### 3500 Conc. Stairs & Ramps

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc. Stair &amp; Ramp Budget</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conc. Stair &amp; Ramp Complete</td>
<td>44.00 LFR</td>
<td>@ New Terr. Stairs</td>
<td>46.00 LFR</td>
<td>2,944</td>
<td></td>
</tr>
<tr>
<td>Concrete Stairs Complete</td>
<td>47.00 LFR</td>
<td>@ New Terr. Stairs</td>
<td>46.00 LFR</td>
<td>2,162</td>
<td></td>
</tr>
</tbody>
</table>

### 3850 Grout Base Plates

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget To Grout Base Plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budget To Grout Base Plates</td>
<td>5.00 LOC</td>
<td>@ Tub Stl Columns</td>
<td>460.00 LOC</td>
<td>2,300</td>
<td></td>
</tr>
<tr>
<td>Budget To Grout Base Plates</td>
<td>2.00 LOC</td>
<td>@ Terr. Stl Columns</td>
<td>460.00 LOC</td>
<td>1,730</td>
<td></td>
</tr>
</tbody>
</table>

### 3910 Anchor Bolts/Embeds

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor Bolt Supply</td>
<td>20.00 EA</td>
<td>@ Tub Stl Columns</td>
<td>4.91 EA</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Anchor Bolt Supply</td>
<td>3.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>4.91 EA</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Instal Anchor Bolt</td>
<td>20.00 EA</td>
<td>@ Tub Stl Columns</td>
<td>9.38 EA</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>Instal Anchor Bolt</td>
<td>8.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>9.38 EA</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

### 3920 Dowels & Bolts

<table>
<thead>
<tr>
<th>Description</th>
<th>Rev</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowel Piers To Wall</td>
<td>88.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>17.25 EA</td>
<td>1,518</td>
<td></td>
</tr>
<tr>
<td>Dowel Piers To Wall</td>
<td>120.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>17.25 EA</td>
<td>2,208</td>
<td></td>
</tr>
<tr>
<td>Dowel Piers To Wall</td>
<td>20.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>17.25 EA</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>Dowel Piers To Wall</td>
<td>145.00 EA</td>
<td>@ Terr. Stl Columns</td>
<td>17.25 EA</td>
<td>2,501</td>
<td></td>
</tr>
</tbody>
</table>

### 4200 Masonry

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick Masonry Budget</td>
<td>16.00 LOC</td>
<td>Patch @ Soil Anchors</td>
<td>287.50 LOC</td>
<td>4,600</td>
<td></td>
</tr>
<tr>
<td>Brick Masonry Budget</td>
<td>3.00 LOC</td>
<td>Patch @ Planters</td>
<td>862.50 LOC</td>
<td>4,313</td>
<td></td>
</tr>
<tr>
<td>Brick Masonry Budget</td>
<td>416.00 SF</td>
<td>@ Chimneys</td>
<td>861.00 SF</td>
<td>86,257</td>
<td></td>
</tr>
<tr>
<td>Brick Masonry Budget</td>
<td>520.00 SF</td>
<td>@ Terr. Ret. Wall</td>
<td>861.00 SF</td>
<td>10,764</td>
<td></td>
</tr>
</tbody>
</table>

### 4500 Masonry Restoration

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonry Restoration Budget</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry Restoration Budget</td>
<td></td>
<td></td>
<td>Pointing Allowance</td>
<td></td>
<td>9,200</td>
</tr>
</tbody>
</table>

### 5100 Structural Steel

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel Budget</td>
<td>1325.00 LB</td>
<td>Tub Stl Columns</td>
<td>3.45 LB</td>
<td>4,571</td>
<td></td>
</tr>
<tr>
<td>Structural Steel Budget</td>
<td>1400.00 LB</td>
<td>30/40' Dining RM DRS</td>
<td>3.45 LB</td>
<td>5,141</td>
<td></td>
</tr>
<tr>
<td>Structural Steel Budget</td>
<td>29.00 LOC</td>
<td>Terr. Anchors @ Chimney Con</td>
<td>115.00 LOC</td>
<td>3,335</td>
<td></td>
</tr>
</tbody>
</table>

### 6020 Plywood Sheathing

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood Budget</td>
<td>7548.00 SF</td>
<td>Shear Plywood @ Roof</td>
<td>2.01 SF</td>
<td>15,190</td>
<td></td>
</tr>
<tr>
<td>Plywood Budget</td>
<td>1399.20 SF</td>
<td>@ Sheathing Infill</td>
<td>3.45 SF</td>
<td>4,827</td>
<td></td>
</tr>
</tbody>
</table>

### 6120 Vertical Reframing

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Reframing Budget</td>
<td></td>
<td></td>
<td>Misc. &amp; Walls Adj Chimneys</td>
<td></td>
<td>2,017</td>
</tr>
</tbody>
</table>

### 6290 Horizontal Reframing

<table>
<thead>
<tr>
<th>Description</th>
<th>LOC</th>
<th>Quantity</th>
<th>Specific Description</th>
<th>Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horiz. Reframe Labor</td>
<td>55.00</td>
<td>Reattach Roof to Main CHM</td>
<td>45.99</td>
<td>2,522</td>
<td></td>
</tr>
<tr>
<td>Horiz. Reframe Labor</td>
<td>88.00</td>
<td>Reattach Roof to LIB/BED</td>
<td>45.99</td>
<td>4,047</td>
<td></td>
</tr>
<tr>
<td>Horiz. Reframe Labor</td>
<td>36.00</td>
<td>Attach JST to STL DR HDR</td>
<td>45.99</td>
<td>1,656</td>
<td></td>
</tr>
<tr>
<td>GENERAL DESCRIPTION</td>
<td>LOC</td>
<td>ORDER SPECIFIC DESCRIPTION</td>
<td>UNIT COST</td>
<td>TOTAL COST</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>----------------------------</td>
<td>-----------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>6290 HORIZONTAL REFRAING (CONT.)</td>
<td></td>
<td></td>
<td></td>
<td>8,232*</td>
<td></td>
</tr>
</tbody>
</table>

### 6400 ROUGH CARPENTRY

<table>
<thead>
<tr>
<th>ROUGH CARPENTRY BUDGET</th>
<th>REV</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PLANTER BOX ALLOWANCE</td>
<td></td>
<td>805</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REPAIR MISC. ROOF CRICKETS</td>
<td>2,300</td>
<td>11,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MISC. ROUGH CARPENTRY</td>
<td>1,140*</td>
<td>14,605*</td>
</tr>
</tbody>
</table>

### 6450 BLOCKING/BACKING

<table>
<thead>
<tr>
<th>BLOCKING/BACKING</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>227.00</td>
<td>EDGE BLK PLY &amp; ROOF INFIL</td>
<td>11.50</td>
<td>2,611</td>
</tr>
<tr>
<td></td>
<td>294.00</td>
<td>@ ROOF STRAPS BET JOISTS</td>
<td>28.75</td>
<td>8,453</td>
</tr>
<tr>
<td></td>
<td>7.00</td>
<td>@ ROOF JOISTS</td>
<td>57.50</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>34.00</td>
<td>BETW. JOISTS @ STL OR HDR</td>
<td>28.75</td>
<td>978</td>
</tr>
</tbody>
</table>

### 6500 NAILS/STAPLES

<table>
<thead>
<tr>
<th>NAILS/STAPLES</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>629.00 SF</td>
<td>REMAINING @ ROOF</td>
<td>.18 SF</td>
<td>1,157</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,157*</td>
</tr>
</tbody>
</table>

### 6550 CARPENTER'S IRON

<table>
<thead>
<tr>
<th>CARPENTER'S IRON BUDGET</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>227.00 EA</td>
<td>STRAPS @ JOISTS</td>
<td>40.25</td>
<td>9,137</td>
</tr>
<tr>
<td></td>
<td>32.00 LNF</td>
<td>S/S ANGLE @ SHEAR WALLS</td>
<td>17.25</td>
<td>552</td>
</tr>
</tbody>
</table>

### 6700 INT. FINISH CARPENTRY

<table>
<thead>
<tr>
<th>INT. FINISH CARPENTRY</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>160.00 SF</td>
<td>NEW SHEAR WALL PANELS</td>
<td>34.50</td>
<td>5,520</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTL LIV RM/KITCH CAS</td>
<td>45.99</td>
<td>5,179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTL EXT.MLSURE STL</td>
<td>45.99</td>
<td>2,759</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL AL @ GAR RET AL</td>
<td>45.99</td>
<td>1,840</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL LIBRARY MILLWORK</td>
<td>45.99</td>
<td>1,259</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL BEDRM MILLWORK</td>
<td>45.99</td>
<td>3,679</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL T.RM MILLWORK</td>
<td>45.99</td>
<td>1,840</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL RLSINT.TB STL.</td>
<td>45.99</td>
<td>5,159</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL TRM @ O/RM OR HDR</td>
<td>45.99</td>
<td>5,159</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL TRM @ CLST W/FG</td>
<td>45.99</td>
<td>1,380</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REINSTAL EAVES/FACIAS</td>
<td>5.98</td>
<td>5,727</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NON SALV.MAT'L REPL.ALLOW</td>
<td>5,750</td>
<td>23,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FINISH TRIM MATERIALS</td>
<td>7.12 SF</td>
<td>45,209</td>
</tr>
<tr>
<td></td>
<td></td>
<td>INSTL REP/REPL SALV.TRIM</td>
<td>45.99</td>
<td>7,358</td>
</tr>
</tbody>
</table>

### 6750 PANELING

<table>
<thead>
<tr>
<th>PANELING BUDGET</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80.00</td>
<td>REINSTAL CLG PNLS @ M.CHIH.</td>
<td>45.99</td>
<td>3,679</td>
</tr>
<tr>
<td></td>
<td>24.00</td>
<td>REINSTAL CLG PNLS @ LIB CH</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td></td>
<td>16.00</td>
<td>REINSTAL CLG PNLS @ BED.MECH.</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td></td>
<td>24.00</td>
<td>REINSTAL CLG PNLS @ TRELLIS</td>
<td>45.99</td>
<td>1,104</td>
</tr>
<tr>
<td></td>
<td>16.00</td>
<td>REINSTAL CLG PNLS @ BAR AL</td>
<td>45.99</td>
<td>736</td>
</tr>
<tr>
<td></td>
<td>16.00</td>
<td>REINSTAL @ INTER 1/STL</td>
<td>45.99</td>
<td>736</td>
</tr>
</tbody>
</table>

### 7500 ROOFING

<table>
<thead>
<tr>
<th>ROOFING</th>
<th>LOC</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEMOL. ADD NEW W/RGD. INSUL.#</td>
<td>629.00 SF</td>
<td>7.12 SF</td>
<td>45,209</td>
<td></td>
</tr>
</tbody>
</table>

### 7650 FLASHING/SHEET METAL

<table>
<thead>
<tr>
<th>FLASHING/SHEET METAL BUDGET</th>
<th>REV</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET METAL FLASHING BUDGET</td>
<td>558.00 LF</td>
<td>PLANTER BOX LINING @ PERIMETER</td>
<td>11.50 LF</td>
<td>11,077</td>
</tr>
<tr>
<td>SHEET METAL FLASHING BUDGET</td>
<td>650.00 LF</td>
<td>@ TRELLIS AREAS</td>
<td>20.70 LF</td>
<td>13,455</td>
</tr>
<tr>
<td>SHEET METAL FLASHING BUDGET</td>
<td>140.00 LF</td>
<td>CHIMNEYS</td>
<td>27.60 LF</td>
<td>3,864</td>
</tr>
</tbody>
</table>

### 8200 WOOD DOORS & FRAMES

<table>
<thead>
<tr>
<th>WOOD DOORS &amp; FRAMES BUDGET</th>
<th>REV</th>
<th>SPECIFIC DESCRIPTION</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.00</td>
<td>MISCELLANEOUS REPLACEMENT</td>
<td>367.91</td>
<td>1,725</td>
</tr>
<tr>
<td></td>
<td>24.00</td>
<td>REPLACE BLDG.WALL PANELS</td>
<td>275.93</td>
<td>4,515</td>
</tr>
<tr>
<td></td>
<td>3.00</td>
<td>REPAIR TERR.DRGNDEN WAK</td>
<td>275.93</td>
<td>6,622</td>
</tr>
<tr>
<td></td>
<td>8.00</td>
<td>REINSTALL @ EXT.TOLL RBS</td>
<td>275.93</td>
<td>828</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>REINSTALL CLST DR @ STL FIG</td>
<td>275.93</td>
<td>2,207</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
<td>ADJUST MISC.DOORS</td>
<td>137.77</td>
<td>2,759</td>
</tr>
<tr>
<td>General Description</td>
<td>Lcc</td>
<td>Order Quantity</td>
<td>Specific Description</td>
<td>Unit</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>----------------</td>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>8200 Wood Doors &amp; Frames (Cont.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8300 Glazing</td>
<td></td>
<td></td>
<td>Glass Breakage Allow</td>
<td></td>
</tr>
<tr>
<td>Glazing Budget</td>
<td></td>
<td></td>
<td>Reinst. Tm Mirrors</td>
<td></td>
</tr>
<tr>
<td>Glazing Budget</td>
<td></td>
<td></td>
<td>repl.allow &amp; Trellis</td>
<td></td>
</tr>
<tr>
<td>Glazing Budget</td>
<td>22.00 EA</td>
<td></td>
<td>repl. trellis FRM</td>
<td>460.00 EA</td>
</tr>
<tr>
<td>9200 Tile</td>
<td></td>
<td></td>
<td>Patch Tile &amp; Toilet RM</td>
<td></td>
</tr>
<tr>
<td>9380 Carpet</td>
<td></td>
<td></td>
<td>Reinstall Carpet</td>
<td></td>
</tr>
<tr>
<td>Carpet Budget</td>
<td></td>
<td></td>
<td>Misc. Patching</td>
<td></td>
</tr>
<tr>
<td>9500 Paint+Wall Covering</td>
<td>1000.00 SF</td>
<td>(N) Int. Conc. Slab</td>
<td>3.45 SF</td>
<td>3,450</td>
</tr>
<tr>
<td></td>
<td>1998.00 LMF</td>
<td>Pt. Flashings</td>
<td>1.73 LMF</td>
<td>3,257</td>
</tr>
<tr>
<td>15400 Plumbing</td>
<td></td>
<td></td>
<td>Relocations + Shutoffs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pge Mnt. @ Terr. Ref. WL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ext. Hose Brg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rem/Repl/Brace Wtr Htr</td>
<td></td>
</tr>
<tr>
<td>15900 HVAC Systems</td>
<td></td>
<td></td>
<td>Relocations + Shutoffs</td>
<td></td>
</tr>
<tr>
<td>HVAC Budget</td>
<td></td>
<td></td>
<td>Remove/Replace B/ment Htr</td>
<td></td>
</tr>
<tr>
<td>HVAC Budget</td>
<td></td>
<td></td>
<td>Modify (E) Ducts @ Tunnels</td>
<td></td>
</tr>
<tr>
<td>HVAC Budget</td>
<td></td>
<td></td>
<td>Clean Ducts</td>
<td></td>
</tr>
<tr>
<td>HVAC Budget</td>
<td></td>
<td></td>
<td>Repl.Flue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Relocations + Shutoffs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conceal Expd. Roof Wires</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reinstl (Exits) @ Clgs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reinstall Outlets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.00 Loc</td>
<td></td>
<td>Misc. New Conduit &amp; Ter WL</td>
<td>345.00 Loc</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16550 Security Systems</td>
<td></td>
<td></td>
<td>Misc. Relocations</td>
<td></td>
</tr>
<tr>
<td>Security System Budget</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20100 Contractor's Fee</td>
<td></td>
<td></td>
<td>Rev</td>
<td>10%</td>
</tr>
<tr>
<td>Contractor's Fee</td>
<td></td>
<td></td>
<td>Rev</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENERAL</td>
<td>DESCRIPTION</td>
<td>LOC</td>
<td>QUANTITY</td>
<td>SPECIFIC DESCRIPTION</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>-----</td>
<td>----------</td>
<td>----------------------</td>
</tr>
<tr>
<td>1000</td>
<td>GEN.REQUIREMENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEN.REQUIREMENTS BY %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1130</td>
<td>PBI INVESTIGATIONS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1140</td>
<td>SURVEYING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1150</td>
<td>TESTING &amp; INSPECTION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2650</td>
<td>LANDSCAPING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2740</td>
<td>SITE DRAINAGE</td>
<td></td>
<td></td>
<td>TERR.DAMAGE REPLACEMENT CHECK SYSTEMS</td>
</tr>
<tr>
<td>3860</td>
<td>CONCRETE PATCHING/REPAIR</td>
<td></td>
<td></td>
<td>REPAIR CRACKED SLABS</td>
</tr>
<tr>
<td>4200</td>
<td>MASONRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4200</td>
<td>BRICK MASONRY BUDGET</td>
<td></td>
<td></td>
<td>RERWORK POST 1975 WALL REP</td>
</tr>
<tr>
<td></td>
<td>BRICK MASONRY BUDGET</td>
<td></td>
<td></td>
<td>REP.DETERIORATED BRK JNTS</td>
</tr>
<tr>
<td></td>
<td>BRICK MASONRY BUDGET</td>
<td></td>
<td></td>
<td>REPLACE CRACKED BRICK</td>
</tr>
<tr>
<td></td>
<td>BRICK MASONRY BUDGET</td>
<td></td>
<td></td>
<td>CLEAN BRICK</td>
</tr>
<tr>
<td>6600</td>
<td>EXT.FINISH CARPENTRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6600</td>
<td>EXT.FINISH CARPENTRY BUDGET</td>
<td></td>
<td></td>
<td>REPLACE STIL SCREWS W/BRAS</td>
</tr>
<tr>
<td></td>
<td>EXT.FINISH CARPENTRY BUDGET</td>
<td></td>
<td></td>
<td>REPL.DETERIORATED CAULK</td>
</tr>
<tr>
<td></td>
<td>EXT.FINISH CARPENTRY BUDGET</td>
<td></td>
<td></td>
<td>REPL.DETERIORATED WOOD</td>
</tr>
<tr>
<td></td>
<td>EXT.FINISH CARPENTRY BUDGET</td>
<td></td>
<td></td>
<td>TREAT WOOD</td>
</tr>
<tr>
<td>6750</td>
<td>MILLWORK &amp; TRIM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6750</td>
<td>MILLWORK &amp; TRIM BUDGET</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8200</td>
<td>WOOD DOORS &amp; FRAMES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8200</td>
<td>WOOD DOORS &amp; FRAMES BUDGET</td>
<td></td>
<td></td>
<td>REPLACE DETERIORATED WOOD</td>
</tr>
<tr>
<td></td>
<td>WOOD DOORS &amp; FRAMES BUDGET</td>
<td></td>
<td></td>
<td>REM.REPL.GLAZING COMPOUND</td>
</tr>
<tr>
<td></td>
<td>WOOD DOORS &amp; FRAMES BUDGET</td>
<td></td>
<td></td>
<td>REFINISH HOW</td>
</tr>
<tr>
<td></td>
<td>WOOD DOORS &amp; FRAMES BUDGET</td>
<td></td>
<td></td>
<td>TREAT WOOD</td>
</tr>
<tr>
<td></td>
<td>WOOD DOORS &amp; FRAMES BUDGET</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8800</td>
<td>GLAZING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8800</td>
<td>GLAZING BUDGET</td>
<td></td>
<td></td>
<td>REPLACE ALUM STAFFANT SCN</td>
</tr>
<tr>
<td>9300</td>
<td>TILE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9300</td>
<td>TILE BUDGET</td>
<td></td>
<td></td>
<td>REPL.POST 1975 T.RM TILE</td>
</tr>
<tr>
<td>9510</td>
<td>ACOUSTICAL CEILING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9510</td>
<td>ACOUSTICAL CEILING BUDGET</td>
<td></td>
<td></td>
<td>REPL.DAMAGED CLOT &amp; PAULS</td>
</tr>
<tr>
<td>9680</td>
<td>CARPET</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9680</td>
<td>CARPET BUDGET</td>
<td></td>
<td></td>
<td>NEW LIVING RM CARPET</td>
</tr>
<tr>
<td>QUANTITY</td>
<td>DESCRIPTION</td>
<td>COST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.250</td>
<td>FINISH CONCRETE FLOORS</td>
<td>17,250</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**16400 ELECTRICAL & DISTRIBUTION**

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,150</td>
<td>NEW 30 CIRCUIT PANEL</td>
<td>1,150</td>
</tr>
<tr>
<td>3,450</td>
<td>100 AMP FEEDER</td>
<td>3,450</td>
</tr>
<tr>
<td>6,900</td>
<td>REPL. EXT. OPAL FIXTURES</td>
<td>6,900</td>
</tr>
<tr>
<td>4,600</td>
<td>REPL. DIPLEX OUTLETS</td>
<td>4,600</td>
</tr>
<tr>
<td>1,150</td>
<td>REPL. LANDSCAPE LITES</td>
<td>1,150</td>
</tr>
<tr>
<td>19,550</td>
<td>REPL./REPL. LANDSCAPE LITES</td>
<td>19,550</td>
</tr>
</tbody>
</table>

**20100 CONTRACTOR'S FEE**

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>35600.00</td>
<td>10%</td>
<td>1.15</td>
</tr>
</tbody>
</table>

**GRAND TOTALS**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>450,340</td>
</tr>
</tbody>
</table>


**NATIONAL REGISTER OF HISTORIC PLACES**
**INVENTORY -- NOMINATION FORM**

SEE INSTRUCTIONS IN HOW TO COMPLETE NATIONAL REGISTER FORMS
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

---

**1 NAME**

HISTORIC: 

AND/OR COMMON: 

---

**2 LOCATION**

STREET & NUMBER: 737 Frenchman's Ford

CITY, TOWN: Stanford University

STATE: California

---

**3 CLASSIFICATION**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OWNERSHIP</th>
<th>STATUS</th>
<th>PRESENT USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISTRICT</td>
<td>PUBLIC</td>
<td>OCCUPIED</td>
<td>AGRICULTURE</td>
</tr>
<tr>
<td>BUILDING(S)</td>
<td>PRIVATE</td>
<td>UNOCCUPIED</td>
<td>COMMERCIAL</td>
</tr>
<tr>
<td>STRUCTURE</td>
<td>BOTH</td>
<td>WORK IN PROGRESS</td>
<td>EDUCATIONAL</td>
</tr>
<tr>
<td>SITE</td>
<td>PUBLIC ACQUISITION</td>
<td>ACCESSIBLE</td>
<td>PRIVATE RESIDENCE</td>
</tr>
<tr>
<td>OBJECT</td>
<td>IN PROCESS</td>
<td>YES: RESTRICTED</td>
<td>ENTERTAINMENT</td>
</tr>
<tr>
<td></td>
<td>BEING CONSIDERED</td>
<td>YES: UNRESTRICTED</td>
<td>RELIGIOUS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SCIENTIFIC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>INDUSTRIAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TRANSPORTATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MILITARY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OTHER</td>
</tr>
</tbody>
</table>

---

**4 OWNER OF PROPERTY**

NAME: STANFORD UNIVERSITY

STREET & NUMBER: c/o Edward E. Shaw

ASSOCIATE PROVOST: 

CITY, TOWN: Stanford

STATE: California

---

**5 LOCATION OF LEGAL DESCRIPTION**

COURTHOUSE, REGISTRY OF DEEDS, ETC.: Santa Clara County Records

STREET & NUMBER: 191 North First Street

CITY, TOWN: San Jose

STATE: California

---

**6 REPRESENTATION IN EXISTING SURVEYS**

TITLE: (See continuation sheet)

DATE: 

DEPOSITORY FOR SURVEY RECORDS: 

CITY, TOWN: 

STATE: 

---

[Continuation sheet]

---

[Blank page]

---

[Blank page]
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY -- NOMINATION FORM

CONTINUATION SHEET

ITEM NUMBER 6

TITLE
AIA plaque set Harnn-Honeycomb as "one of seventeen buildings

designed by Frank Lloyd Wright to be retained as an example

of his architectural contribution to American Culture".

DATE
1966 X Federal

DEPOSITARY FOR SURVEY RECORDS
National Headquarters of AIA

CITY
Washington D.C.

2. TITLE
Santa Clara County (California) Inventory

DATE
1962 and 1975 X County

DEPOSITARY
Santa Clara County Records

CITY
San Jose

STATE
California

3. TITLE
Santa Clara County (California) Planning

DATE
X County

DEPOSITARY
Santa Clara Records

CITY
San Jose

STATE
California
This house is set into the brow of a gently sloping hillside on the Stanford University Campus. The site and a half-acre site landscaped to provide a setting for the house -- one story height, with a central clerestory. The wide-spread roof with generous overhang, measures 75 feet. The concrete patio and terrace were built into hexagonal piers, extends beyond the house in every direction of the compass.

The house is constructed of native redwood board and batten siding to 1 3/8 inch studs (interior and exterior walls identical), whose common brick, cement, and plate glass. The original corrugated roof has been replaced by steel.

The building complex in 1977 consisted of the main house, the caretaker house, hobby shop, storage building, double garage, carport, greenhouse, and garden house with pools and water cascade.

The Kennas worked with Mr. Wright on the house plans during 1935 and 1936. The construction was started in January 1937, on the 1st of the building plan. The complete complex of buildings was built in 4 phases, over a period of 25 years. However, Wright received the entire project and presented plans for all buildings in 1937. During the 25 years following, Mr. Wright and the Kennas viewed the original plans and made minor revisions to conform to changing needs and circumstances.

The original main house was constructed in 1937 to accommodate moving family living in a university community. It consisted of 4 bedrooms, three baths, a large playroom (later to become the living room), a large living-dining room for university entertainments and seminars, a small music room, a kitchen, small study, and spacious foyer.

The openness of the interior space was planned to accommodate easy traffic flow. Only the bedrooms and baths are built for privacy. The three floor levels reflect the gentle slope of the site and give the space interesting relief. A concrete vault below ground houses 3 forced-air gas furnaces with smoke controls, a water heater and water softener equipment. A vault, 4 feet by 4 feet (cross section), running the entire length of the house, contains heating ducts, plumbing, electric ducts -- all easily accessible for repair.

The kitchen, in the center of the house, and the bathrooms are lighted and ventilated from clerestory windows and vents. By 1950, Phase 2 of the construction was undertaken. A 1200 square foot hobby shop, a guest house, and a storage room were added.

(See continuation sheet)
In 1957, Phase 3 was begun. The original 4 small bedrooms and study were converted into a spacious library, a master bedroom suite, and a small bedroom for a visiting grandchild. Mr. Wright, in 1937, accepted the Hannass' request that the house plans provide for alteration of the interior space to conform to the needs of the parents after the young had departed. It was a relatively simple matter to unscrew the non-bearing walls between the bedrooms and the study. A fireplace was added in the new library, and another in the new master bedroom suite.

In 1961 Phase 4 was completed with the construction of a garden house at the south end of the extended concrete terrace, and two garden pools connected with a water cascade. Thus, after 25 years, the complex of buildings and the gardens and landscaping were completed. The attached floor plan reflects the Hanna-Honeycomb House as it grew to be in 1961.

The "living and growing" residence has one more phase contemplated. Hannas gave their residence to Stanford University in 1974. The donors suggested a use for the residence which the university hopes to be able to achieve, namely, to obtain gifts to endow a professorial chair to be known as the Distinguished Visiting Professorship. A couple with worldwide visibility would occupy Hanna-Honeycomb for a year at a time. This plan requires that the hobby shop and guest house be converted to an apartment for a caretaker couple who would serve the distinguished visiting professor, maintain the property in mint condition, and interpret the architecture to visitors who desire to know more about Mr. Wright's organic architecture.

Stanford has received a $500,000 endowment fund for the preservation, management, and improvement of Hanna-Honeycomb House. The Frank Lloyd Wright foundation has prepared the plans for the construction of the caretakers' apartment. Work is anticipated during 1977-78.
PERIOD        AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW

PREHISTORIC  ARCHAEOLOGY PREHISTORIC  COMMUNITY PLANNING  LANDSCAPE ARCHITECTURE  RELIGION
1400-1499    ARCHAEOLOGY HISTORIC    CONSERVATION     LAW     SCIENCE
1500-1599    AGRICULTURE             ECONOMICS      LITERATURE      SCULPTURE
1600-1699    X ARCHITECTURE          EDUCATION      MILITARY      SOCIAL/HUMANITARIAN
1700-1799    X ART                    ENGINEERING   MUSIC      THEATER
1800-1899    X COMMERCE              EXPLORATION/SETTLEMENT     PHILOSOPHY      TRANSPORTATION
1900-        X COMMUNICATIONS        INDUSTRY       POLITICS/GOVERNMENT     OTHER (SPECIFY)

STATEMENT OF SIGNIFICANCE

1. This architectural complex is significant because Frank Lloyd Wright used the 120 degree angle of the hexagon form throughout Hanna-Honeycomb House -- the first building ever to be designed on this geometric pattern. Since, this geometric pattern has been used in hundreds of buildings.
2. Frank Lloyd Wright planned the buildings to grow and change over time as the family size and the activities of the owners were modified.
3. This residence has been evaluated as significant by individuals and organizations, e.g.:
   a) "one of seventeen buildings designed by Frank Lloyd Wright to be retained as an example of his architectural contribution to American Culture" (AIA plaque permanently displayed in Hanna-Honeycomb House).
   b) "The Hanna house is, for us, more important than the weekend pavilion, Taliesin West, because it is attuned to a growing family and is less exhibitionist." (John Sergeant in Frank Lloyd Wright's Taliesin Houses, p. 32.)
   c) "The living room of the Paul Hanna House (1937) ..... shows how important the pattern of light and cast shadow is in Wright's total conception ..... Thus we have a marvelously rich and complex orchestration of the textures and colors of materials, with moving, patterned light working on them. It should be stressed that these interior effects are not the result of an unthinking, cluttered architectural design -- a mere addiction to broken surfaces. Rather, they are the consequence of a fully developed philosophy of shelter combined with the design ability to create the space which that philosophy implies." (Edward Burke Feldman, Varieties of Visual Experience, 2nd Edition, Inc., New York: p. 102.)
4. Hanna-Honeycomb has been visited and studied since 1937 by hundreds of architects, artists, historians, and leaders from every nation, thus serving as an important educational experience for them.
5. This is core project represents an ideal union of garden and shelter.

ARCHITECT  Frank Lloyd Wright
GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY

UTM REFERENCES

ZONE EASTING NORTHING
A 10 574120 4161210
C

ZONE EASTING NORTHING
B
D

VERBAL BOUNDARY DESCRIPTION

737 Frenchmen's Road on Stanford University Campus. Approximately a square lot bounded by Frenchmen's Road on the west, by the residence of Professor John Deeds on the north, by Pine Hill Subdivision on the east, and by the residence of Professor I.James Quillen on the south. See attached copy of Gift Deed, dated 21 Feb. 1974.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE CODE COUNTY CODE

STATE CODE COUNTY CODE

FORM PREPARED BY

NAME / TITLE
Paul R. Hanna Senior Research Fellow

ORGANIZATION
Hoover Institution

DATE
February 10, 1977

STREET & NUMBER
420 Mitchell Place

TELEPHONE
415 222 0977

CITY OR TOWN
Stanford University Stanford California

STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL X STATE LOCAL

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

TITLE State Historic Preservation Officer

DATE

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST:

KEEPER OF THE NATIONAL REGISTER


8) Honeycomb House is presented in a dozen books and in more than 20 periodicals.
Out of this plan came beautiful simplicity

Like the growth pattern of a crystal, a ground work of hexagons, 26" on a side, establishes the basic pattern of this floor plan and the sizes of the spaces it encloses, maintaining an orderly consistency within the complex form of the structure. Chimneys, retaining walls, and thin 24" thick redwood partitions, laid out on the lines of this grillage, result in an easy flow from space to space and, like contour lines, they bring about an easy marriage between the building and its gently sloping site. The plan, overlaying this basic web in a free, asymmetrical design, avoids the rigidity and monotony of a series of fours-walled enclosures. The result is a fluid continuity that makes each room seem an extension of another.
THE LEGEND FOR THE PLAN

- Contour of Elevation
- Lot Number
- Elevation
- Scaled Distance (In Curve)
- Scaled Distance

PINE HILL NO. 2, TRACT 2907 STANFORD UNIVERSITY

Scale in Feet