UTAH HERITAGE FOUNDATION

September 25, 2012

Salt Lake City Historic Landmarks Commission
451 S. State St.
Salt Lake City, UT 84111

Dear Commissioners:

The work session at your October 4, 2012 meeting includes a discussion regarding the Memorial House Sustainability Plan. As the lessee of Memorial House, we appreciate the commission providing review and feedback to us on our efforts to be a model of green preservation.

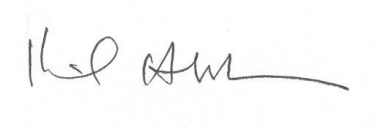
The genesis of this project stemmed from our desire to be the best steward possible for Memorial House and demonstrate what we believe in practice, not just in theory. In order to do this, we needed a reference that would also be the guide for future decision making by both Utah Heritage Foundation as the lessee and for Salt Lake City as the lessor. We felt the plan could also serve as a tool for more effective communication between city departments in regards to goals for the property. Another goal in developing the plan is to clearly communicate and align the sustainability goals of Salt Lake City with those of Utah Heritage Foundation given the operations at Memorial House. And finally, the plan could serve as the foundation for any future capital campaign for Memorial House (though we aren't planning anything currently).

Development of the plan was funded by the George S. and Dolores Doré Eccles Foundation. This enabled Utah Heritage Foundation to distribute a Request for Proposals to potential consultants in spring 2012. Out of that process, we hired CRSA. We're pleased that the process will wrap up and a final plan will be available by mid-October. CRSA has presented to and received input from Utah Heritage Foundation's Historic Properties Committee and Board of Trustees.

While this process isn't complete and the plan is still in draft form, we wanted the Historic Landmarks Commission to hear what's included and have the opportunity to ask questions, discuss the plan's direction, and provide comment. Simultaneously, we are also circulating this draft through the city's administration and various departments for additional comment.

We value our partnership with the city and look forward to having your cooperation to make Memorial House a model of historic preservation and sustainability.

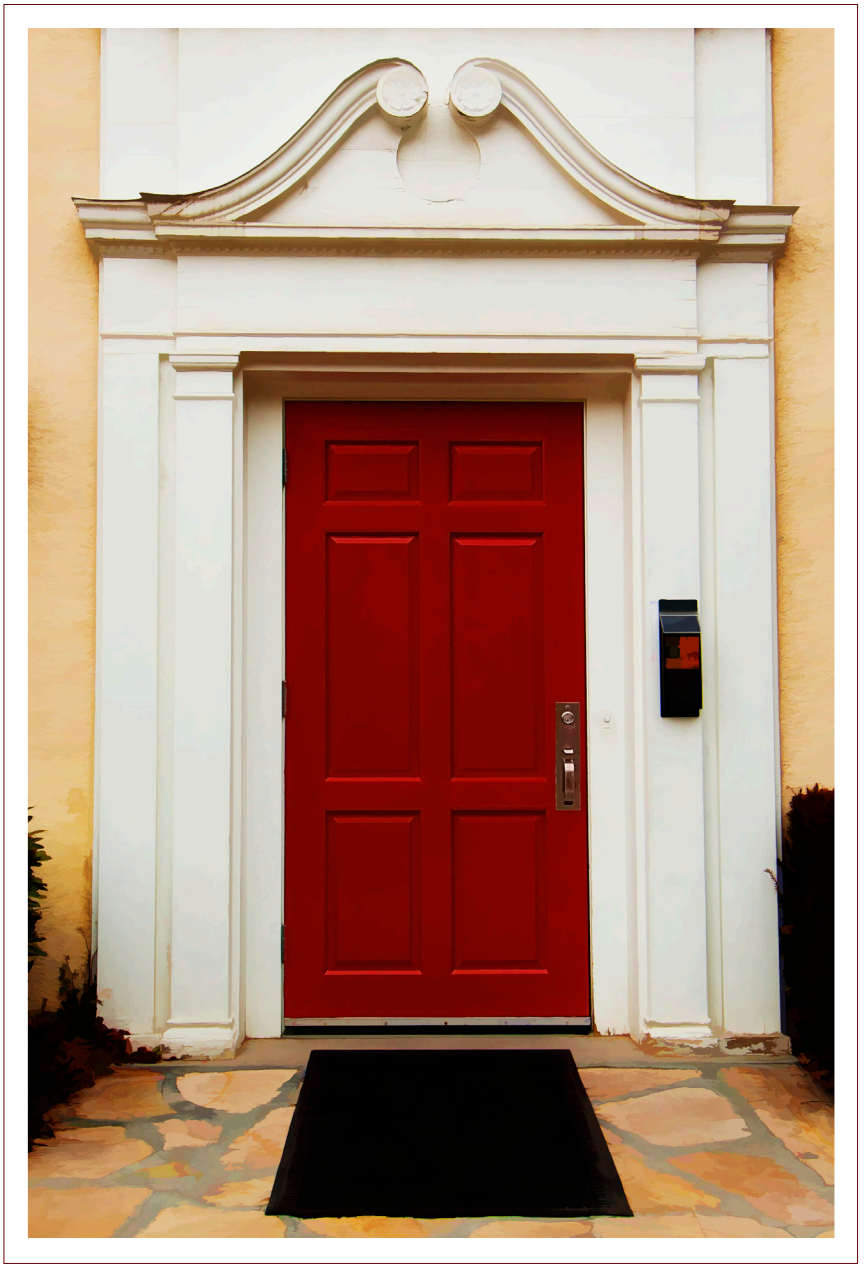
Sincerely,



Kirk Huffaker
Executive Director

cc: Steve Cornell, CRSA

CRSA



MEMORIAL HOUSE SUSTAINABILITY PLAN

90% DRAFT

SEPTEMBER 26, 2012

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EXECUTIVE SUMMARY

1. INTRODUCTION

a. Overall Purpose & Goals

The overall purpose of the Memorial House Sustainability Plan is to act as a guide for future decisions. Some of these decisions can be made by the current occupants and stewards of the building, Utah Heritage Foundation, while others will be ultimately be made by Salt Lake City Corporation, the owner. The plan incorporates the sustainable intentions and goals for decisions that will be made from three perspectives:

1. The ongoing upkeep and maintenance of the building;
2. Its operation as an events center;
3. The sustainable culture and behavior of UHF staff as occupants.

The primary goal of this study is to evaluate the current state of Memorial House and provide recommendations for current and future policies, practices, and physical upgrades to achieve maximum energy efficiency. The plan outlines a sustainable framework and prioritization for future capital improvements. Given the historic importance of Memorial House, the goals of this current project are designed to strike the right balance between sustainable technology, the preservation of character-defining historic elements in the architecture, and the current usage of the structure. The plan identifies ways in which Memorial House can function as a model example of 21st century sustainability in an historic building.

b. Process & Schedule

As well as being a guide, the Memorial House Sustainability Plan serves as a demonstration of UHF's commitment to and recognition of the city's goals in regard to sustainability. The plan was funded through a grant from the George S. and Dolores Doré Eccles Foundation. Utah Heritage Foundation released a Request for Proposals and subsequently hired CRSA in the spring of 2012 to prepare the plan. Reviews of draft plans took place over the summer, with the final plan document completed in Fall 2012. UHF intends to use this plan in their proposal to Salt Lake City for renewal of their lease as the stewards of Memorial House.

2. METHODOLOGY

The key to a successful sustainability plan for a historic building is understanding and identifying the existing energy-efficient aspects of the building and how they function, as well understanding and identifying its character-defining features to ensure their continued preservation. As part of the Sustainability Plan for Memorial House, this study assesses its existing characteristics including: the design, materials, type of construction, size, shape, site orientation, and climate, all of which play key roles in how the building performs.

This study will provide a Sustainability Plan that emphasizes improvements that provide the most effective results for the money, while maintaining the historic character of the building.

The key components of this study include:

- Energy efficiency (Embodied Energy vs. Operational Energy)
- Interior design
- Renewable Energy
- Minimizing Waste/Recycling
- Avoiding potential health hazards

3. COMPLIANCE

The sustainability plan and its recommendations will strive for harmony between the Secretary of the Interior's Standards for Rehabilitation of historic buildings and the 'green building' rating system most commonly used: Leadership in Energy and Environmental Design (LEED™). In addition, compliance with modern building codes used by Salt Lake City and Salt Lake County will be addressed, including: Fire Safety, Means of Egress, and General Safety.

4. BUILDING & INTERIORS EVALUATION

The evaluation of the building is organized into four parts, in which each of the different sections of the building are discussed:

a. Roofing

b. Windows & Envelope

c. Interior Design & Finishes

d. Inherent Sustainable Features

5. SYSTEMS EVALUATION

The systems of the building were evaluated for current efficiency and safety issues. The following are discussed in the document:

a. Mechanical: Heating, Plumbing, Fire Protection

b. Electrical: Electrical System, Lighting, Wiring, Fire Alarm

6. AVOIDING POTENTIAL HEALTH HAZARDS

Avoiding potential health hazards due to indoor pollutants is covered in the following sections:

a. Hazardous Materials

b. Ventilation & HVAC

c. Daylighting & Views

d. Materials Selection

7. MATERIALS & OPERATIONS

While the building's efficiency is a large component of its sustainability, the materials and operations of Memorial House as an events center and office play a large role in its impact on the environment, including catering policies and the cultural behavior of UHF staff.

8. ENERGY EFFICIENCY

Using energy use charts provided by Salt Lake City Corporation, an estimate of Memorial House's EUI was calculated to be 58, based on an estimated total building size of 10,000 ft^2. Generally, a low EUI is an indication of good energy performance. For general comparison purposes, a typical office building may have an EUI of anywhere between 100 and 193.

Innovative ways to improve the efficiency of the building envelope and systems are discussed in this section.

9. SUMMARY RECOMMENDATIONS

Recommendations for the building, its systems, and its operations are summarized in a series of prioritization charts in section 9 of the document. The recommendations are each assigned a priority level based on current understanding of needs and costs, which is not to preclude a re-prioritization should specific project funding

opportunities become available, or a significant change in costs or technology occurs. A brief summary of the recommendations for each chart are provided below:

a. Inherent Sustainability - aspects and elements of the existing building that are inherently sustainable, and should be retained and maintained to the greatest extent possible. These include:

- operable windows,
- the high ceiling of the main hall, which allows heat to rise and air to circulate,
- energy embodied in the building,
- historic significance contributes to renovation prioritization and increases likelihood of a long building life,
- wood elements that were sourced from local, slow-growth trees, and
- the embodied culture of the building's history and use as an events center since 1926.

b. Quick Fixes & Immediate Concern - actions that can be done very cost-effectively for immediate improvements, or are items requiring immediate attention for safety purposes or to address significant areas of energy or water waste. These include:

- Windows and Doors - weather stripping and caulking to minimize air infiltration,
- Thermal Envelope - bring insulation up to an R-value of 42 where deficiencies are indicated,
- HVAC - relocate thermostats to the spaces they primarily control; correct leaks in Coolerado system and recommission system,
- Electrical - GFCI receptacles, additional emergency lighting in Main Hall, replace incandescents, reduce number of lights in Garden Room track lighting system,
- Operations - develop Green Cleaning measures and sustainable policies for Vendors/Caterers.

c. Short-term Concern (1 to 3 years) - actions to be prioritized in the next year or two to improve the indoor environment of the building. These include:

- Windows - restore operability
- Finishes - Adopt VOC and content standards for finishes and millwork/wood/furniture, adopt standards for carpet replacement

d. Mid-term Concern (3 to 10 years) - actions for the next few

years as funds become available to improve efficiencies. These include:

- Windows and Doors - refit/rebuild and consider reglazing,
- Thermal Barrier - remove existing blown-in insulation to address air leaks, insulate ceiling of crawl space/basement, insulate Garden Room roof and restructure rock wall,
- Water - replace fixtures with low-flow options,
- Electrical and Fire Safety - replace light switches, new addressable fire alarm system, fire pull stations at exit doors, add horn/strobes and smoke detectors to Main Hall

e. Long-term Replacement & Opportunities for Innovation (ongoing and 10 years out) - actions for system replacement, when funding/grants become available to implement innovative solutions for energy sourcing. These may include:

Windows - evaluate need for replacement after they have been reworked (if replacement recommended, use historically-compatible options with low-e glazing,

- Doors - replace with historically-compatible ADA-compliant options that include low-e glazing,
- Water - replace water heater with on-demand version or solar hot water system,
- Photovoltaic - PV panels to supply lighting energy,
- HVAC - high efficiency furnaces or review other systems available at that time,
- Wind - purchase contract for wind energy not able to be sourced onsite.

Additionally, each recommendation element is categorized based on one or more of the following five evaluation criteria:

1. Safety: Enhances health and life-safety of the building occupants
2. Preservation: Enhances historical, architectural, or visual integrity, character, or quality
3. Indoor Environment: Enhances health or experienced environment
4. Energy Efficiency: Enhances energy efficiency or leads to a reduction in energy use
5. Responsibility: Provides preference to renewable, recycled, or local sources of energy and materials.

1. INTRODUCTION

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1. The ongoing upkeep and maintenance of the building;
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The primary goal of this study is to evaluate the current state of Memorial House and provide recommendations for current and future policies, practices, and physical upgrades to achieve maximum energy efficiency. The plan outlines a sustainable framework and prioritization for future capital improvements. Given the historic importance of Memorial House, the goals of this current project are designed to strike the right balance between sustainable technology, the preservation of character-defining historic elements in the architecture, and the current usage of the structure. The plan identifies ways in which Memorial House can function as a model example of 21st century sustainability in an historic building.

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As well as being a guide, the Memorial House Sustainability Plan serves as a demonstration of UHF's commitment to and recognition of the city's goals in regard to sustainability. The plan was funded through a grant from the George S. and Dolores Doré Eccles Foundation. Utah Heritage Foundation released a Request for Proposals and subsequently hired CRSA in the spring of 2012 to prepare the plan. Reviews of draft plans took place over the summer, with the final plan document completed in Fall 2012. UHF intends to use this plan in their proposal to Salt Lake City for renewal of thier lease as the stewards of Memorial House.

c. History & Building Overview (Summarized from www.utahheritagefoundation.org)

Memorial House had humble beginnings, constructed ca. 1890 originally as a horse stable and storage shed for Salt Lake City-based contractor Patrick J. Moran. In 1902 the property was purchased by Salt Lake City and was used as a barn, tool shed and blacksmith shop. Beginning in 1926, Salt Lake City leased the structure to the Service Star Legion as a venue for veterans' activities.

The Service Star Legion hired Hyrum Pope and Harold Burton, prominent local architects, to design the renovation. The non-descript brick building was covered with stucco, six rounded dormers were added to the roof, and the windows on the east wall were turned into French doors, and the barn was reinvented as a Georgian-style hall.

In 1953, Memorial House underwent a moderate renovation including a new heating system, stairway to access a second floor, and a garden room addition on the west side. The patio on the east side was built in 1974. When the Service Star Legion lease expired in 1984 the building sat unused until Utah Heritage Foundation entered into a lease in 1994 to use the building as their administrative offices as well as a reception center.

Thus, the building has functioned as an events and reception center for nearly the past century. While under the management of Utah Heritage Foundation, Memorial House typically hosts over 100 events a year. As such, it provides a perfect opportunity to showcase the inherent sustainable features of historic buildings, as well as ways new, innovative systems and equipment can be incorporated into an existing structure.

2. METHODOLOGY

This study identifies ways in which this iconic historic building can become a model of 21st century sustainability. By incorporating whole building design guidelines, the future maintenance, management and construction at Memorial House will be fully integrated and lead to a successful high-performance historic building.

The key to a successful sustainability plan for a historic building is understanding and identifying the existing energy-efficient aspects of the building and how they function, as well understanding and identifying its character-defining features to ensure their continued preservation. As part of the Sustainability Plan for

Memorial House, this study assesses its existing characteristics including: the design, materials, type of construction, size, shape, site orientation, and climate, all of which play key roles in how the building performs.

This study will provide a Sustainability Plan that emphasizes improvements that provide the most effective results for the money, while maintaining the historic character of the building.

The key components of this study include:

a. Energy efficiency (Embodied Energy vs. Operational Energy)

Because there is a quantitative embodied energy in the existing building materials, a successful energy efficiency plan will account for this unique aspect in the overall analysis. Historic building construction methods and materials usually maximized natural sources of heat, light and ventilation to respond to local climatic conditions. As such, the energy efficiency recommendations will address restoring the environmental responses the historic building was designed for and capitalizing on its innate potential to passively heat and cool its interior environment, while implementing modern systems in support of the passive systems. The CRSA team has performed an energy audit to evaluate the current energy use of the building and identified deficiencies in the building envelope or mechanical systems. The building envelope will be analyzed and assessed for leakage and R-values and deficiencies will be addressed and recommendations provided such as adding attic insulation, weather-stripping doors and windows, installing storm windows, and insulating crawl spaces.

User behavior is one of the greatest effects on operational energy use. To that end, cultural and technical applications will be included in our recommendations. These include: programmable thermostats, insulated shades and curtains to control heat gain and loss through windows, operable windows and shutters to control temperature and ventilation, energy efficient lighting and motion sensors capitalizing on natural light, installing and reducing “phantom” electricity loads by turning equipment off when not in use.

b. Interior design

Because we spend 90% of our time indoors, sustainable interior design is an integral component of a building’s overall sustainability. This includes energy conservation, but is also about creating and effecting a healthy interior environment by utilizing natural day-lighting, enhancing air quality, and minimizing

or eliminating VOCs. The interior design sustainability plan will include practical recommendations to yield overall energy savings, measurable water and other natural resource conservation, and tangible improvements to indoor air quality.

c. Renewable Energy

We propose an analysis of feasible cost-effective alternative and renewable energy resources available at the Memorial House site. The use of most alternative energy strategies should be pursued only after all other upgrades have been implemented to make the building more energy efficient given the typically high cost. However, that does not exclude devices that utilize solar, geothermal, wind and other sources of energy provided they can be installed cost-effectively and non-invasively.

d. Minimizing Waste/Recycling

Historic preservation is at its essence an environmentally responsible practice. By reusing existing buildings historic preservation is a recycling program. By fundamentally changing work practices as well, one can effectively reduce waste output and implement a cradle-to-cradle work ethic. We will recommend work practices to enhance sustainable results.

e. Avoiding potential health hazards

As with many historic buildings, hazardous materials pose potential health risks to the building's users. By identifying where risks may occur, the issues may be mitigated and health hazards will be prevented. Two common hazards are asbestos-containing materials and lead paint. Just as important is moisture: archaic foundations may not be adequately protected against moisture infiltration. Our study will identify these and other health hazard risks and recommend mitigation strategies.

f. Recommendations

Many of the sustainability recommendations are consistent with historic building construction. Methods and materials often maximized natural sources of heat, light and ventilation to respond to local climatic conditions. As such, the energy efficiency plan will address restoring the environmental response the historic building was designed for and capitalizing on its unique innate potential to passively heat and cool its interior environment, while implementing modern systems in support of the passive

systems. Where conflicts may arise between the Secretary of Interior's Standards for Rehabilitation and the sustainability recommendations, great care will be exercised to maintain the historic integrity while integrating the best sustainability practices in as careful manner as possible.

3. COMPLIANCE

a. Secretary of the Interior's Standards for Rehabilitation

The sustainability study and recommendations will work to be in harmony with the Secretary of the Interior's Standards for Rehabilitation:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its

environment.

10. New additions and adjacent or related new construction will be undertaken in a such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

b. Leadership in Energy and Environmental Design (LEED™)

One of the better known green building rating systems, Leadership in Energy and Environmental Design (LEED™) is an independent, third-party verification system for buildings or communities designed and built using strategies aimed at achieving high performance. While it is not the intent of this plan to document compliance or potential achievement of LEED certification, the information is provided as a reference guide for future decision-making purposes.

Each LEED project must achieve a set of prerequisites and can be awarded up to 100 possible points which result in varying certification levels beginning with “Certified”, graduating up to “Silver”, “Gold” and “Platinum” certification. Salt Lake City requires Silver certification for all new City buildings. The LEED Rating system provides helpful guidelines for renovation projects such as volatile organic compound limits for paints, primers, adhesives, sealants and standards for other chemical or environmental limits and performances.

With various potential rating system tracks within the LEED family, LEED for Existing Buildings: Operations and Maintenance (LEED-EB: OM) will likely be the most compatible for the operations, maintenance and minor renovations at the Memorial House. This rating system addresses building operations, processes, systems upgrades, minor space-use changes, and minor facility alterations or additions. This program encourages owners and operators of existing buildings to implement sustainable practices and reduce environmental impacts of their buildings over their functional life cycles. Incorporating a specialized set of prerequisites and points, LEED-EB: OM rates high performance in the following seven categories:

Sustainable Sites,
Water Efficiency,
Energy and Atmosphere,
Materials and Resources,
Indoor Environmental Quality,
Innovation & Design, and
Regional Priority.

c. Salt Lake City and Salt Lake County Compliance

An important aspect of long term preservation and viability of the building is the historic structure's compliance with modern building code. This serves to enhance the overall environment and use of the building through its emphasis on Life-Safety features including: Fire Safety, Means of Egress, and General Safety. Evaluation of existing buildings in Chapter 34 of the International Building Code addresses these three major categories regarding building compliance. Because the building is an existing structure, Chapter 34 allows for alternative compliance categories. These categories are intended to maintain or increase the current degree of public safety, health and general welfare in existing buildings while permitting repairs, alterations, additions and change of occupancies without requiring full compliance with the current adopted building codes.

3410.5.1 FIRE SAFETY

Fire safety addresses the structural, fire resistance, automatic fire detection, fire alarm and fire suppression system features of the facility.

3410.5.2 MEANS OF EGRESS

Means of egress assesses the configuration, characteristics and support features for means of egress in the facility.

3410.5.3 GENERAL SAFETY

The general safety category covers the fire safety parameters and the means of egress parameters. As an existing historic structure, Memorial House should be assessed per alternative compliance categories in Chapter 34 of the IBC. However, where feasible, full compliance with current codes and standards should be followed, particularly if the building is to be re-purposed or subject to adaptive re-use.

4. BUILDING & INTERIORS EVALUATION

Memorial House consists of several distinct sections. On the north end of the building is a two-story section. On the main level it contains the entry hall, an office for the building/event manager (which also functions as a bride's room), and restrooms. The upstairs portion contains the offices of Utah Heritage Foundation. The south end of the building consists of a one-story main event hall, with small attic-level dormers, a kitchen, and a one-story garden room addition to the west. The Garden Room addition dates to 1953. The main event hall opens out onto a patio on the east side of the building. The Garden Room addition opens out onto a small patio, garden, and lawn on the south side of the building. A small mudroom connects the kitchen and Garden Room addition and provides rear access to the building. A storage building is attached to the northwest portion of the Garden Room addition, with exterior access only.

The evaluation of the building is organized into four parts, in which each of the different sections of the building will be discussed:

- Roofing
- Windows & Envelope
- Interior Design & Finishes
- Inherent Sustainable Features

a. Roofing

The roof of the main event hall and two-story section are pitched and shingled. The primary roofing material is a cedar shingle roofing. The shingle roofing is in relatively good condition overall and does not show visible signs of damage or disrepair. The shingle roofing is a relatively durable product, and has a lifespan of 50 or more years with proper and regular maintenance. The roof was reshingled in 1994, thus the shingles are nearly 20 years into their lifespan. Some of the shingles have been removed and replaced with a reasonably well-matched asphalt tile shingle. This replacement is limited to the rear of the roof and was done to accommodate the need for routine service and maintenance of new rooftop mechanical units.

There is no insulation in the roofing structure of the main roof. However, there is insulation for the main event hall and two-story section in the form of blown-in loose insulation, which is located on top of the ceiling joists. The depth of the insulation is difficult

to gauge; however, it appears to be at least 8 inches. The depth appears to be inconsistent and the coverage at the areas along the exterior wall is often non-existent. In addition, the wall between the single story space and the two story space has some insulation batting in place, but this is inconsistent at best and in some cases is missing altogether.

Garden Room

The Garden Room addition has a very low pitch and the roof consists of a white membrane roof and appears to be relatively new. Non-slip mats have been laid to provide access to the skylights and roof of the main event hall. The roof appears weather-tight. There is no apparent damage or failures to the roofing membrane. Some patching has occurred, but this is a routine condition. A small leak has been noticeable in one section, as small white drops (from the paint) appear after it has rained. Insulation appears to be non-existent for the roof of the Garden Room addition based on site inspection. Four skylights on the garden room addition provide natural daylight and are raised above the roofline.

The Main Hall roof drains out of a gutter onto this low sloped roof and is directed to the west edge. There are flexible pipes directing the water into the landscaping. A concrete gutter has been constructed to capture the water from the roof and direct it to the south to the end of the building. The larger issue, though, is that the gutter is consistently filled with weeds, trash, dirt, and general debris and the water is not effectively directed away from the stone retaining wall below. Based on visual observation, it appears there is some puddling that occurs in these areas and likely the water

seeps below grade, affecting the integrity of the wall below. The wall is experiencing serious structural integrity issues, which are discussed further in the following section.

b. Windows & Envelope

This section of the evaluation covers the existing conditions of the building envelope, including the exterior wall type, windows, exterior doors, and assessment of the status of insulation and air infiltration. Estimates of current R-value and U-factor values are provided.

R-value is a measure of a thermal resistance for various materials. Essentially, it is providing information on how well a material prevents the flow of heat through it, either from the outside in or vice versa. Materials with higher R-values provide more thermal resistance, and therefore, better insulation.

U-factor is essentially the inverse of an R-value. It is an indication of how well a material conducts heat. It is a measure of the transfer of heat, or rate of heat loss. Materials with a smaller U-value are more effective at reducing the transfer of heat, and therefore, better insulators.

The R-value is used to describe the insulating properties of the building envelope (walls, floors, roof), while the U-factor is used to describe the insulating properties of windows.

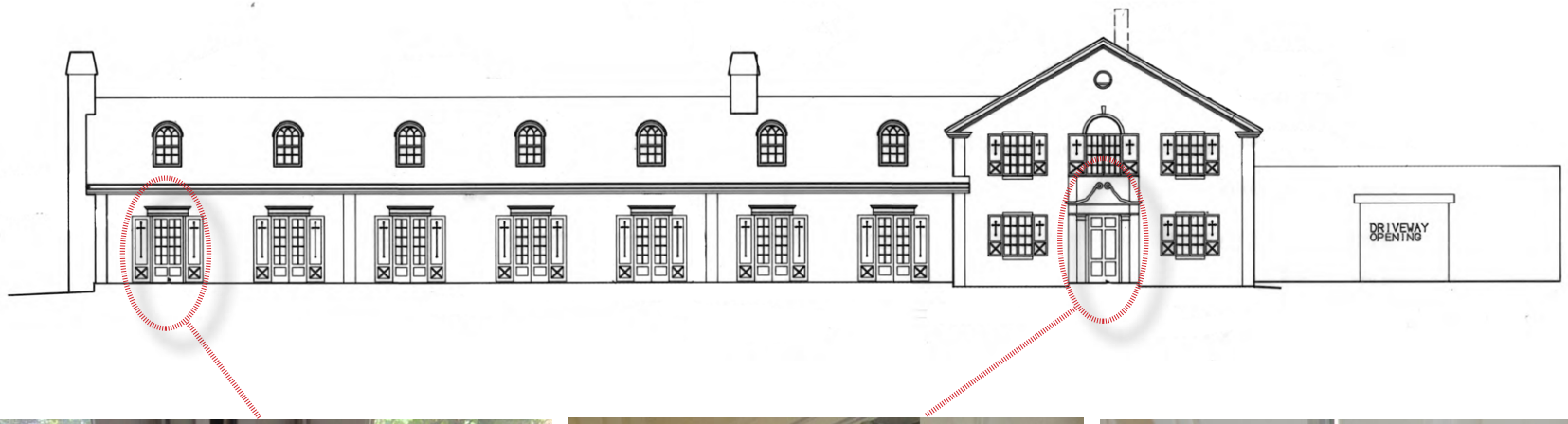
The R-value and U-factor can be compared by dividing 1 by the U-factor number to achieve the R-value. For example, an U-factor of .5 equals an R-value of 2.0.

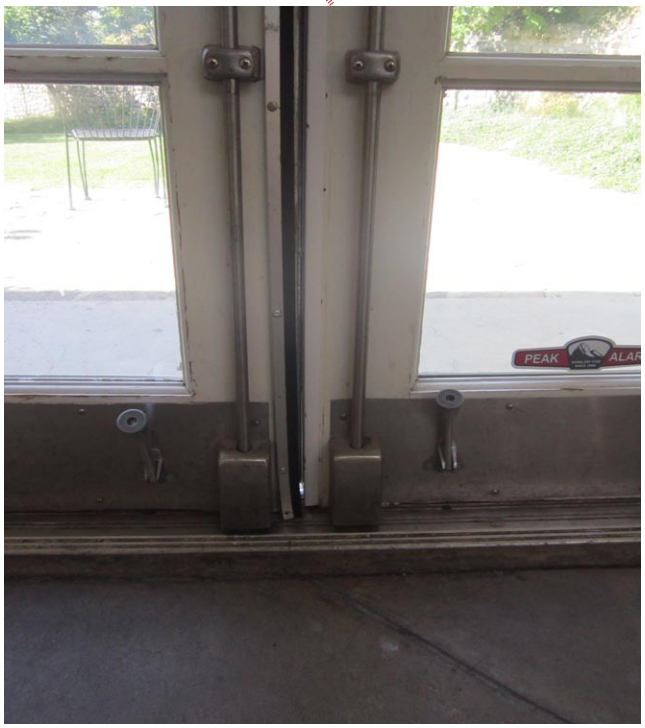
Main Event Hall and Two-Story Section – Walls and Overview

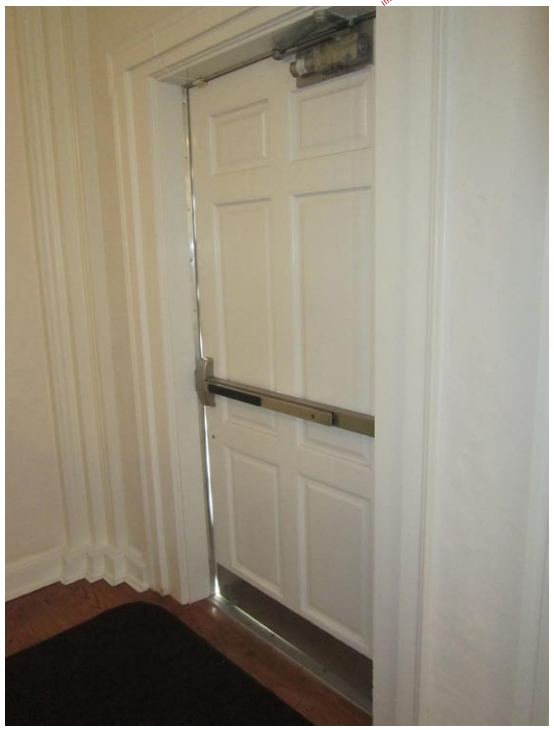
The two-story section is comprised of a painted, stucco-covered brick masonry exterior. The stucco is generally in good condition, with a few areas of cracking. The condition of the mortar and underlying masonry is unknown, due to the stucco. The exterior walls of the main structure do not have any insulation. The relatively thick wall assembly consists of a masonry core with stucco on the outside and a heavy coat of plaster on the inside. Having a high masonry content, the assembly is, thus, an effective thermal mass and acts as one of the components in the passive heating/cooling system of the building.

The doors of the main building are of two types, the original stile and rail wood doors, dating to the 1920s when the building was adapted from its use as a stable and converted to the meeting hall, and a replacement, ADA compliant door. (see Graphics 1 & 2)

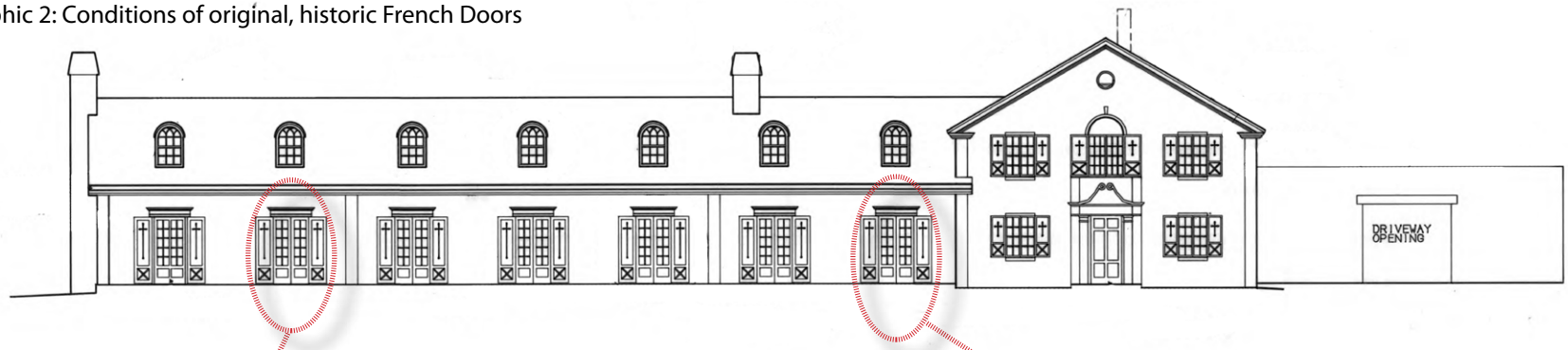
Graphic 1: Conditions of replacement doors

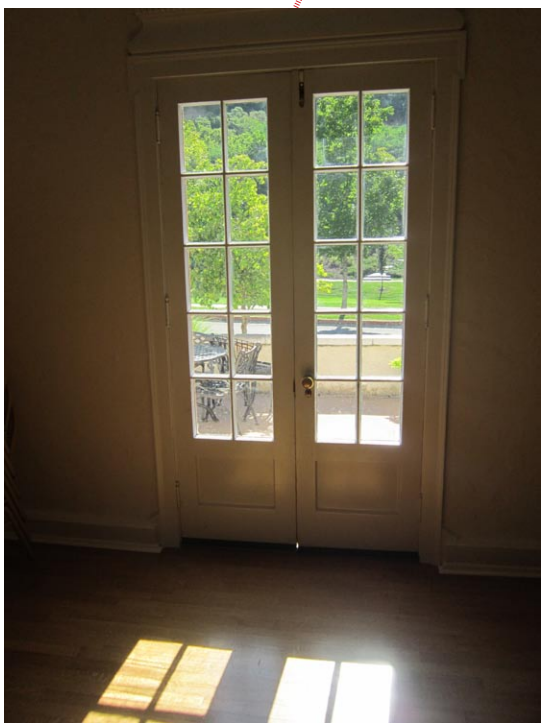


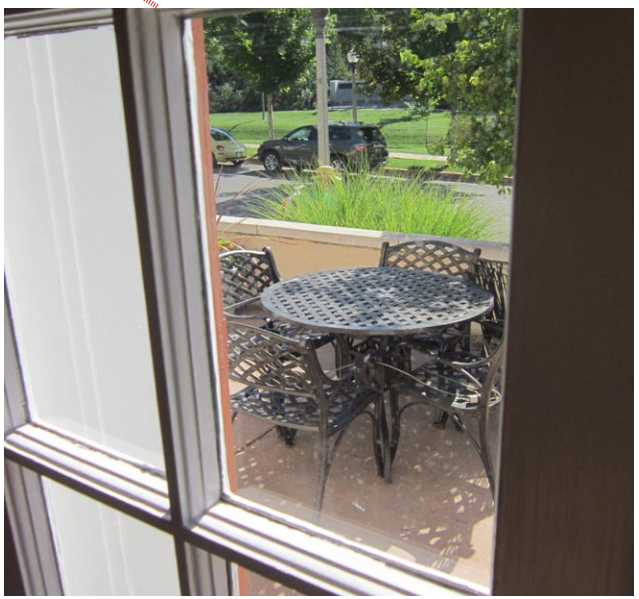




Graphic 2: Conditions of original, historic French Doors







There are two of these doors on the exterior of the main building, one at the main entrance to Memorial House and one in the main hall at the extreme south end, again on the east elevation. In both cases, the new doors show signs of deterioration, there are visible gaps between the frame and the door, not just from a lack of weather-stripping, but from some deformation in the door itself. There is also significant damage to the weather-stripping in both cases. In addition, the doors lack any insulative value. The slab of both doors on the day we observed them was warm to the touch on the inside face, on both the glazed and wood surfaces. The glazing, though appearing to be an insulated glazing, still does not appear to have a satisfactory U-facotr value. Two more doors of this same type lead between the main event hall and the Garden Room addition to the west.

For their age, some of the existing c. 1926 french doors appear to be in relatively good condition. While there are some gaps around the edge of the frame, there are few visible gaps between the double-leaf in each opening, with some notable exceptions. However, Memorial House staff describe the wood as 'rotting' and 'thin' with daylight visible through it for some units. A recent application of paint obscures this condition to some degree. Some of the doors show signs of deterioration at the base where water has damaged the wood over time. Additionally, the wood is failing in areas where the hardware is attached. Without exception, all of these doors (ca. 1926) have single glazed panes. There appears again to be an unsatisfactory U-factor value. (see Table 1 for R-value and U-factor estimates)

The windows on the two-story section primarily consist of wood casement windows with divided lights. The divided lights appear to

be achieved through the exterior application of muntins on a single sheet of glass, rather than individual panes of glass. Windows are single-pane glass. All of the windows are presumed to be dated to the 1920's when the building was reconfigured for use by the Service Star Legion. In one or two instances, some rebuilding of the windows may have occurred; however the majority of them appear to be in original condition.

Two-Story Section – lower level windows and doors

The main entry to the building is on the east façade of this two-story section. On either side of the entry door is a set of divided light, wood casement windows. These are single-paned glass, with 2x4 lights on each of the windows in the casement set. Along the north façade are three pairs of casements in the same style. The

TABLE 1: R-VALUE AND U-FACTOR ESTIMATES

Wall/Window/Door Type	R – Value	U - Factor
Double-wythe Brick w/ stucco exterior & plaster interior	Stucco (cement plaster) @3/4"= 0.026 Brick 4" common – 2 wythe = 1.60 Plaster (gypsum plaster) @ ½" = 0.056 Air space = 1.00 **Total = 2.682**	
Fieldstone w/ mortared joints (uncovered interior)	Comparative to concrete: 0.08 per inch x 18" thick wall **Total = 1.44**	
Wood Casements, Double/Single-hung, French Doors w/ single pane, single sheet	Single pane glass = 0.91	Single pane glass = 1.1
Wood French Doors – non-operable sidelights & transoms w/ double-pane, individual lights	Double pane glass @ ½" = 2.04	Double pane glass @ ½"= 0.50
Wood Door w/ individual lights on upper ¾ of door	Single pane glass : ¾ of door @ 0.91 = 0.6825 Solid Wood Door : ¼ of door @ 2.5 = 0.625 **Total = 1.3075**	Double pane glass : ¾ of door @ 1.1 = 0.825 Solid wood door : ¼ of door @ 0.40 = 0.20 **Total = 1.025**

one in the middle is smaller in configuration. Some are currently inoperable due to being painted shut. The window in the office is operable, however the hardware is not in good shape, making the windows difficult to open and close. Additionally, the set of casements on the west end of the north façade has had the paint seal broken. This window is located in the men's restroom and contains 2x3 lights and frosted glass. On the lower level of the west façade are two windows with divided lights. One contains 2x2 lights and the other 2x3. These have frosted glass and are located in the women's restroom. Both appear to be non-operable. The entry hall leading into the main event hall contains 2 french doors in the same style and configuration as the main event hall.

Two-Story Section – upper level windows

The upper level of the west façade contains two sets of casements windows with 2x4 lights and one spring loaded double-hung

window with 6 over 6 lights. Interior screens are present. One set of the casement windows and the double-hung window all are original, but may have been reworked as the hardware and screens are newer than the other original windows.

Main Hall

The windows in this portion of the building are either French doors or casement windows. The south wall of the main event hall contains two pairs of casement windows, with 2x4 divided lights. Although the windows are designed as casement, no hardware is present. The windows contain single-pane glass. They are currently inoperable due to being painted shut and lacking hardware.

Seven pairs of French doors comprise the remainder of the windows in the main event hall. Three sets lead to the garden room addition to the west and four sets lead to the patio on the east side of the building. Each of the doors contains 2x5 divided lights. The glass is single paned.

Three single wood doors with divided lights on the upper portion have been installed where French doors were previously located. One door is on the east wall, leading to the patio. The other two are on each end of the west wall leading to the garden room.

While all the doors are far from air tight, the newer doors actually have the largest gaps around their edges.

The main event hall contains four ceiling vents on the slope of the ceiling. Two vents are on each end of the hall, located near the peak of the ceiling. Five floor vents are located along the east and west walls of the hall.

Garden Room

The wall type for the Garden Room is a rough-cut fieldstone with mortar joints. The fieldstone is uncovered and unpainted on both the exterior and interior sides of the wall. The wall appears to be about 8 inches in thickness. The mortar joints appear to be tight, with little evidence of crumbling or spalling. The west exterior wall primarily functions as a stone retaining wall. It remains unclear what degree of waterproofing the wall has been given. Since the work on the wall was done in the 1950s, even if it was given some waterproofing mitigation at that time the mitigation may be ineffective presently. There are signs of water damage on the interior side of these stone walls, and more problematic, the walls have a slight cant to them toward the interior as the mass of earth below Capitol Hill pushes down into the building. Evidence of

cracking in the mortar joints and the inward cant is visible along the top north end. Stabilization work was recently done on the retaining wall, however this was only on 25 feet of the wall to the north of the building. The work did not extend to the wall that is inside the Garden Room.

The south wall of the Garden Room contains a set of wood French doors with non-operable sidelights and transoms. The wood is painted white. The glass is double-paned for the French doors and the sidelights and transoms. These date to the 1994 remodel.

No gaps in the glazing are evident for any of the glass. A minor gap is present at the bottom of the doors, where they join together.

Four non-operable skylights are located at an even spacing on the roof of the addition hall to allow additional daylight into the area. The skylights also data to the 1994 remodel. The skylights are in good shape, with no noticeable gaps in the seal. No leakage has been reported by the building manager. One skylight has a small ding in the glass, which appears to be cosmetic in nature only.

The Garden Room contains a solid wood swing door that leads into the mudroom, which in turn connects to the kitchen.

The Garden Room contains two air return vents located on the north wall.

Kitchen

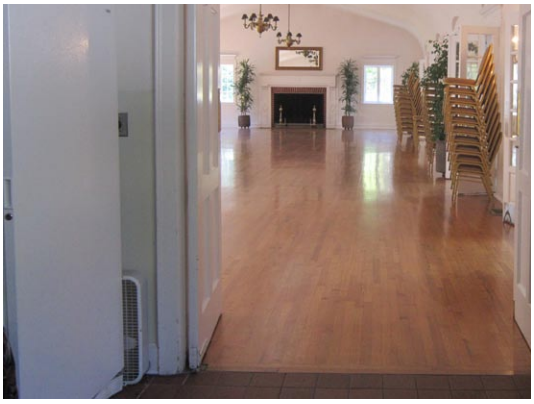
The kitchen contains four double-hung wood windows on the west wall. Two of the windows are 6 over 6 divided lights; the other two are 4 over 4 divided lights. The windows retain their original rope pulls. They are currently inoperable due to being painted shut.

The mudroom off the kitchen contains a single wood window with

2 x 8 divided lights. The glass is one single pane, with exterior applied muntins. One section of the muntins is missing on the interior of the window. The glass is single-pane.

No door is located in the opening between the kitchen and mudroom. The mudroom has an exterior door that is solid wood, with no window. Some gaps occur along the top, side, and bottom of the opening edge, with the most noticeable gap along the top where an alarm fixture has been installed. The door is in need of paint and the closure bar is currently not connected/operable. This door is used for transporting tables and chairs into the Main Hall for catered events, thus needs to stay open often.

The walls of the kitchen are either gypsum board (on interior walls) or plaster over the masonry on exterior walls.



Attic

The majority of the attic space above the main entry hall is unfinished, unconditioned space. A small storage and mechanical room, accessible from the upper level of the two-story addition is partially finished, but not conditioned. Dormer windows from the 1926 remodel line the east side of the attic. These appear to be operable single-hung windows; however they are not immediately accessible for day-to-day operation.

Basement/Crawl Space

The basement/crawl space functions as a semi-conditioned space due to the lack of a thermal barrier between the space and the main level of the building. Without a thermal barrier, the basement draws heat out of the conditioned space above during the winter, while also introducing unwanted cool air.

c. Interior Design & Finishes

A brief overview of the current interior design and finishes is provided to establish the following objectives:

- Identify those elements that are of historic integrity to the construction of the building
- Identify those elements that are currently sustainable in nature (or vice versa)
- Identify areas where replacement is likely, and indicate how these can become more sustainable as the replacement is undertaken.

Main Hall

A hardwood floor covers the extent of the main hall and entry way. It is protected with a polyurethane finish. In the entry way, a wide rug runner is used to cover the wood floor and catch mud and debris as people enter the building.

Lighting in the main hall consists of four chandeliers and six wall-mounted scones. Each chandelier contains 6 candle-style lights. The light bulbs used are conventional incandescents, with bulb-mounted shades used to deflect light downward. The scones contain two lights, also in the candle style with conventional incandescent bulbs.

A decorative cornice is atop each set of doors and the windows in the main hall. A recessed arch is above each cornice for the doors on the east and west walls, which in combination with the cornice resemble a segmented pediment detail. A modest, decorative baseboard is in place around the perimeter of the main hall and casing is present around each set of doors and windows. These details are presumed to date to the reconfiguration of the building in 1926. The ceiling in the main hall is coved and finished in a tudor arch. A fireplace is located on the south wall, with a red brick hearth and border inside a wood, decorative mantel.

The entry hall has similar finished to the main hall, except the windows and doors do not have the decorative cornice atop. The light fixtures in the entry hall are suspended from the ceiling and contain a single, candle-style fixture inside a clear glass cylinder shade.

Garden Room

The floor in the garden room is a stained and scored concrete. Some cracks are present, as well as one kidney-shaped area where a patching job appears to have occurred. The ceiling is open, with exposed wood beam rafters.

The lighting consists of a series of track lighting, mounted to the sides of the roof beams. Each track generally contains 4 to 6 bulb fixtures. A total of 63 bulb fixtures currently light the room. The majority of these bulbs are compact fluorescents, with a few incandescent bulbs interspersed. (photo #045)

A white, ceramic drinking fountain is inset-mounted on the east wall of the garden room. As the east wall was originally an exterior wall, the decorative cornice and casing are the same style as that used on the east façade.

A simple wood casing surrounds the doorway leading from the Garden Room to the mudroom and then the kitchen. The mudroom also has a concrete floor. Its lighting is provided by a single, fluorescent tube light fixture with a plexiglass cover; the cover has a broken edge.

Kitchen

The kitchen contains two swing doors of painted wood that lead into the main entry hall. While the doors are likely original, they have had newer brass push plates applied that don't match with other door hardware. A new(er) door leads from the kitchen into a hallway off the entry hall that provides access to the upstairs and basement levels.

The floor in the kitchen consists of 6"x6" red ceramic tiles, which date to a remodel done in 2005.

A simple, painted baseboard and casing are present. These are likely original to the kitchen.

Two-story section

A five-panel painted wood door leads to the upper level from a small hallway off the entry hall. The hardware on the door is simple in design, but likely original to the construction era of the door. Upstairs, the area has been reconfigured for use by UHF for the organization's offices. There is a combination of historic and contemporary elements that date to the remodeling.

On the south portion of the upper level, two of the rooms have doors with single beveled-edge panel. These have nice door hardware that is historic and likely original to the construction era of the door. The three doors to the offices along the north portion of the upper level have a newer, simple hardware.

Interior, non-operable windows provide additional daylight to the corner offices on the north section.

The carpet on the upper level has areas where seams are exposed, which are due to wear and tear over the past 18 years.

The walls are painted gypsum board or plaster, with painted wood casings and baseboard. The profile is simple, without decoration.

d. Inherent sustainable features

It has been said that the most sustainable building is the one that is already built; this is especially true with the Memorial House. Utilizing the Memorial House building maximizes the embodied

energy of the building. The fact that the building has a historic designation and is a cherished treasure of the community, it is more likely for the building to be maintained and reused for years to come, further lengthening the life of the Memorial House.
In the time the building was built, mechanical heating, cooling and efficient lighting was not available, making it necessary for the building form and openings to utilize passive options. The fenestration pattern provides natural daylight into the interior spaces very effectively. Operable doors and windows throughout the space allow for natural ventilation. Occupants that can have control over their ventilation and temperature through the use of operable windows are often comfortable in a wider range of temperatures; this lessens the load of mechanical heating and cooling and therefore lower energy use. Spaces with high volumes such as the main hall allow for hotter air to rise and windows on opposing walls allow for air movement to cool occupants. It was necessary for the builders of the Memorial House to utilize locally available building materials as transportation was costly and difficult. Likewise, millwork and other woodwork would have been made from slow-growth trees, rendering stronger more durable wood.

RECOMMENDATIONS:

The primary recommendation with regard to the exterior envelope should address the existing glazing. The existing doors (both new and original) should be refitted with a modern, thermally efficient low-e insulated glazing. The depth of the original door frame and muntins are sufficient to accept a 3/8" insulated glazing unit. This measure would greatly increase the overall performance of the building given the relatively high ratio of glazing surface to wall surface. New weather stripping should be installed to replace the existing. Though some is undoubtedly in fair condition, this should be a top priority. In addition, consideration should be given to replacing the newer ADA compliant doors with an insulated glazed door given the disrepair on these currently. This same recommendation applies to the dormer windows in the attic, although if the insulation is installed well, these will open into unconditioned spaces, so this is of lower priority`.

The insulation in the attic should be maintained and added to where necessary. Because most of this is intact, the actual depth should be measured and additional insulation should be added to achieve code minimum, (R-value 42). If this is not achievable without altering the existing building, then the highest R-value achievable should be sought. Where missing, especially

at the edge of the roof, insulation should be added to maintain consistency and to effectively isolate the unconditioned attic space from the main building. Additionally, the roof of the Garden Room should be insulated to an R-value of 42 with batting-style insulation placed between the beams and then covered with a rigid ceiling.

Another issue to deal with is the un-insulated storage room in the attic and the adjacent conference room. The walls should be insulated to prevent heat loss from the conference room in the winter and heat gain in the conference room in the summer. This room is prone to uncomfortable working environments at the moment because of these deficiencies. In addition, the wall between the single-story space and the two-story space appears to have some insulation in place, but this is inconsistent at best, in some cases is missing altogether. The existing insulation should be removed and new insulation should be installed consistently, again to isolate the attic space from the occupied spaces beyond.

New insulation on the interior side of the exterior walls is not recommended on the main floor because this would have an adverse effect on the existing historic elements in these spaces. New exterior wall insulation is recommended on the second level, however, given there are fewer historic elements on the second level spaces. An additional advantage of adding insulation within the inside surface of the exterior walls is that it allows for electrical and data conduit to be located inside the wall. Currently, the conduit is surface mounted to the wall, a much easier proposition than routing out a trough in the masonry and burying the conduit in the wall. This would typically be a 1 1/2" to 2" rigid board insulation with a new layer of sheetrock. This would add approximately about 10 points to the total R-value of the wall. This is sensible given the placement of offices in these second story spaces. The disadvantage of this upgrade is the disruption to the existing office spaces for an unspecified amount of time during the construction and the substantial decrease in square footage in these already tightly arranged office spaces.

The roofing should be maintained as it is in good condition and remains viable for some time. However, the current wall system of the Garden Room needs to be reengineered both structurally and hydrologically. The soils are likely unstable behind the wall, though this has not been evaluated by a geotechnical engineer and is only an assumption made based on visual observation of the wall. The overall drainage system of the roof needs to be reconsidered over the long term stabilization and sustainability of the building.

5. SYSTEMS EVALUATION

a. Mechanical

i. Heating

The original building was built as a stable and equipment storage shed in about 1890. Since 1926 it has had renovations and improvements to convert it to its present use. Much of the present HVAC system was installed in 1994. One furnace serves the Main Hall and other first floor rooms through floor registers near the exterior walls. Another furnace serves the Garden Room and another serves the second floor offices.

Evaporative coolers (swamp coolers) were connected to the same ductwork as the furnaces in 1994 to supply cool (and moist) outside air to the Main Hall and the Garden Room.

In 2009 the evaporative coolers were replaced with Coolerado units which use indirect cooling and do not add humidity to the space. Motorized dampers open the duct from the Coolerado unit to the furnace for the Garden Room when cooling; the furnace blower is only used as a booster fan. Motorized dampers open the duct from the Coolerado unit to the new furnace for the Main Hall; a DX cooling coil and a five ton condensing unit provide additional cooling. Both systems use 100% outside air through the Coolerado unit when in the cooling mode. There are relief dampers in the ceiling of the Main Hall and exhaust fans for the Garden Room to relieve excess pressure if the doors are shut.

The second floor furnace has a two and one half ton DX coil and condenser on the roof for cooling. The system appears to be adequate for the space served.

Ductwork is galvanized sheet steel and appears to be in good condition. It is not insulated in the basement crawl space or attic. Floor registers on the first floor are in good condition. The ceiling diffusers on the second floor are in good condition.

The operable doors for the Main Hall are often open during events in the summer. The HVAC systems in the cooling mode or the open doors provide adequate ventilation for the building. There does not appear to be any ventilation through the HVAC systems in the heating mode although there should be adequate infiltration around the many loose doors.

There is a Kitchen exhaust hood (that would not meet present standards) and no makeup air unit. The Kitchen is only used for food preparation for catered refreshments. The Kitchen should not be used as a commercial kitchen but should be adequate for its present use.

5-ton condensing unit for Main Hall

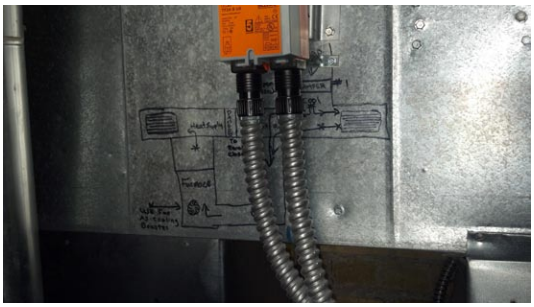
5-ton Coolerado unit for Main Hall and 2.5-ton condensing unit for second floor unit

5-ton Coolerado unit for Garden Room

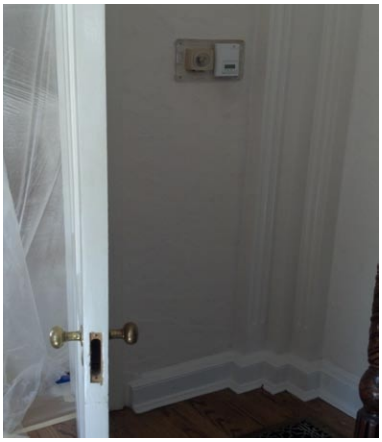
Leak from 5-ton Coolerado unit for Garden Room onto wood shingle roof

Pump and tank to pump waste water from Coolerado units to irrigation system

Dampers for Garden Room Coolerado unit and furnace



Air flow diagram for Garden Room Coolerado unit and furnace



Thermostat for Main Hall behind the door in Corridor outside the Main Hall

Thermostat for Main Hall in Corridor hidden behind the open door to the Main Hall

ii. Plumbing

Utilities include a 1" gas service to a ¾" regulator, 1½" meter and 1½" steel piping to the building. There is a 3/4" domestic cold water line to the building.

Exposed hot and cold water piping is copper. The hot and cold water piping has fiberglass insulation with ASJ.

There is one domestic hot water heater which serves the building

The Toilet Rooms were renovated in 1994. If there are to be further renovations new water saving fixtures would be recommended.

The Coolerado units use 1.7 gpm each or 200 gallons per hour. About 75% is evaporated and 25% is now piped to a tank and pumped to an irrigation system. They only need to be run during a function and operate much more efficiently than electrical DX cooling.

iii. Fire Protection

The building has no sprinkler system.

iv. Discussion

In general the building mechanical systems appear adequate for their present use and are in good condition and well maintained with the following exceptions:

The HVAC systems are not designed to maintain normal temperature set points in the building during large gatherings but they do provide adequate cooling during light occupancies and some cooling during heavy occupancies. Doors are often open during summer functions.

The Coolerado units are presently run all the time in the summer for cooling. They can only operate with 100% outside air even when the building is not occupied and there is no need for outside air. It is recommended that DX cooling be added to the Garden Room furnace and that controls for the Main Hall and the Garden Room be upgraded to recirculate return air when unoccupied. This will be more efficient and reduce water consumption.

The Garden Room Coolerado unit was not operating properly this summer but has now been apparently been repaired. From feedback from the Memorial House staff, it is questionable whether the cooling systems are running properly, are wasting large amount of water and are believed to be suffering from inconsistent maintenance personnel with varying levels of experience with this particular type of system. It is recommended that the cooling systems are recommissioned to ensure they are operating properly at their highest efficiency.

There have been drainage issues with the sanitary piping in the

building. The problem is due to dips in the underground piping outside the building. The City has contracted to have the piping fracked and replaced and the project should completed soon.

v. Recommendations:

1. Correct leak on Garden Room Coolerado unit
2. Relocate thermostat for Main Hall to make it more responsive. The ideal location will place the thermostat in the main room it is controlling. Care should also be taken to avoid direct sunlight or drafts in the new location to avoid incorrect assessment of the ambient temperature of the space.
3. Replace handle on fireplace damper so that damper can be shut
4. Provide automatic ignition for the fireplace
5. Insulate ductwork in the basement, attic and Garden Room storage room
6. Modify controls to provide minimum ventilation air in heating occupied mode
7. Provide DX cooling for Garden Room furnace
8. Recommission cooling systems to restore efficiency.
9. Provide upgraded controls for Main Hall and Garden Room systems (see above)

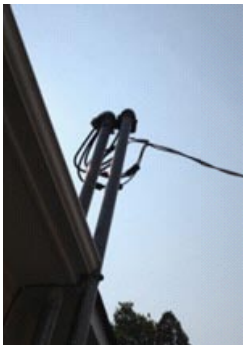
Kitchen hood


Kitchen hood showing open space between filters


Kitchen hood showing hole for lighting fixture


Fireplace without handle on damper

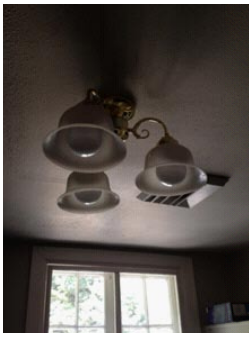
Power pole feeding buidling



Weatherheads fed from power pole.

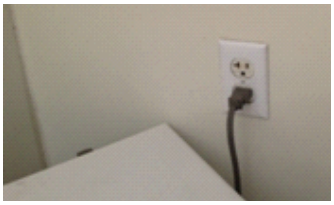
Building Disconnects.

Entry and Gathering Hall incandescent fixtures.



Sectond Floor Office Incandenscent Luminaire.

Light switches in poor condition.



Receptacles in acceptable condition.

c. Electrical

i. Electrical System

The electrical systems for the building were reviewed at the site on June 11, 2012 by David Hinckley from Spectrum Engineers.

Electrical Distribution- The building is currently fed from an overhead power pole on the northwest side of the building. There are (2) building disconnects located on a storage building adjoining the main building. One is 400A and one is 200A and each feeds a 120/240V 1 Phase 400A panel. There are no issues seen with the current overhead feed or disconnects. There is an additional storage building that is detached from the main building with lighting, but there is no disconnect in this building. Per NEC Article 225.31&225.32 an additional disconnect at the nearby storage building is required. The heat tape is not GFCI protected.

Recommendations:

1. Provide disconnect at nearby storage building.
2. Provide GFCI circuit breakers for the heat tape.

Estimated Cost for Upgrade: $1,000

ii. Lighting

Existing lighting consists of a combination of T8 lamping with electronic ballasts, T12 lamping with magnetic ballasts, and incandescent lighting. The upstairs office spaces receive good daylighting. It is recommended that new lighting is installed in the offices with a daylighting control system which will contain a photocell per office that adjusts light levels to recommended ambient light levels. At the main floor, it is recommended that T12 lamped fixtures are replaced with T8 lamped fixtures with electronic ballasts. The chandeliers in the gathering hall contain older incandescent lamps. It is recommended that these lamps are replaced with LED candelabra lamps to decrease energy usage. Emergency lighting consisted of bug-eye lighting at various locations. Additional EM lighting should be added in rooms such as the Main Hall to meet minimum IBC required light levels.

Recommendations:

1. Provide new daylighting control system on second floor to allow each office to adjust light levels.
2. Add emergency lighting to Main Hall.
3. Replace lamps of chandeliers in Main Hall.

Estimated Cost for Upgrades: $10,000

iii. Wiring Devices and Wiring

Several of the light switches are damaged and do not toggle properly. Receptacles seen throughout the building were in fair condition and no need for replacement at this time was seen. Receptacles in the kitchen are not GFCI and should be replaced.

Recommendations:

1. Replace light switches throughout building.
2. Replace receptacles in the kitchen with GFCI receptacles.

Estimated Cost for Upgrades: $800

Mechanical Upgrades- Based off of the mechanical report, a few pieces of equipment may be added. However, none of the recommended upgrades would require electrical connections, thus no associated electrical cost is estimated.

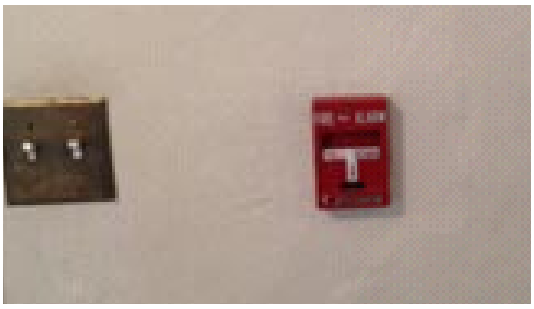
iv. Fire Alarm

There is a partial fire alarm system existing in the building. The main panel is an old zoned panel located in the basement. It is a type PFC series fire alarm control panel. It is recommended that this panel is replaced with a new addressable panel. The building is not sprinklered and therefore pull stations are required at the exits. Additional horn/strobes should be added in the Main Hall. Since the building is not sprinklered and due to the size of the Main Hall it is recommended beam detectors are added (or smoke detectors if ceiling space is accessible) to protect occupants in the largest gathering space in the building.

Recommendations:

1. Upgrade fire alarm system with new addressable panel.
2. Provide pull stations at the exit doors and near the stair on the second floor.
3. Provide smoke detection in the Main Hall.

Estimated Cost for Upgrades: $8,000



Fire Alarm pull station in acceptable condition.

Fire alarm strobe in acceptable condition.

6. AVOIDING POTENTIAL HEALTH HAZARDS

a. Hazardous Materials

Hazardous materials are those that exhibit toxicity, corrosively, reactivity or ignitability. Asbestos and lead are the two most prevalent hazardous materials expected to be in the Memorial House. Asbestos is regulated by the Environmental Protection Agency (EPA) as a hazardous air pollutant under the Clean Air Act. Any renovation or demolition to the Memorial House should follow all state and local regulations where there is potential for the disturbance of any asbestos material. The EPA regulations require that any material with asbestos content greater than 1% be removed from facilities before construction or cleanup activities begin that would potentially break up, dislodge or disturb these materials. Asbestos is likely present in any early installed pipe fitting insulation, thermal insulation for mechanical system components, tank insulation, undercoatings, and flashing. If work is done in any of the areas with these materials, asbestos containing materials (ACMs) should be removed by a contractor following proper OSHA regulations.

Lead-based paint would almost certainly be found in the early layers of paint on walls, metals and attic spaces. Currently, the lead based paints are considered “encapsulated” as they are concealed within layers of non-lead based paint. As long as these areas are not disturbed, the lead-based paint is not a problem. While hazardous materials are not anticipated to be an issue under current operations, a survey should be completed by an accredited environmental engineer prior to any work on previously unabated or undisturbed areas of the building.

b. Ventilation & HVAC

Airborne contaminants are the main concern when evaluating the indoor air quality of a building. These usually affect the building’s occupants through inhalation. Fresh air and ventilation are critical for the health of a building’s occupants, and care needs to be taken that efforts to maximize energy efficiency do not result in a building that is too air-tight. Operable windows, fresh air intakes, and good exhaust systems are all essential to creating a healthy indoor environment.

c. Daylighting & Views

Daylighting admits natural sunlight, either direct or diffused, into a building. Daylighting is a mechanism for reducing reliance on electric lighting, which in turn saves money and energy resources.

In addition to the energy-saving benefits of daylighting, numerous studies have been conducted to demonstrate the physiological and psychological effects of daylighting on the occupants of a building.

Prior to the 1940's, the primary source of light for buildings was natural daylight through the fenestration pattern of the building's design. Over the space of 20 year period from the 1940's, electric lighting advanced quickly to provide most, if not all, of the lighting requirements for buildings' occupants, and the design of buildings reflected this change. This dramatic shift has been documented to elicit adverse effects from spending large amounts of time in buildings without natural light. Studies have focused both on productivity and general well-being in office, school, and retail environments.

The construction era of Memorial House reflects the reliance on natural daylight for interior illumination. The entry hall and Main Hall are well-lit through the French doors and casement windows, as is the office/bride's room. With the addition of four skylights during the 1994 remodel, the Garden Room is able to enjoy natural light through theses as well as the south-facing French doors with sidelight. The reconfiguration of the upper level for Utah Heritage Foundation offices in 1994 incorporated natural light into the central spaces through the use of interior windows. Any future remodeling should ensure that the current levels of natural daylight remain or are further increased to continue the benefits.

d. Materials Selection

Volatile Organic Compounds (VOCs) and Chemical Emissions- Many of the building materials and finishes cab be odorous, irritating and sometimes harmful to the comfort and health of the occupant. When any building materials are replaced or introduced into the Memorial House, specifically the interior, they should be carefully reviewed for emitting and offgassing of VOCs and other irritating materials. Urea-formaldehyde is commonly used in resins for composite woods used for doors and cabinetry and in laminate adhesives used for countertops and finish woods. Over time, urea-formaldehyde continues to breakdown and offgas for up to 30 years, being harmful and not easily eliminated by airing out a room. For this reason, composite wood and agrifiber products should not contain any urea-formaldehyde and should not be allowed as well in any laminating adhesives used to fabricate the items.

While natural and no-VOC materials are desirable, they are not always as durable as those that are simply lower-emitting. This should be taken into consideration to lengthen the life of materials

and delay the need for replacement. The following guides should be used when limiting VOCs:

- SCAQMD Rule #1168- VOC Limits for adhesives, sealants, caulks and sealant primers.
- Green Seal Standard For Commercial Adhesives GS-36 for aerosol adhesives.
- Green Seal Standard GS-11 for Paints, GS-03 for Anti-Corrosive Paints, SCAQMD Rule 1113, for other coatings, clear wood finishes, floor coatings, stains, sealers and shellacs.
- Carpet and Rug Institute's Green Label Plus program for all carpeting.

7. MATERIALS & OPERATIONS

While a large part of sustainability is addressed through the physical characteristics of the building, the way in which the building is operated and how events are handled greatly affect the sustainability of Memorial House.

a. Waste Management & Recycling

i. End of Life Building Materials Recycling or Reuse

Construction and building renovation waste is a significant contributor to landfills, estimated by some to be at least 25%. At the end of a building's or material's useful life, buildings or materials should be deconstructed for recycling or reuse rather than being demolished for waste. Building materials more readily recycled include appliances, trees and site waste, masonry, lumber, woods, plastics, metals, windows and doors. At the point of removal, carpet should be removed prior to other demo activities to keep it clean from contaminants for recycling or in some cases available for reuse through Habitat for Humanity or another charity. All carpet should be selected for recyclability at its end of life. Type Nylon-6 and Type Nylon-6,6 can both be recycled with specific manufacturers however Type Nylon-6 is more commonly recycled. Other Nylons in production including N-6,10 and N-6,12 are soy based and avoid petroleum use and should be explored. Carpet backings should be selected from those able to be recycled back into carpet at its end of life.

ii. Office and Catering Recycling

A way in which Memorial House can achieve more sustainable practices is in the way they handle events, which can generate a great deal of waste if attention is not paid to details. Currently, Memorial House utilizes preferred catering companies for their events. There are a total of 10 companies available for renters to consider. Catering companies bring in their own serviceware,

etc. for the events, which may be disposable or washable. This decision is currently made by the client and caterer, and mainly is based on cost. China is more expensive due to the labor required to bring and wash the dishes, as well as accounting for breakage. Most clients choose to use disposable, but it is not often recycled due to the time and staffing associated with bussing tables.

Memorial House can work with their preferred vendors to evaluate how sustainable the vendors are in their practices. Memorial House could consider directly controlling more aspects of the catering, such as supplying dinnerware (Plates, cups, silverware, etc.) for the events on site, where they can then be washed and stored. In this way they are able to know what type of dinnerware, detergent, washing routines, etc. are utilized and can ensure that they are achieved in as sustainable a manner as possible.

b. Environmental Sensitivity (i.e. renewable resources, recycled, salvaged, etc.)

Sourcing- Materials with recycled content and those manufactured and extracted locally should be given preference when possible at the Memorial House. Recycled content replaces the need for harvesting virgin materials while locally sourced materials support the local economy and avoid pollutants by minimizing transportation distance. A wide variety of materials utilizing recycled content are available including those of a historic nature or that would be in harmony of the historic importance of the building. Specifically carpet, rubber flooring (for back of house/ kitchen spaces), gypsum, toilet partitions, insulation, metals and glass should be chosen with preference to recycled content. Local materials include reclaimed woods, gypsum, some metals, stone and glazing.

c. Durability/Embodied Energy

The durability of materials used in the construction and renovation of buildings translates into a measure of energy known as embodied energy. Embodied energy can be thought of as a way to describe the relationship between building materials, construction methods, and their resulting impact on the environment.

Embodied energy can be broken down into two forms: initial and recurring. The initial embodied energy is composed of the direct energy used to transport materials to a construction site, and the indirect energy associated with the process of acquiring and manufacturing building materials. Recurring embodied energy is a representation of the non-renewable energy that is consumed to maintain, repair, replace, restore, or refurbish building materials,

components, or systems during the life of the building. Quality materials that are more expensive represent a more sustainable option than cheaper materials that need to be replace frequently.

A historic building such as Memorial House represents a trove of embodied energy through its materials and use, which would be lost if the building were to be torn down and replaced.

d. Operations & Maintenance

Green Cleaning- Due to the frequent use of the Main Hall for large groups, frequent cleaning of the space is undertaken. The following guidelines pertain to how the process of cleaning and the products used can be facilitated in a more sustainable manner. Cleaning materials and chemicals are a common cause of pollutants, potentially hazardous chemicals and particulate contaminants which adversely affect air quality, occupant health, building finishes and the environment. Green cleaning policies can help decrease these effects while providing an equally clean building. A new cleaning policy should be reviewed and developed in conjunction with the maintenance crew who cleans the building to ensure buy-in and their being informed of proper use of materials. Without this communication, crews may not be aware of goals or strategies and become easily frustrated and which to go back to traditional cleaning chemicals. Strategies for a green cleaning program include:

- Establish a standard procedure for cleaning wood flooring, carpeting and tile addressing cleaning materials and frequency. The durability and visual look of flooring is directly related to regular appropriate maintenance.
- Outline strategies for promoting and improving hand hygiene, including hand washing and hand sanitizers.
- Address safe handling, storage and disposal of cleaning chemicals.
- Provide for feedback and continuous improvement and evaluation of strategies.
- Consider reusable or recycled cleaning equipment and products including janitorial paper products, trash bags, microfiber tools and wipes.
- Use established standards for guides for creating policies which may include:
- Green Seal GS-37 and 40 for cleaners and floor care, Environmental Choice CCD- 110, 112, 146, 147, 148 for cleaners, carpet and upholstery care and degreasing compounds, and the California Code of Regulations maximum allowable VOC levels.
- Green Seal GS-01 for tissue paper, GS-09 for paper

towels and napkins, or Environmental Choice CDD-082 for toilet tissue and CCD-086 for hand towels.
- Vacuum cleaners should be certified by the Carpet and Rug Institute “Green Label” testing program.

e. Vendors/Catering Policies

Questions that may be asked of caterers to elicit sustainable practices are:

- Do they offer seasonal menus with locally-featured ingredients?
- Do they use certified organic or fair trade ingredients?
- Do they prepare items or are they purchased frozen or fresh?
- Do they offer multiple vegetarian options?
- Are they able to provide reusable serving ware, tablecloths, and napkins?
- Do they provide the option of compostable or recyclable dinnerware?
- Can they detail any of their sustainable practices, including the above items, in their catering contract?

These are just a few of the ways Memorial House can work to not only provide a sustainable place, but a sustainable reception/event center.

8. ENERGY EFFICIENCY

A building’s energy use can be described by a unit of measurement called *energy use intensity* (EUI). EUI represents the amount of source energy a building consumes relative to its size in square footage over a year. This is presented as a value in kBTU/$ft^{2.}$

Using energy use charts provided by Salt Lake City Corporation, an estimate of Memorial House’s EUI was calculated to be 58, based on an estimated total building size of 10,000 ft^2. Generally, a low EUI is an indication of good energy performance. There are certain building types that will always use more energy than others, such as a hospital. Likewise, an office building that supports thousands of workers will use quite a bit more energy than one that houses only a few dozen. For general comparison purposes, a typical office building may have an EUI of anywhere between 100 and 193.

a. Building Envelope

Mechanical systems and innovative fuel sources play a vital

role in energy efficiency, but only as a second step to a tight and efficient building envelope. First measures to any energy management program should be to lower the required amount of heating and cooling needed. This not only lowers energy use but increases the buildings flexibility for future systems, technology and renewable systems. A smaller building energy appetite can be accommodated but a broader range of solutions and is more cost feasible to be addressed with renewable energy systems.

The exteriror of your building- the outer walls, roof, windows and floor is considered the envelope or building shell. Ares of this shell will have differing thermal or insulative qualities and will contribute to the thermal boundary- a line or plane where insulation and air barriers exist in order to resist thermal transmission and air leakage through or within a building shell. Areas of low insulative value where little or no insulation exists are considered gaps in the thermal boundary where unwanted heat or cold can escape or infiltrate into the building. On vertical and horizontal dimensions, the Memorial House needs to fill in these thermal gaps wherever is possible.

Areas of the attic and crawl space are semi-conditioned space. As these area are not occupied, they do not require conditioning. However being poorly insulated, these spaces and are stealing heating in the winter and allowing unwanted heat to infiltrate the building in the summers. The attic space should be amended to have continuous insulation on the attic floor, and shared conference room wall. The crawl space ducting should be sealed and insulated and crawl space ceiling should be insulated to avoid unwanted heat transmission. In areas where insulation is in good order, it should be left in place and additional insulation provided on top. However in areas along the attic and roof perimeter where insulation has been blown back, is otherwise missing or in the crawl space where no insulation exists, air sealing should take place first before insulation is installed. An air barrier, likely in the form of a spray foam, would stop unwanted air leakage.

b. Systems

i. Innovation or Large Replacement Options

The existing mechanical systems, especially the Coolerado systems are in good condition only needing some tuning and recommissioning to become as efficient as is possible. These systems are appropriate to the building size and use and should remain in place for the rest of their usable life. The current DX cooling and gas furnace are the most cost effective systems for the building and provide very good energy efficiency. However, should

funding be available and desires exist for more inventive systems, a step of enhanced efficiency or renewable sources, the following summaries can provide some guidance.

ii. Ground Source Heat Pumps

Ground source heat pumps can reduce operating cost for heating and cooling buildings. They are best when the heating loads and the cooling loads are steady and balanced for the year. The loads for this building are not predictable. Heat pumps would not be much more efficient than the gas heat in the winter but would be more efficient than the DX cooling in the summer. A new electrical service might be required for the building. Due to the unpredictable and limited use of the building and the efficient use of the Coolerado units when occupied, the payback could be greater than 20 years. Ground source heat pumps are not recommended.

c. Solar & Wind

i. Solar PV

Ongoing innovations in solar photovoltaic (PV) panels provides a wide variety of options; panels of different weights, attachment means, and efficiencies. Key to the viability of solar as an energy source is heavily reliant on panel mounting location and orientation. The Memorial House location is difficult due to the North south orientation that would shield early eastern sun in combination with the hillside to the west that would shield late day sunlight. However some measure of solar pv could be utilized and would be appropriate to generate power enough for specific elements as it is very size and cost prohibitive to provide total building electricity. A 20KW system would be appropriate for the building costing about $5,000 per KW.

ii. Solar Hot Water

Solar domestic hot water heating systems can be effective when there is a consistent use of hot water such as for a residence. The use of domestic hot water in this building is not predictable; it would require a very large storage tank to effectively use solar heated water. The only acceptable location for the solar collectors would be on the Garden Room roof; they would need to avoid the skylights and the structure would need to be evaluated for the weight of the collectors and snow drift loads. The amount of sunlight would be limited in the morning due to the roof to the east and in the afternoon due to the hillside to the west. The payback could be greater than 20 years. Solar domestic hot water heating is not recommended as a cost effective solution, but is available if inventive or renewable desires exist.

d. Wind

While the Memorial House location is undoubtably picturesque, it is not ideal for on-site wind generation. In order for wind to be a viable energy source, sustained wind speeds of 12 m/s or 26 mph are needed for small turbines. Wind at the Memorial House is intermittent and not likely to provide reliable energy, but could be used as a feature item for sustainable education. Wind generator system for the site would cost about $3,500 per KW and a specific study is recommended to find the ideal location for wind turbines.

9. SUMMARY RECOMMENDATIONS

Recommendations for the building, its systems, and its operations are summarized in a series of prioritization charts. The recommendations are each assigned a priority level based on current understanding of needs and costs, which is not to preclude a re-prioritization should specific project funding opportunities become available, or a significant change in costs or technology occurs. The charts include the following:

- Inherent Sustainability
- Quick Fixes & Immediate Concern
- Short-term Concern (1 to 3 years)
- Mid-term Concern (3 to 10 years)
- Long-term Replacement & Opportunities for Innovation (ongoing and 10 years out)

Each recommendation element is categorized based on one or more of the following five evaluation criteria:

1. Safety: Enhances health and life-safety of the building occupants
2. Preservation: Enhances historical, architectural, or visual integrity, character, or quality
3. Indoor Environment: Enhances health or experienced environment
4. Energy Efficiency: Enhances energy efficiency or leads to a reduction in energy use
5. Responsibility: Provides preference to renewable, recycled, or local sources of energy and materials.

Inherent Sustainability

Items inherent to the existing building which are sustainable. These measures should be retained to the greatest extent possible.

	Area or Element	Inherent Element	Review Criteria: Safety	Preservation	Indoor Environment	Energy/Water Efficiency	Responsibility	Cost
1	Windows	Operable windows provide for natural ventilation.		X		X		$0
2	Main Hall	Event spaces with high volumes allow heat to rise and movement of air.		X	X	X		
3	Embodied Energy	Energy embodied within the existing building.		X			X	
4	Historic	The historic significance increases renovation priority and likelihood of the building long life.		X			X	
5	Wood	Older woods come from slow-growth trees that are local and more durable.					X	
6	Embodied Culture	The history/use of the building as an events center		X				

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Quick Fixes & Immediate Concern:

Actions that can be done cost effectively to provide immediate results and items requiring immediate attention to increase safety or address energy and water waste.

	Area or Element	Recommendation	Review Criteria: Safety	Preservation	Indoor Environment	Energy/Water Efficiency	Responsibility	Cost
1	Windows	Apply weather stripping and caulking to minimize air and water infiltration		X	X	X		
2	Exterior Doors	Apply weather stripping and caulking to minimize air and water infiltration		X	X	X		
3	Thermal Envelope	Seal perimeter or any areas of air infiltration where insulation is missing or being blown back.			X	X		
4	Thermal Envelope	Measure and add insulation to R-42 or as high as possible throughout attic space.			X	X		
5	Thermal Envelope	Remove and replace insulation at the wall between single and two story space.			X	X		
6	HVAC	Relocate Thermostats into the spaces they control.			X	X		
7	HVAC	Correct leak on Coolerado system and recommission system to restore cooling and minimize water and energy waste.			X	X		
8	Fireplace	Provide automatic ignition for the fireplace and replace handle on the fire damper.	X		X	X		
9	HVAC	Seal and insulate ductwork in basement and Garden Room storage area.				X		
10	Electrical	Provide disconnect at storage building.	X					
11	Electrical	Provide GFCI circuit breakers for heat tape at storage building.	X					
12	Electrical	Replace damaged light switches	X					
13	Electrical	Replace kitchen receptacles with GFCI receptacles.	X					
14	Lighting	Add additional emergency lighting to Main Hall.	X					
15	Lighting	Replace chandelier lamps with LED candelabra lamps.			X	X		
16	Lighting	Reduce the number of track lights in the Garden Room			X	X		
17	Kitchen	Replace/add stove vent filters.	X					
18	Operations	Create in-house waste reduction practices with reusable dishes and full recycling plans.					X	
19	Operations	Create in-house green cleaning measures in cooperation with maintenance staff.			X		X	
20	Operations	Develop & approach Vendors/Caterers with sustainable operations policies.					X	

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Short-Range Concern:

Actions to be prioritized in the next year or two as funds become available to improve efficiencies.

	Area or Element	Recommendation	Review Criteria: Safety	Preservation	Indoor Environment	Energy/Water Efficiency	Responsibility	Cost
1	Windows	Restore operability to all windows.	X		X	X		
2	Finishes	Adopt paint, primer and coating VOC standards.			X		X	
3	Finishes	Adopt a no urea-formaldehyde composite wood standard for incoming millwork, furniture or replacement doors.			X		X	
4	Finishes	Adopt floor refinishing product standards.			X		X	
5	Finishes	Adopt carpet replacement standards for recyclability and Green Label Plus certification.			X		X	

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Mid-Range Concern:

Actions to be prioritized in the next few years as funds become available to improve efficiencies.

	Area or Element	Recommendation	Review Criteria: Safety	Preservation	Indoor Environment	Energy/Water Efficiency	Responsibility	Cost
1	Windows	Refit/rebuild windows to address air leaks; consider low-e insulated glazing.			X	X		
2	Doors	Refit/rebuild doors to address air leaks; consider low-e insulated glazing.			X	X		
3	Thermal Barrier	Remove insulation, air seal and replace insulation with R-42.						
4	Thermal Barrier/Electrical	Add interior rigid insulation at all second level walls & relocate electrical and data into the wall.	X		X	X		
5	Thermal Barrier	Insulate crawl space to isolate it from the main building.			X	X		
6	Thermal Barrier	Insulate walls between un-insulated attic storage and the adjacent conference room.			X	X		
7	Thermal Barrier	Reconfigure roof and restructure Garden Room rock wall.	X			X		
8	Water	Replace plumbing fixtures with low-flow fixtures- review in consideration with sewage system status at the time.				X	X	
9	Lighting	Replace second floor lighting in the offices with daylighting control system with photocells to adjust lighting.			X	X		
10	Lighting	Replace T12 lamped fixtures with T8 lamped fixtures with electronic ballasts.				X		
11	Electrical	Replace light switches throughout the building.	X					
12	Fire Alarm	Provide new addressable fire alarm system building.	X					
13	Fire Alarm	Provide pull stations at the exit doors per IFC 2009.	X					
14	Fire Alarm	Add horn/strobes to the Main Hall.	X					
15	Fire Alarm	Add bean detectors or smoke detectors to Main Hall.	X					
16	Operations	Select vendors based on compliance with sustainable practices					X	
17	Showers	Install shower and changing facility in the rear storage building for employees who run or cycle to work.					X	

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Long-Term Replacement & Innovation:

Actions for system replacement, when funds or grants are available to increase innovation and energy sourcing.

	Area or Element	Recommendation	Review Criteria: Safety	Preservation	Indoor Environment	Energy/Water Efficiency	Responsibility	Cost
1	Windows	Evaluate need for window replacement after they have been reworked; if needed, replace windows with historically appropriate wood windows with low-e insulated glazing.			X	X		
2	Doors	Replace doors with historically appropriate, ADA compliant doors with low-e insulated glazing.			X	X		
3	Domestic Hot Water	Replace water heater with instant hot water heater or solar hot water system.				X	X	
4	Photovoltaic	Pursue grant opportunities for PV panels to supply lighting energy.				X	X	
5	HVAC	Replace furnaces with high efficiency furnaces or review with systems available at that time.				X	X	
6	Wind	Pursue purchase contract of wind energy for energy not able to be sourced onsite.					X	

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10. COST ESTIMATE

(to be completed after approval of 90% draft)

11. FUNDING & IMPLEMENTATION OPTIONS

a. Incentives and Grants

Utility and grant programs should be pursued to supplement any funds for renovations, especially those which may introduce renewable energies into the Memorial House. The Database of State Incentives for Renewables and Efficiency or DSIRE is a regularly updated database of nationwide programs which offer funds for various energy related projects. This resource can be accessed online at: www.dsireusa.org and should be reviewed regularly for potential funds as the Memorial House plans for future upgrades or enhancements. While some of the State and Federal programs are based on tax refunds not available to the Memorial House, a wide variety of options are updated weekly.

The local utilities, Rocky Mountain Power and Questar Gas, have various rebates and incentives for energy based programs that are available for non-profit and for-profit groups alike. Many of the recommendations provided in this document would qualify for utility rebates such as added insulation, window or door replacement, and providing duct sealing and insulation.

For more information on utility rebates, please go to:

www.rocklymountainpower.net

www.thermwise.com

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