Historic Structure Report

Rising Sun Tavern
Second Story Interior and Exterior

Conducted by University of Mary Washington Historic Preservation Student
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HISP461
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Introduction

Why and how was this report completed?

This historic structures report concerning the Rising Sun Tavern in Fredericksburg, Virginia, was completed by Emilie Kracen, with the help of David Casteel, students in the Historic Preservation Department of the University of Mary Washington. The project was a result of HISP461 (Building Forensics), a class taught by Michael Spencer, assistant professor in the department. The purpose of the project was for students to gain experience in studying the preservation of historic structures by understanding the causes, symptoms, and treatments of structural deterioration. The methodology was based on the National Park Service's Historic Preservation Brief #43, written by Deborah Slaton, and included gaining an understanding of the design, construction, and development, and current condition of the Rising Sun Tavern through archival research, field investigations, and laboratory analysis of materials. The work for the historic structures report (HSR) was completed during the UMW fall 2010 semester, and the findings were presented to representatives from the Rising Sun Tavern on December 6, 2010. This particular report contains history, development, condition assessment, and recommendations for preservation of the structure with a concentration on the second floor. However, it should be noted that any student recommendations should be checked and verified with a structural engineer as well as a preservation specialist.

PART ONE
HISTORY
AND
STRUCTURAL DEVELOPMENT

I. Historic and Local Context

II. Structural Development

III. Statement of Significance

Historic and Local Context

What is the history of the building and what roles has it played in the community?

The building known today as The Rising Sun Tavern, situated at 1304 Caroline Street in Fredericksburg, Virginia, was built approximately 1762 by Charles Washington, youngest brother of General George Washington. On August third, 1761, Washington purchased Lots 87 and 88 from Warner Lewis, who acquired the land in 1759 when the General Assembly of Virginia enlarged the town of Fredericksburg, laying out new streets and lots on the northern side of town.[1] On this land, Washington built for his private residence the one and a half story frame structure that would become The Rising Sun Tavern. During this time the house was visited several times by General George Washington paying visits to his younger brother.[i] On October sixth, 1786, Charles Washington and his wife sold the lots and structure to their son George Augustine Washington, and his wife Francis, who owned the property for five years before selling it in 1791 to Larkin Smith. On April second, 1792, Smith sold the property to Gustavus Brown Wallace. Members of the Wallace family would own the property until 1907, when it was purchased by the Association for the Preservation of Virginia Antiquities.

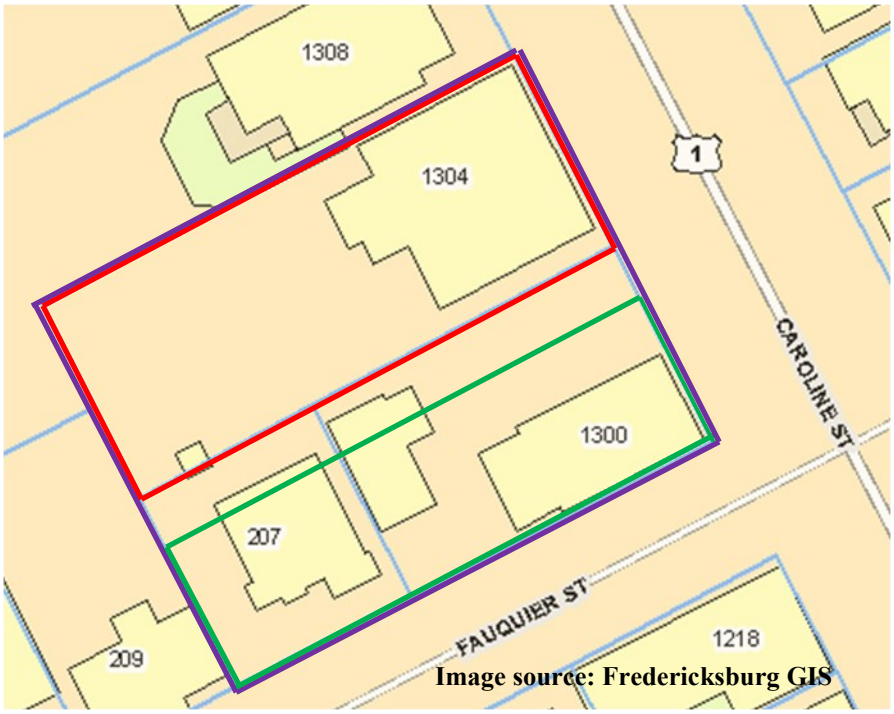


Figure 1
-- Original lots acquired by Warner Lewis, Lots 87 and 88.
-- Lot 88, upon which Charles Washington's residence was built which later became the tavern
-- Land sold to George W.B. Spooner in 1792

In the same year that he purchased the property, G.B. Wallace sold part of the property running along Fauquier Street to his son-in-law George W.B. Spooner (See fig 1). Wallace also began to rent out the property, and on September 29th, 1792 when occupied by John Frazer, a tavern was opened in the building.[ii] This tavern was known as The Golden Eagle Tavern. When Mr. Frazer died, his wife continued to run the tavern in his place until 1795.[iii] The tavern was then rented and run by Mr. James Fisher, whose wife, Martha Fisher, took over the business after his death. She ran the tavern until 1802, when she

[1]See Appendix A, Tables 1 and 2 for all information regarding deeds and Mutual Assurance Policies for information on property transactions and residents (unless source is otherwise noted).

moved to a tavern near the Market House.[iv] She returned in 1807 when the latter burned to the ground.[v] During her absence the tavern was occupied and run by Mr. Joseph Norwood.[vi] By 1813 the tavern was occupied by John Harvey.[vii] In 1815 the property was then rented by Richard I. Tutt, who ran the tavern until November, 1818.[viii] The next known renter was Joseph Verone, who ran the tavern by 1822 under the name of The Rising Sun Tavern.[2] Mrs. Verone, his wife, probably ran the tavern until 1827, when it ceased to be used as a tavern as a result of losing its liquor license for reasons unknown.[ix] The tavern was situated on the main route of travel from the lower Virginia region toward the Potomac area, and served as an important stagecoach stop. It was the only "proper" tavern in Fredericksburg, providing adequate dining and sleeping accommodations to both upper and lower class patrons during most of its operation, and served as a gathering place for the gentlemen of the town as well as the common workers, including sailors and farmers.[x] For a time, the Fredericksburg postal office was housed in the tavern, and the tavern keeper acted as postmaster.[xi] During the period of the tavern's operation, the property was owned and rented out by several members of the Wallace family. In 1801, Gustavus Wallace sold the property to John and Thomas Wallace, and the heirs of John Wallace owned the tavern in 1827 when it ceased to operate.

In the years following 1830, members of the Wallace family, including H. H. Wallace, a well-known merchant of Fredericksburg,[xii] tenanted the former tavern. Others, including a Mr. McDonald, a Mr. Hodges, and a Mr. B. B. Cole, also occupied the house during this period, leading some to believe the building functioned as a boarding house. In 1851, Doctor John H. Wallace purchased the property, and his heirs owned it until 1907, when H. Lewis Wallace sold the Property to the APVA. Soon thereafter, the building was renovated and opened to the public as a museum. On January 24, 1974, the tavern was made a National Historic Landmark, and in July, 1975, the tavern was placed on the National Register of Historic Places.[xiii] Presently, the museum is still owned and operated as a historic shrine by the APVA, and is a popular tourist stop in historic downtown Fredericksburg.

[2] It has been debated as to whether the Eagle Tavern and the Rising Sun were indeed the same structure. The 1829 advertisement in the Virginia Herald for Dr. Merwin's new practice states he will be moving "opposite to Mr. Verone's Tavern, or the sign of the Rising Sun." The Mutual Insurance Policy for the property of the same year shows Mrs. Verone to be the occupant, indicating the buildings are one in the same.

References

[i]*The Diaries of George Washington*, p. 104, 161
[ii]VA Herald 26 Sept., 1792
[iii]VA Herald 15 Jan., 1795
[iv]VA Herald 21 Sept., 1802
[v]VA Herald 27 Oct., 1807
[vi]VA Herald 15 Apr., 1805
[vii]VA Herald 6 Oct., 1813
[viii]VA Herald 7 Oct., 1818
[ix]RST Staff, 6 Oct., 2010 Tour
[x]RST Staff, 6 Oct., 2010 Tour
[xi]RST Staff, 6 Oct., 2010 Tour
[xii]Howison, *Fredericksburg: Past, Present, and Future*, p. 74
[xiii]Lissandrello, Stephen. "National Register of Historic Places Inventory - Nomination Form"

Structural Development

What significant physical changes has the structure undergone to reach its current form?

Despite its age, The Rising Sun Tavern has undergone relatively few changes in its physical development since its construction in about 1762. The current structure, a one and one half story brace frame structure in simple Georgian style, still contains parts of the original structural fabric. However, the structure has undergone a series of renovations and repairs throughout its lifetime, and much of the original material has been replaced. Emphasis in this section is given to changes in the overall footprint of the building, including porches, and changes to the second story.

Figure 2: Original porch footing found in 1975 archaeological investigation. Photo c. 1975, photographer unknown

The first evidence of changes made to the building is discussed in the summary of the 1975 archaeological investigation done of the porch area on the street side of the structure. The report concluded that the original structure built by Charles Washington did not have a front porch. Evidence was found of an eighteenth century porch, but this was found to be a later addition based on discrepancies in brick size and hardness between the porch footing (Figure 2) and the chimneys. However, matching bricks were found on the exterior of the chimneys, indicating that they had been repaired about the same time the front porch was built.

More development can be seen in the Mutual Insurance Policies for the building from 1796 and 1815 (see Table 2). In 1796, there was a full length "portico" on the street side of the structure, probably the same porch mentioned above, and in the rear there was a small central porch with shed roofs to either side (fig. 3). The 1815 policy shows a larger rear porch measuring 13' by 24'. The value of the policy also increased from $1,700 to $2,000 within these years. The advertisement for the Eagle Tavern put out by Richard I. Tutt in 1817 states that the structure had undergone "considerable repair." The details of the repair are unknown, but may include the changes to the porch, as Tutt is listed as occupant of the tavern in the 1815 policy.

The drawings of the structure on the following Mutual Insurance Policies up to 1850 show various changes to the structure's porches (see Table 2). Until 1842, a full-length (or near full-length) porch is shown on the Caroline Street side. This was confirmed by the findings of the archaeological investigation, which showed evidence of a second full-length porch on the street

Figure 3: Mutual Assurance Policy illustrations showing the changes in the structure's porches. From left to right: 1796, 1815, 1822, 1842

side of the structure dating to the mid-nineteenth century. In the 1842 and 1850 policies, no porches are shown.

It is noted in the 1957 report of the Restoration Committee of the Rising Sun Tavern, of which Levia Houston was chairman, that extensive work was done to the structure in the mid-nineteenth century. These changes were probably made after the tavern ceased to operate, and were most likely intended to make the structure suitable for a private dwelling, although it is not certain what changes were made.

Figure 4: Wooden front porch built early 1900s.
Photo c.1900 (Virginia Historical Society)

No further evidence of change is seen until 1898, when Robert Howison wrote, in *Fredericksburg: Past, Present, and Future*, that the owners, the children and descendants of Dr. J. H. Wallace are "so repairing it that it may lose something of its antique appearance and interest." These repairs, though unspecified, may have included the addition of a small central back porch which, according to the Sanborn maps of the area, did not exist in 1891, but is recorded in 1902. The extent of this work is not recorded, but it seems unlikely that it resulted in the loss of the 'antique appearance,' as in 1907 Silvanus Quinn also comments, in *The History of the City of Fredericksburg*, that the building had recently been repaired, but "retains in all respects its original style of architecture."

A small, wooden front porch was added sometime in the first years of the twentieth century, as evidenced by a photo from the Virginia Historical Society, dated c. 1900 (Figure 4), and a photo in John T. Goolrick's *The Life of General Hugh Mercer*, published in 1906. However, a porch matching this footprint is not shown on the Sanborn map of the property until 1912. It is probable that the porch mentioned above was never shown in the Sanborn maps, and that the porch noted in the 1912 map is the same seen in the HABS drawings done by Philip Stern in 1934, with stone piers and a pedimented portico (see Figure 5).

In 1927, a new kitchen was added to the rear of the structure, as seen in the Sanborn map of the same year. A small stairway existed on the rear door of the original structure, as well as on the north side of the new kitchen. In the 1934 HABS drawings and photos these structures are shown (Figure 6). The structure was also fitted with a heating system in 1927. It is possible that the wooden partition shown in the 1934 HABS drawings creating a bathroom in the central western second floor room was part of this work (see Figure 6).

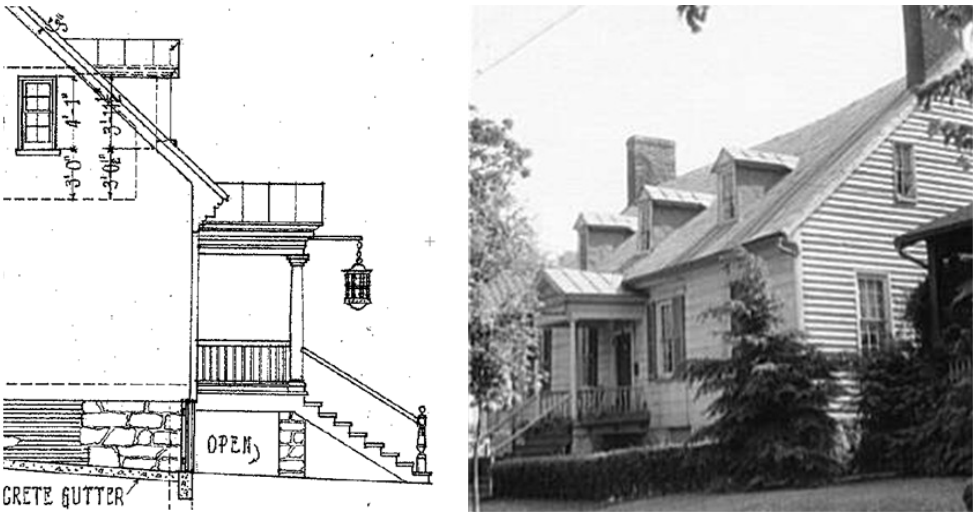


Figure 5: Views of porch with stone piers built c. 1912
Left: 1934 HABS, by Philip Stern;

A major restoration was carried out by Philip Stern in 1938.[1] The work included the construction of a

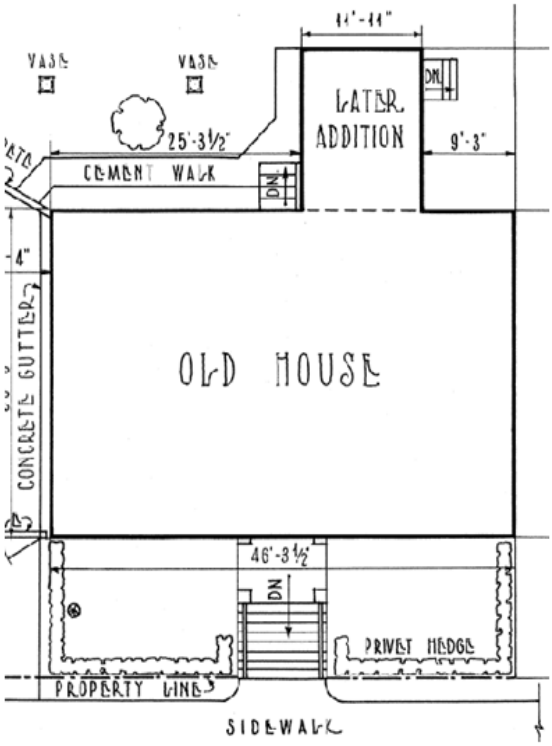


Figure 6: 1927 Kitchen addition.
1934 HABS documentation, by Philip Stern

new front porch following a model of another local historic porch. This porch, with a sandstone foundation and iron railing, was in place until the construction of the current porch, and is the same one seen in the records of the archaeological dig (Figure 8). A small porch was also added to the rear door of the structure using material taken from the front porch for the convenience of the museum staff (Figure 9). The renovation also included the addition of new brick piers in the cellar to support sagging beams and prevent further settlement of the center of the structure. It was found that the roof framing was mostly sound but the dormers on the front side of the structure were rotted off at the roof line. These were replaced (including the sashes and screens) and parts of the original dormers were removed to the back of the structure to repair the rear dormers. The sides of the dormers were removed and replaced with beaded board. The old tin roof (date of this roof is unknown) was replaced with asbestos shingles imitating wood shingles, thought to be the original roofing material. New flashing and valleys made of copper were furnished to the building, as well as new gutters and downspouts made of galvanized iron. The tops of the chimneys, seen to be in disrepair, were rebuilt. The exterior of the building was given necessary repairs and patching. Inside, changes were also made to the second floor. All ceilings and knee walls were lined with rockwool insulation, four inches

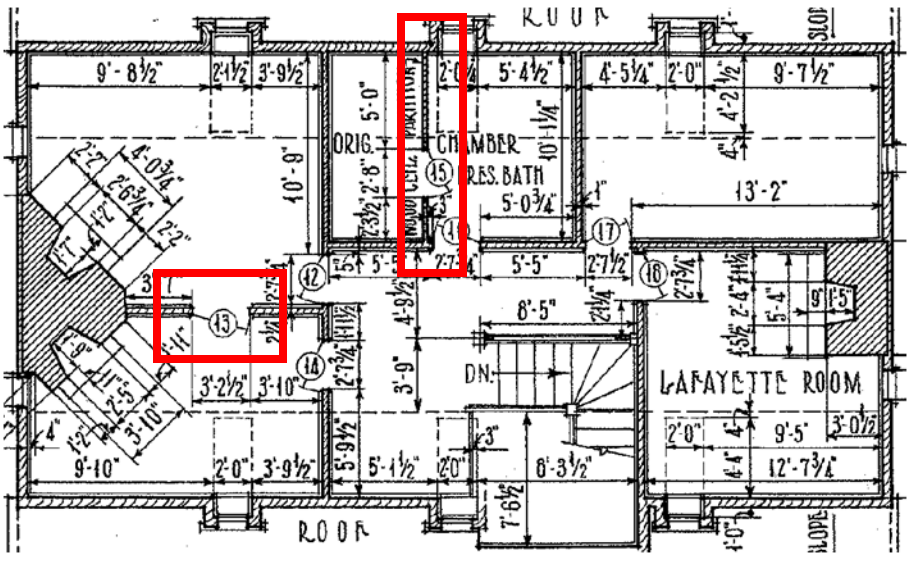


Figure 7: 1934 HABS Second Floor Plan, by Philip Stern
Red squares indicate features not seen in current plan

[1] It is noted in the 1992 maintenance survey that a restoration was carried out by Philip Stern in 1929 as well. However, it is unclear what work was done at this time, as his HABS drawings are dated 1934.

Figure 8: 1938 Front porch by Philip Stern.
Left: Photo c. 1975, photographer unknown; Right: Photo c. 1970, NPS

thick. Window stops and other details were repaired, changes were made to the electrical wiring, and all wall brackets were removed. All floors were cleaned and refinished. This restoration, its goal being to restore the structure as close to its original form as possible, was probably when the partition and plumbing was taken out of the central western room of the second story, restoring it to its original function as a chamber. The door between the two southernmost rooms and the wall dividing the central western room were probably also removed at this time. These features were seen in the 1934 HABS drawings by Philip Stern but do not exist in the current structure (See figure 7).

In 1957 another renovation was performed, including the installation of a circulated warm air heating system and the restoration of the interior stairs and their decorative features.

In February of 1975, a fire broke out in The Rising Sun Tavern, damaging the roof and parts of the rear of the structure. The repairs included replacing some original roofing material and connecting laths in the second story walls, as well as splicing the second floor ceiling joists with new wood. Parts of the interior were also replastered.

In 1978 yet another major renovation took place, this time done by Walter Macomber, with the major addition to the structure being the reconstruction of the original full length porch (Figure 10). The porch, originally having the stairs in the center extending into the street, was reconstructed with the stairs on the south side to prevent them from reaching into the street. This project also included the stripping of much of the exterior weatherboarding and the inspection and repair of the main framing elements. In 1981 the asbestos shingles were replaced with wooden shingles, still existing on the current structure. The following year, plasterwork was done on the inte-

Figure 9: Custodian's porch built 1938 by Philip Stern.
Compare railings and columns with figure 4.
Left: Photo 2010 by Emilie Kracen; Right: Photo 1969 NPS

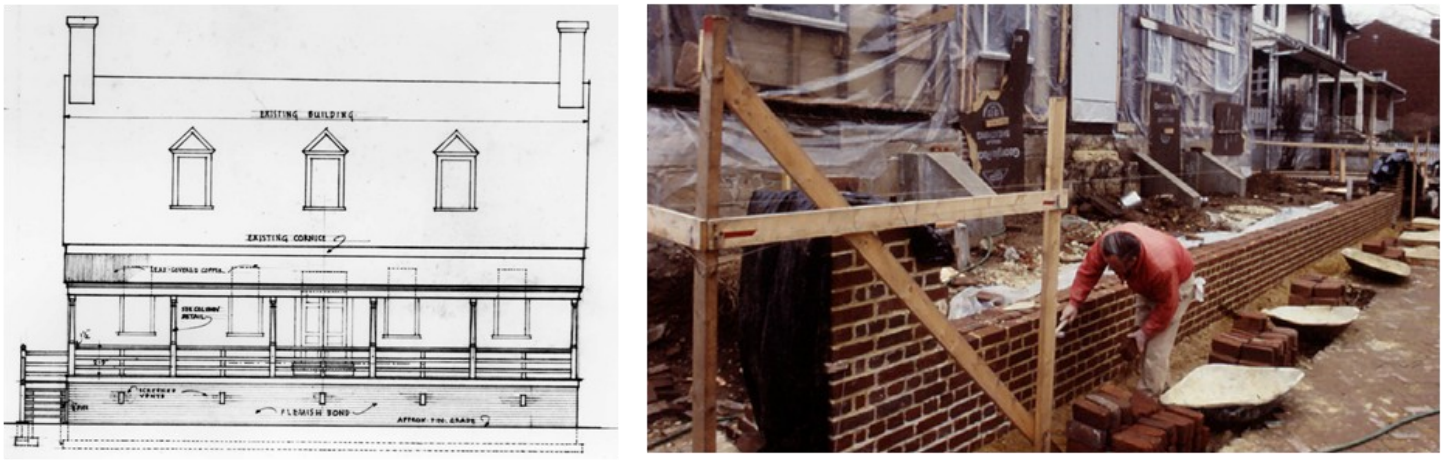


Figure 10: 1978 porch construction.
Left: 1976 drawing by Walter Macomber, architect; Right: Photo 1979, photographer unknown

rior of the structure. The building was fitted with a new climate control system in 1984, which is probably the system currently in place. In 1986, rotten siding on the north end of the structure was replaced. Both the interior and the exterior have been repainted several times. Currently, the front (street) side of the structure is restored to its early nineteenth century form, with a full-length porch set upon a brick foundation. The rear of the house retains its later additions for the convenience of its current use as a house museum. The kitchen addition now serves as an office and archival center, with the rear porch providing easy access from the museum to the office. Figure 11 shows the current structure broken up into its four existing periods of construction, including the front three dormers, which were replaced in 1938. Overall, the structure is in a form nearly restored to its period of operation as a historic tavern.

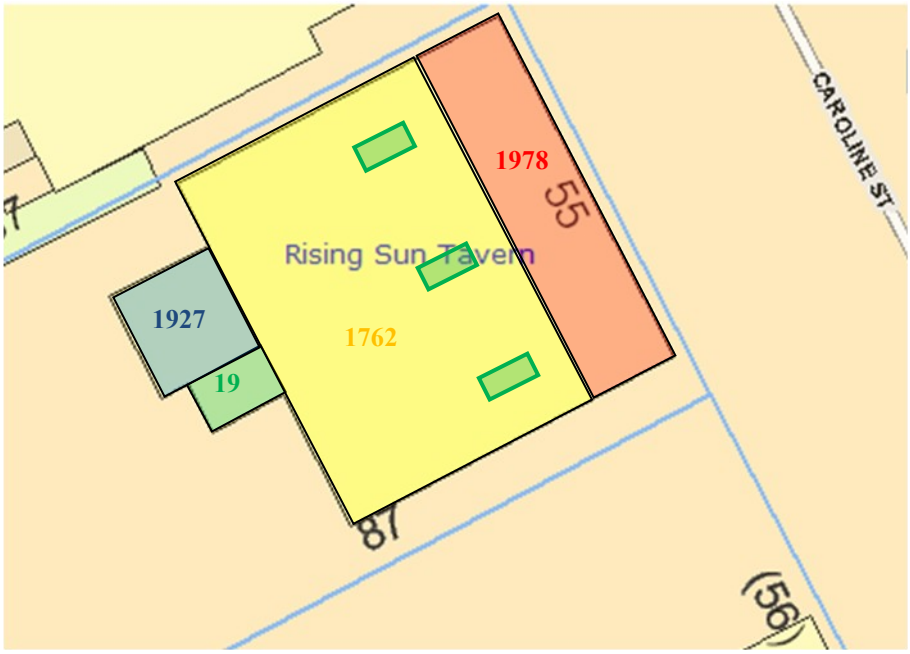


Figure 11: Current footprint, Fredericksburg GIS, 2010. Stages of development based on above archival research are highlighted

Statement of Significance

What National Register criterion for significance does this structure fall under, and to what period in its history does this apply?

In accordance with the National Register criteria for significance, The Rising Sun Tavern is considered significant due to its association with events that have made a significant contribution to the broad patterns of our history. Its operation as a principle tavern and stagecoach stop cause it to be a primary example of the importance of tavern activities in late-eighteenth and early-nineteenth century American life. Therefore, the period of significance is defined as the years during which the building functioned as a tavern, from 1792 through 1827. The tavern, as mentioned, is located on the main route of travel from lower Virginia to the Washington D.C. area. Therefore, it was a well-used stagecoach stop, accommodating gentlemen and ladies from all over the region. The tavern was an important landmark within the town of Fredericksburg as well, serving as a frequent gathering place of both gentlemen of the higher classes and common citizens as well, including farmers and sailors (one could even find a crew to hire for a voyage at such a tavern). Finally, the tavern also housed the Fredericksburg postal office for a period, and the present tavern keeper would have served as the postmaster.

It is worth noting that it has been mentioned that the significance of The Rising Sun Tavern lies earlier, leading up to the Revolutionary War, when men such as George Washington, George Mason, Lafayette, and other notable statesmen of the day gathered there frequently to socialize and discuss pressing issues of the day. It is said that George Weedon ran the tavern before the Revolutionary War when Charles Washington owned the property, and that the place served as a "hotbed of sedition." However, several factors discount this theory. Beginning in 1764 and continuing at least until the years following 1773, Weedon was operating a separate tavern located on Lot 26 in Fredericksburg, formerly belonging to his father-in-law, John Gordon. Furthermore, in the advertisement for the opening of the Golden Eagle Tavern in 1792 by John Frazer, it is stated that the building was formerly the private residence of Charles Washington, indicating it was not operated as a tavern before that year. In George Washington's diary entries during these years, he mentions dining at his brother Charles' twice, and reports going to Weedon's tavern on multiple occasions. The fact that these locations are mentioned separately indicates that Charles Washington was not operating the building as a tavern, and that the tavern of George Weedon (on Lot 26) was a favorite social retreat. Therefore, the significance of The Rising Sun Tavern falls to the later period and its example of a nineteenth century tavern rather than to the Revolutionary period and its association with significant persons in American history.

PART TWO
CONDITION ASSESSMENT
AND
RECOMMENDATIONS FOR PRES-ERVATION

I. Preservation Philosophy
II. Architectural Description
III. Initial Observations
IV. Wood
V. Chimneys and Fireplaces
VI. Plaster
VII. Windows
VIII. Paint Analysis
IX. Other

Preservation Philosophy

What policy should be followed when it comes to future work on the structure?

In accordance with its period of significance and its current use and condition, it is recommended that a policy of preservation be adhered to for the property of The Rising Sun Tavern. As defined by the Secretary of the Interior, preservation is the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project. This is appropriate for The Rising Sun Tavern as it has previously been restored to its period of significance and is currently in public use. Therefore, emphasis should be placed on the upkeep of the property to ensure its functionality and safety as a public museum and its integrity as a historic shrine.

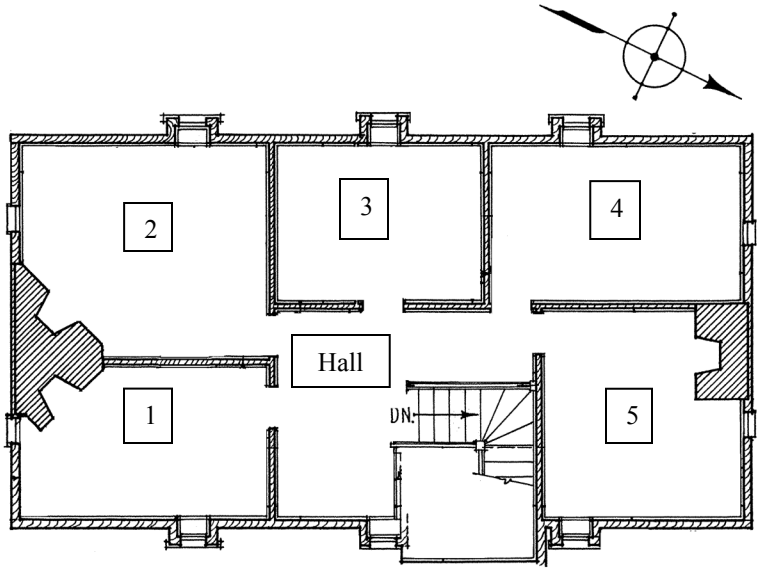
Architectural Description

What are the defining architectural characteristics of the structure?

The Rising Sun Tavern is a colonial two-story brace framed building with a basement and attic. The structure has two interior end chimneys. There are two porches, including a full-length covered porch along the eastern façade and a small porch providing access to the rear addition on the western façade. The exterior of the structure is covered in wooden weatherboarding painted white. The side gabled roof is covered with wooden shingles. The second story of the Rising Sun Tavern has ten windows, including three dormers on the east and west sides of the roof. The north and south sides of the building have two windows each. All the windows are 4/4 double hung sash with wooden muntins and casings.

The interior of the second floor is divided into five rooms surrounding the central hall on the southern, western, and northern sides. A floor plan of the second floor is shown below with the rooms numbered for convenience. The rooms will be referred to using these numbers throughout the rest of the document. Knee walls are present on the eastern and western sides of the structure. The flooring of all the second floor rooms is wooden and the walls and ceilings are plastered. Wooden moldings and baseboards are present in all the rooms. The southern chimney opens into corner fireplaces in the two southern rooms, and the northern fireplace opens into a fireplace on the northern wall of the northeast room.

There is an entrance to the attic in the northwest room via a small square opening covered by a plywood board. The attic is open with exposed rafters, joists, and other framing elements. In the middle of the attic is the HVAC system that is anchored to the center rafters. Rockwool insulation lines the bottom of the attic.



SECOND FLOOR PLAN

Initial Observations

What were things that caught our eye about the structure when we walked through the first time?

When first looking at the Rising Sun Tavern's second floor and attic from the exterior of the building we immediately noticed a significant sag in the center of the roof. Other than this apparent damage there was no specific concerns seen on the exterior. Upon entering the second floor of the house we noticed that the plaster around the staircase and hall had cracking and some bowing. At this point we determined that this could be because the sag in the center of the roof could be causing stress on the middle of the building.

When we went into room one, we came across cracking in the plaster at multiple places along the window and baseboards. We couldn't find any apparent reasons why this could be occurring at those specific areas. An examination of the chimney in the room revealed that there was debris piled up above a metal barrier. As we entered room two we found out a strange substance around the metal barrier of that fireplace that we assumed could be animal excrement or a mixture of small debris. This room had similar cracking plaster problems, which we found a little of in every room. The apron of the southern window was seen to have been lifted off the wall, and the plaster below was deteriorated. The cause could not be identified at the time.

Room three had no significant problems, although we noticed several floorboard cuts in unusual places, indicating possible changes to the floor plan of this room. We also began to notice a trend of mold growth on the vents and near the windows of the rooms we were walking through. Room three our attention was drawn to a network small cracks in the plaster that appeared slightly darker than the surrounding plaster as if wet. These were existent in large areas of plaster all around at the time of examination. In room five we encountered what we considered to be one of the largest areas of concern for us, which was significant efflorescence under the northern window.

We entered the attic for the first time two weeks later and we noticed that it was in rather good condition with no major wood deterioration of the structural framing system. We did notice, however, that there was a good deal of deterioration on the northern chimney as well as mold growth.

Wood

What condition are the various wooden elements of the structure in and what should be done?

The following section contains information about the current condition and recommendations for the preservation of the following areas of the structure:

I. Framing system

II. Siding

III. Flooring

IV. Shingles

V. Detailing (including wooden moldings and banisters)

I. Framing

Condition Assessment

The Rising Sun Tavern is constructed using brace frame technology, which consists of a system of vertical piers resting on horizontal sills with diagonal bracing in the corners. The braces on the corners of the Rising Sun are called down braces because they extend from the corner posts to the bottom sill. During the 1978 restoration, the framing of the walls was revealed, inspected, and repaired where necessary (see fig. 12)

Figure 12 APVA photo of the 1978 restoration in progress (south elevation)

Figure 13 Existing repair work to rafters in the form of wooden bracing.
Photo by David Casteel

No apparent issues exist with the framing system in its current condition. For the purposes of this investigation, the framing system of the roof visible from the attic was inspected. There is evidence of repair work done to some of the rafters, probably the ones that were damaged in the 1975 fire . These members have been stabilized by attaching a wooden brace along the damaged area (see fig. 13). There was no apparent evidence of other serious damage. Samples were taken from a ceiling joist and a rafter in order to identify the types of wood present and to assess the characteristics of the framing elements based on this information. Sample data and analysis are located on the following pages.

Sample Analysis Methodology

The wood samples taken from the attic of the Rising Sun were inspected using both gross and microscopic analysis to identify them and determine defining characteristics. An overview of the importance of these techniques the preservation and conservation of a historic structure is given below.

Gross Analysis - In the field of preservation and conservation it is important to be able to determine certain distinguishing characteristics of various types of wood with the naked eye or a hand magnifying glass. Gross analysis can determine the species of the member in question (or a general family or type), and with this information one can understand its general nature (strength, durability, moisture content, etc.) which is crucial when considering how it is performing in its location in the structure as well as various preservation and conservation options.

Microscopic Analysis - Microscopic analysis results in a much more exact identification as well as a more thorough understanding of the unique physical features of the species. This is important because when performing preservation and conservation work, such as splicing/ replacement or determining susceptibility to various types of deterioration, knowing the species and how its specific features function is crucial, as each species possesses distinct characteristics in terms of strength, susceptibility to damage, or compatibility with other woods.

Identification - Precise identification of a wooden member is important before repair or replacement because the same or a compatible type of wood must be used for the repair. Different species differ in many ways, including the following:

- •strength, weight, density
- •fire resistance
- •hardness
- •flexibility
- •degree of expansion and contraction
- •susceptibility to moisture intake
- •susceptibility to insect or fungal attack
- •cleavage style

Therefore, it is necessary to choose compatible woods for a repair, as must behave in a way that compliments the existing timber in the structural system.

Identification

The following is a chart compiling data observed during gross and microscopic analysis of the two samples. The samples were both ultimately identified as Red Oak.

Gross Analysis

Sample	Color	Texture	Luster	Pore Distrubution	Visable Features	Hardness	Odor
Sample #1 Rafter	reddish brown	rough	semi-lustrous on transverse, dull on other surfaces	ring porous	large pores visible, small pores indistinct, but appear in tight radial lines. Large oak-type rays (sample too small to measure length of rays)	hard	very little distinctive smell, slight musty odor
Sample #2 Joist	reddish brown	rough	semi-lustrous on transverse, dull on other surfaces	ring porous	large pores visible, small pores indistinct, but appear in tight radial lines. Large oak-type rays (sample too small to measure length of rays)	hard	very little distinctive smell, slight musty odor

Microscopic Analysis

Sample	4x Magnification	10x Magnification	Identification
Sample #1 Rafter	early wood pores are large, approx. 2-3 rows; late wood pores are small and appear semi diffuse in radial bands	early wood pores are large, approx. 2-3 rows; late wood pores are small but individualized and distinct from surrounding cells	**Red Oak**
Sample #2 Joist	early wood pores are large, approx. 2-3 rows; late wood pores are small and appear in radial bands	early wood pores are large, approx. 3 rows; late wood pores are small but individualized and distinct from surrounding cells	**Red Oak**

Significance to the structure - The timer framing of the roof is made of red oak, which is a hardwood found locally. The oak family is very variable, but they are usually very heavy, hard, strong and tough. Oaks, as hardwoods, are porous, with red oak being more porous than white oak. It stands up well in structural framing, is durable, and little subject to attacks of insects. The two most common types of oak for framing are white and red oak. White oak the stronger, tougher, less porous, and more durable. Red oak, is usually of coarser texture, more porous, often brittle, and less durable.

Despite these characteristics, the beams making up the rafter and joist system in the attic are in fairly good condition, exhibiting only slight softening and discoloration due to age. The timbers located in the wall framing were repaired in the 1970's, and as no obvious defects are showing, it is assumed they are in good condition as well.

Fig 14: The common rafter system in the Rising Sun Tavern attic. The members are in fairly good condition, excepting those that have been damaged by fire, which have been braced.

Recommendations for Preservation of Framing System

As the members making up the structural system were found to be in fairly good condition, there are no recommendations for repairs at this time. However, steps can be taken to maintain this quality, and certain policies should be followed should work on the system become necessary in the future.

Recommendations for ongoing maintenance:

•Inspect periodically (two to three times a year) for the following and seek immediate remediation work if found:

-noticeable defects in the visible framing system, including water damage (staining), rot (crumbling), cracking, mold, and insect damage.

-leaks in roof or siding that could cause framing members to become wet

-exposed members due to damaged siding or plaster

•Keep temperature of building as consistent as possible to prevent freeze-thaw issues in timbers.

Recommendations for future work:

•If only a small section of decay is present on a member, less destructive remediation techniques such as epoxy or glue stabilization can be used. These techniques involve injecting the stabilizer into a rotted area inside the timber or applying it to the outside of a beam to replace areas that have deteriorated, and allowing it to harden[1]. These methods can fix a small area of decay and can help to maintain the material integrity of the structure by decreasing the need for complete replacement of wooden elements. However, such methods should not be used if repair will:

-interfere beyond reasonable limits with the visual integrity of the element

-destroy a large segment of the original fabric

-fail to meet a safety standard or code requirement

-adversely affect surrounding structures

•If bracing, splicing, and/or replacement of members is deemed necessary, make sure the same or compatible wood is used. Woods compatible with red oak include other oaks and porous hardwoods, although the use of red oak is preferable and this timber is not difficult to come by and is usually slightly less expensive than white oak. This type of repair is generally more expensive than reinforcement or stabilization and decreases the material integrity of the structure.

1. See Martin Weaver's *Conserving Buildings* (1997) p. 41-45 for more information on these and other similar techniques. Advantages and disadvantages of each specific method should be weighed as well as importance or material integrity of the member in question when choosing a remediation technique.

II. Siding

Condition Assessment

The siding on the Rising Sun Tavern is horizontal weatherboarding, mostly installed in the 1978 renovation. The weatherboards are generally in good condition, with some areas showing minor deterioration, mostly a result of water penetration.

The paint on some of the siding is seen to be peeling or flaking, which is usually caused by water damage, weather wear, or sun exposure. The following areas on the second level exhibit this problem:

Northern elevation - approx. 2 ft. to the left of the left window, and first and second weatherboards directly below the left window (fig. 15)

Southern elevation - sixth weatherboard down from left window, directly below window, to the right of the window approx. 7-8 ft (fig. 15)

Western elevation - beaded board siding on sides of all three dormer windows (fig 15)

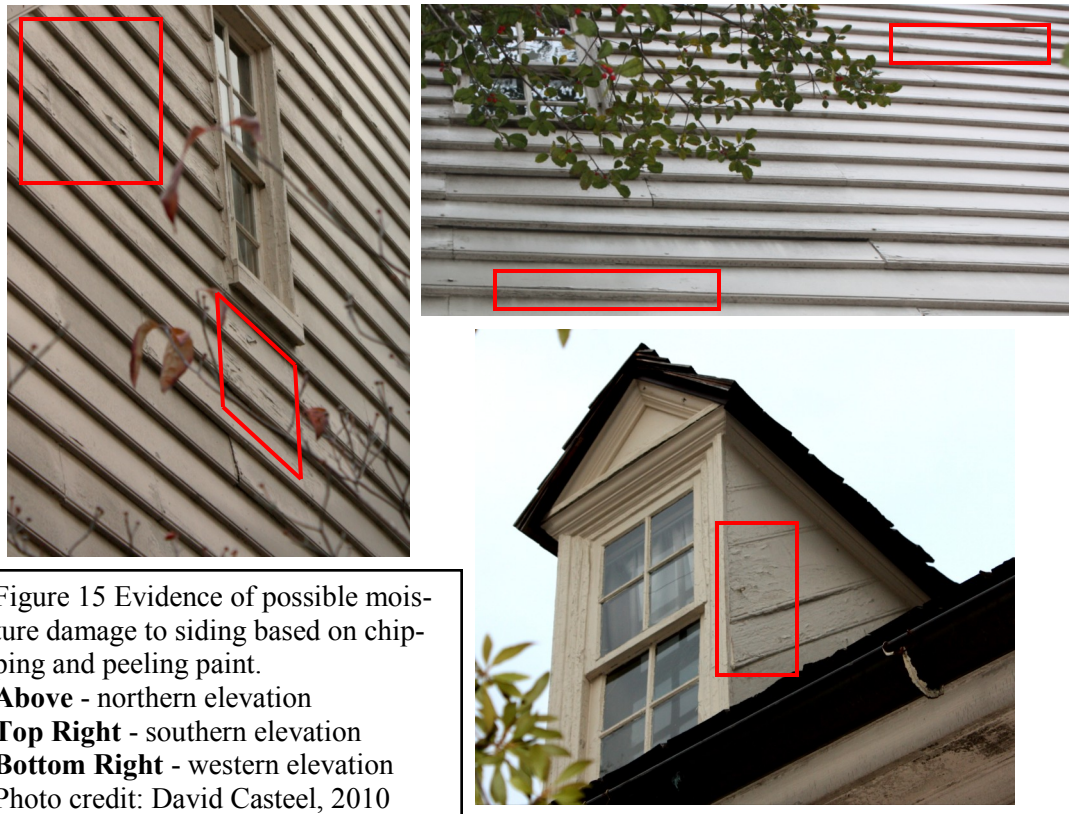


Figure 15 Evidence of possible moisture damage to siding based on chipping and peeling paint.
Above - northern elevation
Top Right - southern elevation
Bottom Right - western elevation
Photo credit: David Casteel, 2010

Mold:
Black mold can be seen on the interior surface of the northern weatherboarding in the attic. The mold growth does not seem to be active, and is not significant enough to pose a structural threat.

Figure 16 Black mold on interior surface of northern siding as seen from the attic entrance
Photo by David Casteel, 2010

Figure 17: Deterioration of siding along left edge of left window (north elevation). This may be the source of the peeling paint seen under the window, as well as the damage to the plaster on the interior wall.
Photo by Emilie Kracen, 2010

Another area of concern regarding the weatherboarding is along the left edge of the left window on the northern side of the structure. The weatherboard appears to be deteriorating in such a way as to cause a small gap between the siding and the window frame (see fig 17). This area requires further investigation, but is probably the cause of the water damage to the siding below the window as well as the efflorescence occurring on the plaster underneath the window on the interior (this efflorescence will be discussed in greater detail in the plaster section). Once the water is able to penetrate the structure, it can be absorbed by elements, like the siding below the window and the plaster inside, which then exhibit deterioration. If the source of this moisture damage is left unchecked, it may result in serious decay or failure of these and other surrounding architectural elements.

A final concern for the weatherboarding on the Rising Sun Tavern is a gap in the siding located between the fourth and fifth boards underneath the left window on the southern elevation (fig 18) The gap is not posing any structural threats at this time, but when viewed through the Infrared Radiation Camera it is clear that this gap is an area of significant heat loss (fig 19)

Figure 18 Photo showing gap in weatherboarding on southern elevation
Photo by David Casteel, 2010

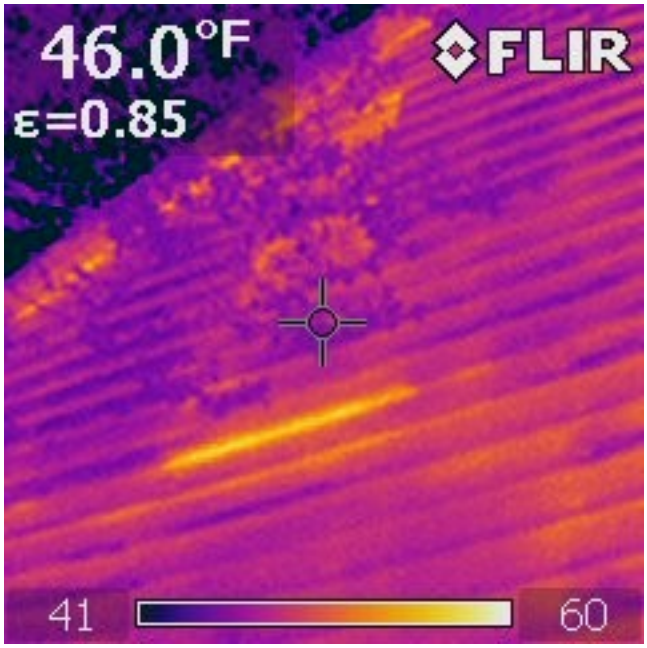


Figure 19 Infrared photo showing heat distribution on southern elevation. The yellow area seen in the photo indicates an area of higher temperature. This is located at the gap between siding boards, indicating heat loss from this area.
Photo by David Casteel, 2010

Recommendations for Preservation of Siding

While the siding is generally in good condition, there are minor repairs that should be made to ensure no further damage to the structure, and routine maintenance should be done to improve the longevity of the existing siding.

Recommendations for repairs:

•Clean mold from interior of weatherboarding in attic with a dilute bleach solution (about one cup bleach to one gallon of water). Wipe the area with a clean cloth then apply solution with a dampened cloth. If the mold is not removed, increase the strength of the solution by small amounts.

•Investigate areas of peeling and chipping paint to see if moisture damage is present. If there is evidence of moisture in these areas, first remediate the source of the excess water. If siding it-self is seen to be damaged by moisture, repair or replace the decayed boards. Repaint areas by first removing loose paint, sanding the area, and touching up with matching and compatible paint (see paint analysis for matching color techniques).

•Examine the deterioration of weatherboarding along the left edge of the left window on the southern elevation for cause. Examine damage below window on exterior and interior to see if this leak is the source of moisture. Replace flashing on left edge of window to prevent further moisture intake, and repair or replace damaged weatherboards.

•Seal the gap between weatherboards on the southern surface to prevent further heat and energy loss. This can be done by reattaching the existing boards with stronger nails or, if weatherboard is warped in such a way that this approach fails, replace the board with one that fits tightly in place.

Recommendations for maintenance:

•Routinely inspect (three to four times a year) siding for evidence of moisture or other damage (usually visible in peeling or chipping paint). If damage is seen, take immediate remediation action to prevent (further) water penetration and damage to the structure.

•Keep siding clean to prevent growing environments for mold.

III. Flooring

Condition Assessment

The floorboards on the second floor of the Rising Sun Tavern are in generally in good condition, with only minor imperfections. The flooring was removed, cleaned, and refinished in the 1938 restoration, and is still in good condition. There are numerous anomalies in floorboard seams, indicating much change in floor plan arrangement over the years (see Appendix C, Floorboard Map).

Some floorboards are loose and move when stepped on. This is not a structural hazard but can cause strain to brittle boards and eventually result in cracking.
In the central western room, there is a significant hole near the southwest corner of the room (see fig 20), which can serve as an entrance for insects and other vermin.

Figure 20 Photo showing hole in flooring in central western room, near southwest corner of room.
Photo by David Casteel, 2010

Recommendations for Preservation of Flooring

As the floorboards seem to be in stable condition currently, there are no repairs that need to be carried out immediately. However, there are a few minor issues that could be addressed, and there are steps that should be taken to ensure the preservation of the existing floorboards.

Recommendations for repair:
•nail down any loose floorboards.
•Seal hole in flooring in central western room with wood plug of matching or compatible wood.

Recommendations for maintenance:
•Sweep floors at least once a week to prevent dust and grime buildup.
•Place furniture on felt pads to avoid scratching or rubbing on the floors.
•Maintain relative humidity of around 50% to minimize expansion and contraction which may cause gaps to appear, and to prevent boards from becoming too dry and brittle.

IV. Shingles

Condition Assessment

The shingles on the structure seem to be in good condition, although thorough inspection was not possible under the circumstances. The current shingles were installed in 1981, replacing the asbestos shingles formerly covering the roof. The underside of the roofing is visible from the attic, and the necessary ventilation required for wooden shingles is in place, minimizing the possibility of moisture damage to the shingles or other roofing elements.

Recommendations for Preservation of Shingles

As the shingles appear to be in good condition, no immediate action is necessary. However, it is recommended that the shingles be inspected more closely for damage or decay. Routine maintenance for the existing shingles can also extend their lifetimes and put off the need for replacement.

Recommendations for maintenance:

•Regular inspection of shingles (about two times a year) for evidence of excess moisture, rot, and missing or damaged shingles. Note that the expected lifespan of wooden shingles is between 20 and 50 years.

V. Detailing

Condition Assessment

The wooden detailing on the second floor consists of the banister railing, the baseboards, and the door frames. All of these elements appear to be in good condition, showing only regular wear and tear, including minor scratches and dents and missing paint, as a result of the building's use as a museum. It should also be noted that the banister railing is slightly loose and moves when handled.

Recommendations for Preservation of Detailing

The detailing appears to be in good condition, and only minor repairs are recommended. Maintenance of these details is also recommended.

Recommendations for repair:

•Secure banister railing to stabilize it and ensure the safety of visitors.

•Touch up paint on other surfaces where it has been worn away, as paint can serve as a protective coating for wooden elements. Be sure to use a matching color and compatible paint type (see paint analysis for information on matching paint color).

Recommendations for maintenance:

•Keep surfaces clean by wiping them down with a clean cloth at least once a week to prevent buildup of dust or other grime.

•Inspect detailing regularly for any damage

Chimneys and Fireplaces

What is the condition of the bricks and mortar of the chimneys and what should be done?

The following section of this report presents information regarding the experimental analysis and subsequent condition assessment of the brick and mortar material of the fireplaces (at the second floor level). Recommendations for the remediation of current issues and further preventative preservation are also given. The section addresses the following:

I. Condition Assessment of Chimneys and Fireplaces

   A. Compositional Analysis of the Mortar

   B. Analysis of the Porosity of the Brick and Mortar

   C. Other Issues Concerning the Chimneys and Fireplaces

II. Recommendations for Preservation of the chimneys and fireplaces

I. Condition Assessment

A. Compositional Analysis of Mortar

The composition of the mortar of the chimneys at the second story level of the Rising Sun Tavern was determined through the process of acid digestion applied to two samples (one from each chimney). Details of this procedure and its results as relevant to the preservation of the Rising Sun are discussed in this section.

Sample Analysis Methodology

Mortar analysis by acid digestion is a simple procedure used to determine the rough percentage makeup of a sample of mortar. The ground-up sample is exposed to a strong acid such as hydrochloric acid which reacts with the lime in the mortar, which is a base, neutralizing and eliminating it from the mixture. Once the lime is removed, the aggregate (sand) and clay can be separated by decantation, and the presence of Portland cement (or other pozzolans such as clay, dust, dirt, or other debris) can be determined by studying the color of clay residue obtained during the filtering process. When all the components have been separated and the masses determined, these can be used to calculate the mass percentage of each substance in the total makeup of the mortar. This process is useful to historic preservation because every mortar, especially within historic mortars, is different. Knowing the composition of a particular sample is important because it distinguishes it from other mortars in percent mass and volume of its components as well as type of aggregate. The composition of a sample of mortar can also yield information about the characteristics of the sample and can be used in determining the composition of a mortar mixture for future repair work.

Results of acid digestion testing of the mortar samples
After carrying out the acid digestion procedure on RS SAMPLE 2 and RS SAMPLE 5, the following compositions were determined.*

RS SAMPLE 2

Mass Percentage Composition

Lime …….. 68.09 %

Sand …….. 20.23 %

Clay …….. 11.67 %

Volume Percentage Composition

Lime …….. 70.73 %

Sand …….. 21.22 %

Clay …….. 8.05 %

RS SAMPLE 5

Mass Percentage Composition

Lime …….. 36.73 %

Sand …….. 36.73 %

Clay …….. 26.53 %

Volume Percentage Composition

Lime …….. 40.38 %

Sand …….. 40.38 %

Clay …….. 19.23 %

*The results obtained through acid digestion should not be regarded as exact, due to the fact that some of the sand and clay particles present in the original sample will have been destroyed by exposure to acid in the neutralizing step.

Analysis of results and relevance for the condition assessment of the Rising Sun

As mentioned, obtaining the composition of a sample of mortar is useful in understanding the characteristics of the mortar itself as well as its aggregates. The sand left over from the experiment is useful in this respect because it can be analyzed for color, grain size and shape, and general makeup. The sand obtained from the mortar from both the northern and southern chimneys at the second floor level of the Rising Sun Tavern was found to be a reddish brown color with a great variation in grain size, ranging from very fine to medium-large grains. When examined under 12X magnification, the grains were found to be rough-edged with some clear crystalline particles over various size (possibly quartz) distributed throughout. The sand also contained small black particles (possibly obsidian) and brick dust particles. Very few impurities were found. Overall, this aggregate is ideal due to the presence of large, angular grains, which contribute to the cohesiveness of the mixture. This kind of description can be used to determine where the aggregate was obtained by comparing this composition to that of sand from local rivers and streams. When this information is known, it can be used in conjunction with the overall percent composition of the mortar to create or select an appropriate match for replacement or repair if needed.

The lime content of the sample is important in understanding the characteristics of the specific mortar. The Rising Sun Tavern sample number two (from the exterior of the northern chimney) had a high percent mass and percent volume of lime (68.09% and 72.86%, respectively), which is possibly the result of lime (probably in the form of oyster shell) used as an aggregate. This composition means the sample is very soft and is effective in recalcification (or "self-healing"). The softness of lime mortar is important to historic structures because when movement occurs, the cracking or damage will occur to the weaker mortar, rather than the brick, and the damage is more easily repaired. The mortar obtained from the interior of the southern chimney had a lower percent mass and percent volume of lime (36.73% and 40.38%, respectively), equal to the percent mass and volume of sand present in the sample.

Mortar analysis is also useful because if it is found that various mortars with different compositions are found at one site, different building phases can be established, correlating each mortar to a distinct construction period. The exteriors of the chimneys were thought to have been repaired sometime in the late eighteenth century (see Structural Development section), and the tops of the chimneys were rebuilt during the 1938 restoration. The mortar obtained from the northern chimney is likely from the eighteenth century repair based on its location (inside the attic, below the 1938 construction) and its high lime content (as oyster shell is not a common aggregate in more modern mortars). The sample was also in an advanced state of disrepair, as can be seen by the decrease in mass it experienced due to crumbling when subjected to total

Figure 21 Photo showing the advanced state of disrepair at the site of removal for RS SAMPLE 2. It is possible that this damage is caused by the presence of a harder mortar (with a composition similar to RS SAMPLE 5) on the interior of the chimney
Photo by David Casteel, 2010

submersion in water (see Porosity Analysis in next section). This weakness is probably a combined result of age and high lime content. The mortar obtained from the southern chimney is probably from the original construction period. Its lower lime content causes it to be harder than the other sample, but the advanced state of disrepair on the inside of the chimney evident from the size of the mortar piece that broke off suggests an older construction period (see fig 22). The mortar from the original construction period would be subject to the special chemical stresses subjected to the interiors of chimneys in use, causing it to crumble as it is. The similarity in sand aggregate used in the two mortars also suggests they were made during the same period (or at least using the same source for the sand). The hardness of the sample from the interior of the chimney may be the cause of the damage to the brick and mortar on the exteriors of the chimneys as well (see fig. 21), as hard and soft mortar used side by side can cause damage to the softer mortar and other materials. However, as the exact original position of this sample is unknown (see Appendix B, sample sheet RS SAMPLE 5), it is possible that it fell from the top of the chimney, and is part of the 1938 reconstruction of the chimney tops. Overall, the significant difference in composition between the two samples suggests they were not of the same period of construction.

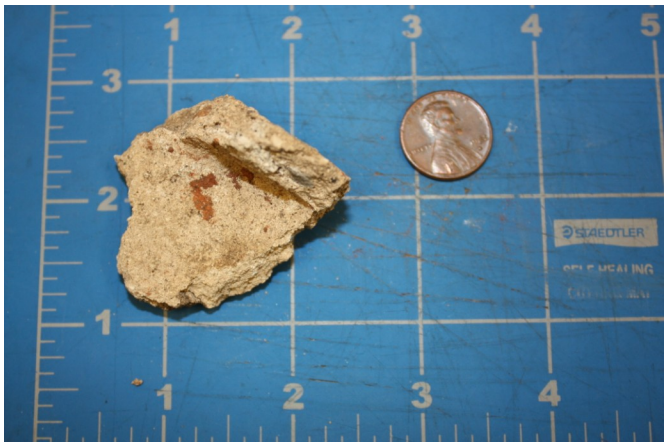


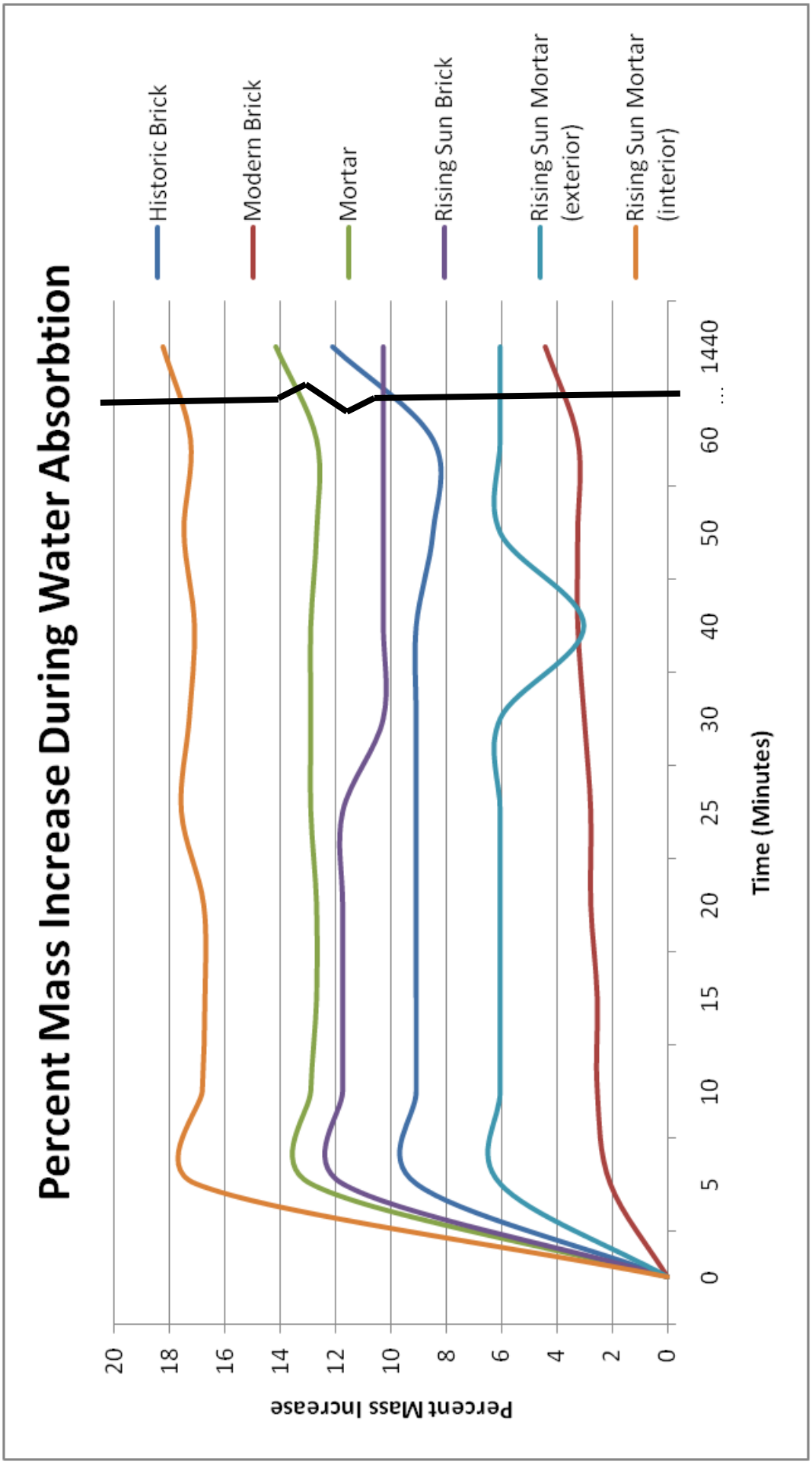
Figure 22 Photo showing relatively large size of sample which had fallen off of the interior of the southern chimney. This indicates that the state of deterioration inside this chimney is severe.
Photo by David Casteel, 2010

B. Porosity Analysis of Brick and Mortar

The relative porosities of the brick and mortar samples taken from the northern and southern chimneys of the Rising Sun Tavern at the second story level were determined by measuring the rate of absorption through total submersion in water for twenty-four hours, and the subsequent rate of desorption when dried for twenty-four hours. This data was compared to results for modern brick, historic brick from another structure, and modern lime mortar as references. The following section provides information concerning the results of this test and analysis as it relates to the preservation of the Rising Sun Tavern.

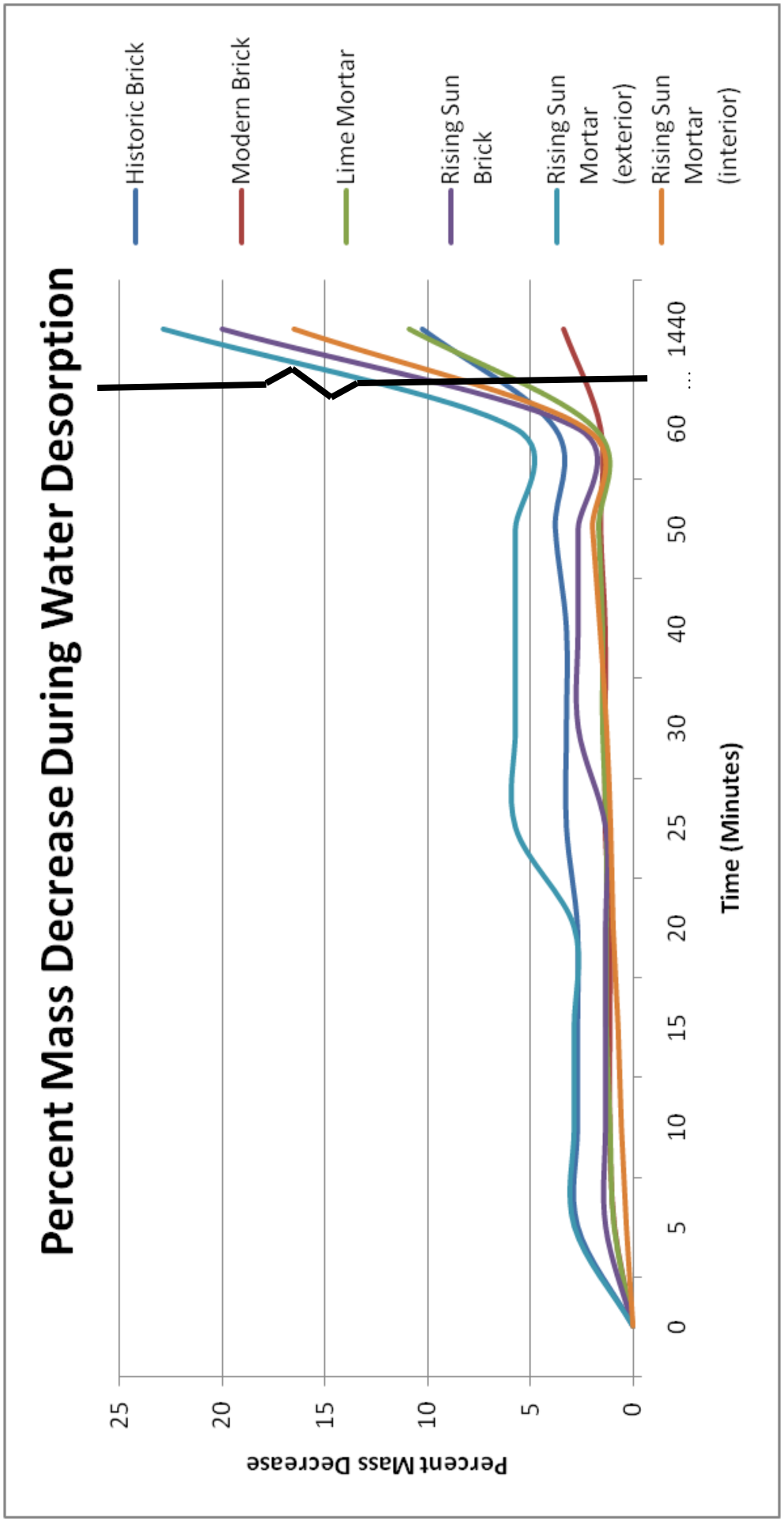
Data for Water Absorption by Total Immersion (Mi%= percent mass increase)

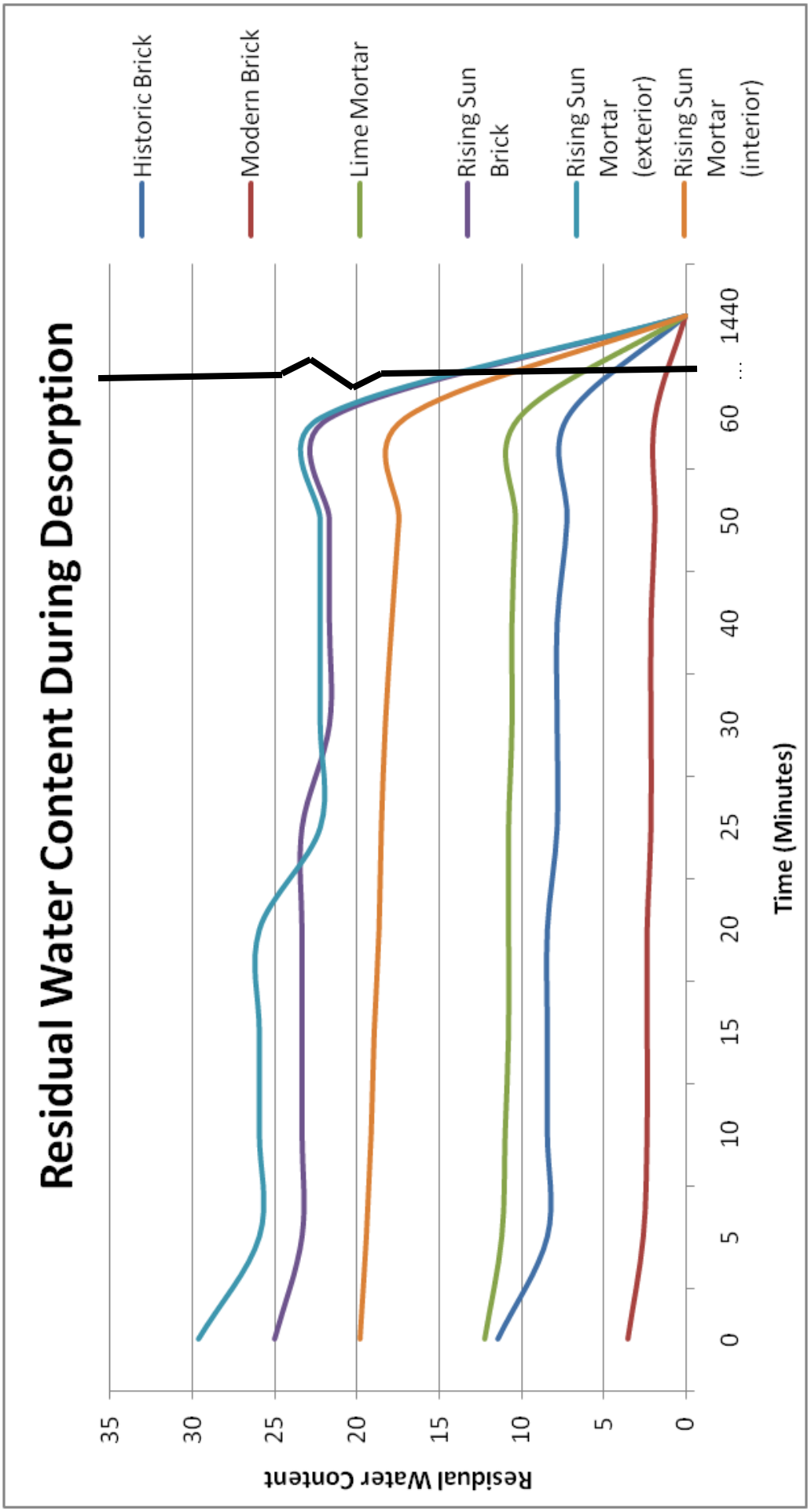
		0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min	1440 min	WAC
Historic Brick	Mass (g)	16.5	18	18	18	18	18	18	18	17.9	17.9	18.5	12.12121
	M_i %	0	9.0909	9.0909	9.0909	9.0909	9.0909	9.0909	9.0909	8.4848	8.4848	12.1212	
Modern Brick	Mass (g)	42.42	43.3	43.5	43.5	43.6	43.6	43.7	43.8	43.8	43.8	44.3	4.431872
	M_i %	0	2.0745	2.546	2.546	2.7817	2.7817	3.0174	3.2532	3.2532	3.2532	4.43187	
Lime Mortar	Mass (g)	47.38	53.5	53.5	53.4	53.4	53.5	53.5	53.5	53.4	53.4	54.1	14.1832
	M_i %	0	12.917	12.917	12.706	12.706	12.917	12.917	12.917	12.706	12.706	14.1832	
RS SAMPLE 1 Rising Sun Tavern Brick	Mass (g)	6.8	7.6	7.6	7.6	7.6	7.6	7.5	7.5	7.5	7.5	7.5	10.29412
	M_i %	0	11.765	11.765	11.765	11.765	11.765	10.294	10.294	10.294	10.294	10.2941	
RS SAMPLE 2 Rising Sun Tavern Mortar (exterior)	Mass (g)	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.5	3.5	3.5	6.060606
	M_i %	0	6.0606	6.0606	6.0606	6.0606	6.0606	6.0606	3.0303	6.0606	6.0606	6.06061	
RS SAMPLE 5 Rising Sun Tavern Mortar (interior)	Mass (g)	21.04	24.63	24.58	24.56	24.57	24.74	24.68	24.64	24.72	24.67	24.88	15.43408
	M_i %	0	17.062	16.825	16.730	16.777	17.585	17.300	17.110	17.490	17.252	18.250	


Percent Mass Increase During Water Absorbtion
Historic Brick
Modern Brick
Mortar
Rising Sun Brick
Rising Sun Mortar (exterior)
Rising Sun Mortar (interior)
Percent Mass Increase
0
2
4
6
8
10
12
14
16
18
20
Time (Minutes)
0
5
10
15
20
25
30
40
50
60
1440

Data for Water Desorption by Total Immersion (Qi= Residual water content Md%= percent mass decrease)

		0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min	1440 min
Historic Brick	Mass(g)	18.5	18	18	18	18	17.9	17.9	17.9	17.8	17.8	16.6
	Qi	11.445	8.433	8.433735	8.433735	8.433735	7.831325	7.831325	7.831325	7.228916	7.22891	0
	Md%	0	2.702703	2.702703	2.702703	2.702703	3.243243	3.243243	3.243243	3.783784	3.78378	10.27027
Modern Brick	Mass(g)	44.3	43.9	43.8	43.8	43.8	43.7	43.7	43.7	43.6	43.6	42.8
	Qi	3.5046	2.570	2.336449	2.336449	2.336449	2.102804	2.102804	2.102804	1.869159	1.86915	0
	Md%	0	0.902	1.128668	1.128668	1.128668	1.354402	1.354402	1.354402	1.580135	1.58013	3.386005
Mortar	Mass(g)	54.1	53.6	53.5	53.4	53.4	53.4	53.3	53.3	53.2	53.1	48.2
	Qi	12.240	11.20	10.99585	10.78838	10.78838	10.78838	10.58091	10.58091	10.37344	10.1659	0
	Md%	0	0.924	1.109057	1.2939	1.2939	1.2939	1.478743	1.478743	1.663586	1.84842	10.90573
RS SAMPLE 1 Rising Sun Tavern Brick	Mass(g)	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.3	6
	Qi	25	23.33	23.33333	23.33333	23.33333	23.33333	21.66667	21.66667	21.66667	21.6666	0
	Md%	0	1.333	1.333333	1.333333	1.333333	1.333333	2.666667	2.666667	2.666667	2.66666	20
RS SAMPLE 2 Rising Sun Tavern Mortar (exterior)	Mass(g)	3.5	3.4	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.3	2.7
	Qi	29.629	25.92	25.92593	25.92593	25.92593	22.22222	22.22222	22.22222	22.22222	22.2222	0
	Md%	0	2.857	2.857143	2.857143	2.857143	5.714286	5.714286	5.714286	5.714286	5.71428	22.85714
RS SAMPLE 5 Rising Tavern Mortar (interior)	Mass(g)	24.88	24.80	24.74	24.70	24.64	24.61	24.56	24.48	24.39	24.31	20.77
	Qi	19.788	19.40	19.11411	18.92152	18.63264	18.4882	18.24747	17.8623	17.42898	17.0438	0
	Md%	0	0.321	0.562701	0.723473	0.96463	1.085209	1.286174	1.607717	1.969453	2.29099	16.51929


Percent Mass Decrease During Water Desorption
Historic Brick
Modern Brick
Lime Mortar
Rising Sun Brick
Rising Sun Mortar (exterior)
Rising Sun Mortar (interior)
Percent Mass Decrease
0
5
10
15
20
25
Time (Minutes)
0
5
10
15
20
25
30
40
50
60
...
1440


Residual Water Content During Desorption
Historic Brick
Modern Brick
Lime Mortar
Rising Sun Brick
Rising Sun Mortar (exterior)
Rising Sun Mortar (interior)
Residual Water Content
0
5
10
15
20
25
30
35
Time (Minutes)
0
5
10
15
20
25
30
40
50
60
...
1440

Analysis of porosity results and relevance for condition of materials

The extent to which each sample takes in water can easily be seen by comparing the percent mass increase over the period of twenty four hours. The sharper the increase in mass, the more readily the material absorbed water after a short exposure time. It can be seen on the graph that the RS SAMPLE 5 mortar absorbed the most water in the shortest amount of time. Following this mortar is the modern lime mortar, the brick from the Rising Sun, the historic brick, the mortar from the Rising Sun, and the modern brick. This factor can yield information about the sensitivity of the material to small amounts of water, or short periods of exposure (i.e. a rainstorm hitting the exterior of a structure). It is also important to note the overall percent increase in mass, as some materials surpassed others in overall absorption. By twenty four hours, the historic brick absorbed a higher percentage of water than Rising Sun brick. All the materials except RS SAMPLE 1 and 2 absorbed more water between sixty minutes and twenty four hours, while the brick and mortar from the tavern had reached their maximum water capacity before sixty minutes. This factor can help determine the sensitivity of the material to a prolonged exposure to moisture (i.e. rising damp in a basement or a consistently leak). Any decrease in mass observed is associated with the deterioration of the sample in the water. Every sample except the modern brick suffered from slight deterioration. The historic brick and the brick from the tavern suffered the most deterioration, while the three mortar samples tended to fluctuate in mass readings, probably due mostly to inconsistency when removing excess water before weighing. The deterioration of the materials is a significant factor to note because it reveals which materials are more susceptible to water damage and ultimate failure than others. In this case, the historic bricks are more prone to damage and deterioration than the modern brick.

Similar information is obtained from studying the percent mass decrease as the samples dry out over a period of twenty four hours. The sharper the increase in the first five minutes, the faster the sample dried in a short amount of time. The graph shows that the mortar from the northern chimney of the Rising Sun (RS SAMPLE 2) was rid of the most water in the shortest amount of time. Following the mortar is the historic brick, the brick from the Rising Sun, the mortar from the interior of the southern chimney, the modern lime mortar, and the modern brick. However, as seen in absorption, the overall mass decrease can reveal how a material will perform over an extended period of time. All of the materials except the modern brick dried significantly between sixty minutes and twenty four hours, losing a great deal of mass (the modern brick dried slightly, but not as much, due to the fact that it had not absorbed much water in the first place). The modern lime mortar lost a greater percentage of mass over the entire test than the historic brick, even though it had been losing a smaller percentage during the first sixty minutes. This information determines how much water is retained for how long within each material. The samples that increased the most sharply between sixty minutes and twenty four hours (also the samples where there is the greatest difference in residual water content between the sixty minute and twenty four hour marks) retained the water for longer. This is significant in determining the stability of the materials and their effect on materials around them. If the water is retained for a long period of time, it has time to spread to surrounding materials and to cause damage within the material itself, weakening it. The overall retention of water determined by the overall percent mass increase after the entire experiment was performed also reveals which materials held the most water even after drying for twenty four hours. The modern lime mortar in particular retained the greatest percentage of water mass, while the modern brick retained a higher percentage than the historic brick. All three samples taken from the

Rising Sun Tavern deteriorated, resulting in an overall loss in mass, making it difficult to determine how much water was actually retained.

In general, the faster the material absorbed water and dried relates to its porosity. Large and numerous pores in a material cause it to pick up water faster and dry out faster. The pores in a material also correlate to the amount of water that can be absorbed, as they are empty space that can be filled by the incoming water. In general, it was observed that the historic brick and the Rising Sun brick both were very porous, while the mortar samples were very quick to absorb, but slow to dry, and vice versa, respectively. However, it is definite that the modern brick was the least porous of all, increasing and decreasing in mass both very slowly and by a small overall amount. This is probably due to modern industrial manufacturing techniques used to produce modern brick. The older bricks, which were pressed into a mold by hand, are relatively porous.

Certain conclusions about these materials can be drawn based on this information. The modern brick is the least porous overall, showing no deterioration and relatively little water absorption. However, it did retain a higher percentage of water than the historic brick and was very slow to dry out, meaning it would be susceptible to damaged resulting from prolonged exposure to water, and could contribute to issues such as rising damp. The historic bricks were much less durable, with the Rising Sun brick losing a significant percentage of mass to deterioration. These bricks absorbed a great deal of water very quickly, meaning they would be susceptible to damage if placed on the outside of a structure where weather would affect them (fortunately the brick from the tavern was taken from the interior of a chimney, which does not experience moisture due to rain, etc.). The bricks also dried out almost completely, revealing that the most damage would be incurred when the brick was exposed to water for a long period of time, because it would absorb and necessarily retain a significant amount, which would cause even more deterioration. The porosity of these two materials also makes them probable contributors to rising damp issues because the water wicks through them easily.

The three mortar samples were very different. The modern lime mortar and the sample from the southern chimney absorbed water quickly, indicating they would not be fit for an exterior surface. However, they also dried relatively slowly, and retained overall a greater percentage of water mass than the other samples. However, deterioration was not significant over a twenty four hour period. The mortar should not be exposed to large amounts of water, because it could suffer damage from the large amount of time the water is retained. The sample from the northern chimney was slow to absorb water, but very quick to dry out. This sharp drop in mass as the sample dried, however, was most likely due to deterioration rather than to loss of water, as the sample suffered a relatively large overall negative change in mass. Therefore, the location from which the sample was removed should not be exposed to water, as it is fairly absorbent, and is highly susceptible to damage that could lead to failure.

C. Other Issues

Other areas of concern for the chimneys and fireplaces were found upon inspection of these elements.

A significant amount of debris (dirt, possible bat guano, leaves, etc.) can be seen sitting on top of the covers inside the fireplaces in the southern rooms (see fig 23). The cover of the fireplace in the northeast room is sealed, and any material that may be sitting on it can not be seen from the interior. Buildup of debris inside a chimney can pose problems for the structural materials through chemical or moisture damage, depending on the material.

Figure 23 Debris building seen on top of fireplace chimney covers. Right: southeast room. Left: southwest room.
Photos by David Casteel, 2010

There is also noticeable white streaks running down the back of the fireplace in the southwest room (see fig 24), which are probably caused by soluble salts and acids that come to the surface of the bricks on the interior of the chimney. In the presence of smoke from a fire in a fireplace, the bricks collect chemicals which can be brought to the surface of the bricks by capillary action and solidify, causing damage to the brick itself and run-off as seen coming through the gap between the cover and the back of the chimney.

Figure 24 White streaks running down the back of the fireplace in the southwest room.
Photo by David Casteel, 2010

II. Recommendations for the Preservation of the Fireplaces and Chimneys

The fireplaces and chimneys, while still structurally sound at this point, call for some remediation and repair in order to stabilize certain problems posing risks to the structural integrity. Information detailing these repairs will be given, as well as suggestions for routine maintenance procedures for the future preservation of the materials.

Recommendations for repair

•Have chimneys swept to remove buildup of debris

•Install copper chimney covers in tops of chimneys to prevent further penetration of moisture and other damaging materials. These covers should be placed within the tops of the chimneys so as not to be obviously visible and to prevent animals from entering the chimneys.

•Inspect brickwork on exterior of chimneys closely and replace bricks that have exhibit the most deterioration. Bricks made using traditional methods should be used in order to obtain compatible size, hardness, and porosity. Bricks should be cut out and replaced one by one as needed.

•Repoint areas of significant mortar decay with compatible mortar. This mortar should have a composition containing a higher proportion of lime to aggregate than the historic mortar (see acid digestion data). Deteriorated mortar should be scraped out gently using a masonry chisel, and the new mortar should be put on in two separate layers (called lifts), allowing sufficient time between lifts for complete drying to avoid trapping moisture within the structure.

Recommendations for maintenance

•Regularly inspect bricks and mortar for signs of damage, and repair following guidelines listed above.

•Ensure a dry environment for historic brick and mortar by carefully maintaining roofing and siding materials as detailed in the Wood section, as they are very susceptible to water damage (as noted in porosity analysis)

Plaster

What condition is the plaster in and what should be done?

The following section presents information regarding observations made concerning current condition of the plaster on the second floor of the Rising Sun Tavern. Specific areas of concern and types of damage will be addressed. Recommendations for repairs and maintenance of the plaster will also be given.

Condition Assessment

Plaster is easily susceptible to damage due to its soft composition and ability to absorb water. The plaster at the Rising Sun Tavern varies in condition from good to poor, suffering from a number of issues. The following outlines the various areas of damage noted.

Cracking - The most common problem found to be affecting the plaster on the second story of the Rising Sun Tavern is cracking, particularly around windows. Cracking of plaster is a common problem caused by structural stress or settling and other normal movement of a structure, as well as fluctuations in temperature or relative humidity. A comprehensive survey of the cracking is described by room.

Figure 25 Photo showing large crack at bottom right corner of the southern window in room one
Photo by David Casteel, 2010

Room one: There are significant cracks in the plaster occurring around the southern window, including a crack stretching from the bottom right corner of the window to the baseboard (see fig 25), a short and wide crack extending from the top right corner of the window, a crack running from the top left corner of the window along the line where the sloped ceiling meets the ceiling proper as well as down a short way along the left edge of the window, and a crack surrounding the left edge of the sill where it extends beyond the casing and apron. The plaster is chipped and cracked along the baseboards as well. On the east wall near the southeast corner, a small portion of the finishing coat has come off and a crack extends from this area up the wall a few inches. It is worth noting that this cracking occurs about one inch to the right of a break in the baseboards. Another instance of chipping of the finishing coat along the baseboard occurs further to the left along the same wall.

Figure 26 Cracking along left edge of western window in room two. A hole and cracks filled with lime putty is also seen.
Photo by David Casteel, 2010

Room two: Cracking occurs around the southern window at the top right corner extending upward along edge of south wall and ceiling, and at the lower left corner extending to the left several inches. A long crack extends along the left edge of the western window as well (see fig 26).

Room three: Cracking occurs along the top edge of the west window, as well as along the lower right edge.

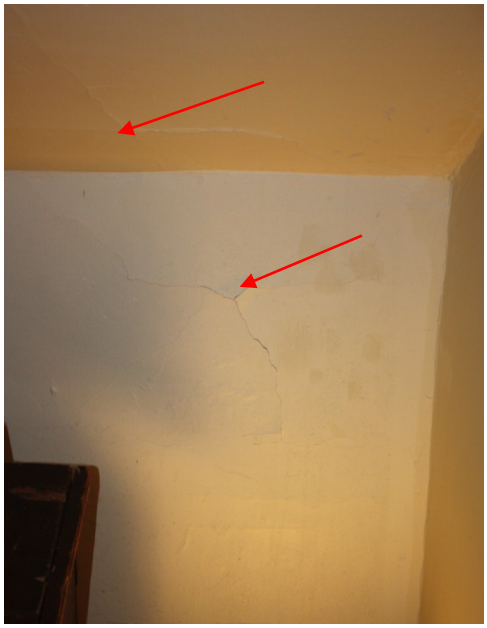
Room four: There is significant cracking around the northern window, including a long crack running down the lower right edge of the window and extending from the lower left corner about a foot diagonally out and down toward the baseboard. There is also a crack extending several inches up from the top left corner and along the edge where the north wall meets the ceiling.

Room five: A small crack runs about two inches from the top right corner down the right edge of the northern window.

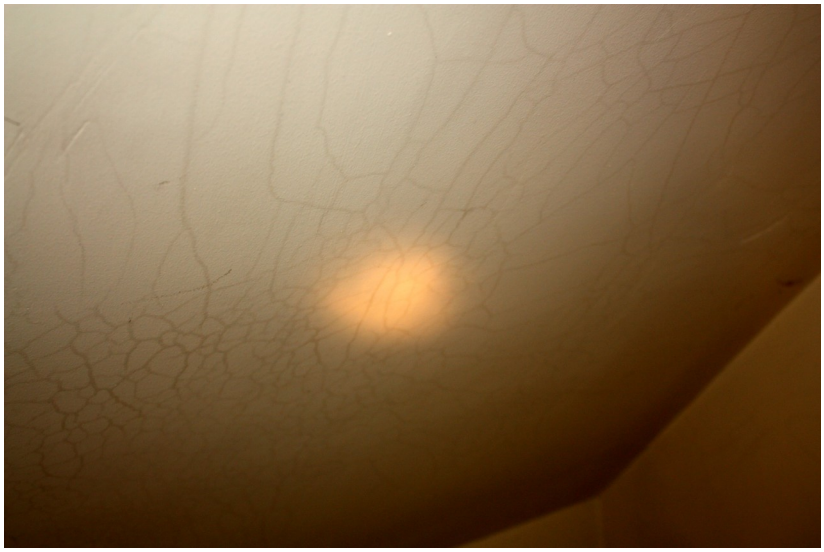
Hall: Significant cracking occurring on the east sloped ceiling surface and on the knee eastern knee wall (see fig 27). A long crack also extends upward toward the ceiling from the point where the railing meets the northern wall. The northern wall along the stairwell also

has significant bowing with large cracks associated with this stress.

Microcracking - The plaster throughout the second floor also exhibits a great deal of microcracking, which is barely visible except for that the very thin and shallow cracks seem to be outlined with mild moisture collection, indicated by a darkened coloring of the plaster. The cracks are more visible on some days than others, indicating the problem is dependent on changing relative humidity or temperature. These cracks have a web-like appearance and occur in large amounts on the knee walls and sloped areas of the ceilings, especially in the northwest corner of the northwest room (fig 28) and the southeast corner of the southeast room.



Above: Figure 27 Large cracks seen on the knee wall and sloped ceiling of the hall
Photo by David Casteel, 2010



Left: Figure 28 Microcracking on the sloped ceiling surface in the northwest corner of the northwest room
Photo by David Casteel, 2010

Holes - Several holes that have been filled with what appears to be "high-gauge" lime putty can be seen throughout the second floor rooms. No effort was made in these instances to match color of repair material to the color of the plaster. The following is a listing of the holes seen in the plaster by the room in which they occur.

Figure 29 Holes in the right side of the western dormer in room two. Nail heads can be seen in these holes.
Photo by David Casteel, 2010

Room one: no visible holes
Room two: an irregular hole and surrounding cracks are smoothed over on the left side of the dormer of the west window near the bottom left corner of the window (see fig 29). There are also two small holes on the right side of the same dormer, both relatively deep with a nail head visible in the center of each.
Room three: no visible holes
Room four: two holes about one and a half inches in diameter are seen about a foot apart on the western wall about two feet from the northwest corner of the room. They are about eight inches above the baseboard. These holes were probably associated with a radiator that once stood in that area as evidenced by

the small square plugs in the floorboards below the holes (see Appendix 2, Floorboard Map).
Room five: no visible holes
Hall: two small holes occur in the plaster on the right side of the eastern dormer. The holes appear relatively deep, and bent nail shafts can be seen emerging from the centers of the holes.

Efflorescence

Efflorescence is the term for damage done or deposits left by soluble salts drawn to the surface of a material through capillary action and re-crystallized. When a material absorbs moisture, any impurities (usually ionic salts) dissolved in the water also enters. As the water evaporates from the material, it draws these substances to the surface of the material, where they solidify and expand. When the crystallization of the salts occurs on the exterior surface of the material, it is called efflorescence. When it occurs near the surface, but still within the pores of the material, the resulting pressure can cause the surface layers to fall off. This is called crypto-efflorescence. Both types of efflorescence are seen on the plaster of the second story. Two main areas of damage are seen: beneath the southern window in the southwest room, and beneath the northern window in the northeast room.

Room two (southwest): the area underneath the right side of the southern window is experiencing both efflorescence and crypto-efflorescence (see fig 30). The damage is significant, as some of the surface layers of the plaster have already fallen off. The damage seems to be related to the lifting of the apron of this window, as the concentration of efflorescence occurs directly below the largest gap between the wall and the apron. There is also efflorescence seen along the baseboard about one foot to the left of the left side of the window (see fig 31). The bottom edge of the area is completely chipped off, presumably from settling of the house, and this leaves a large gap into the wall from which the efflorescence emanates. These areas of moisture damage seem to be the result of excess water entering the plaster where there is a gap into the wall cavity, indicating water is drawn to areas with this problem. Further investigation is needed to determine the exact route of water into the building, as no defects can be seen on the exterior of the building that lines up with these areas.

Fig 30 Efflorescence under southern window in room two
Photo by David Casteel, 2010

Room five (northeast): the area under the northern window exhibits an advanced and active case of both efflorescence and crypto-efflorescence. Photos taken at different points within the investigation show that the damage has progressed and spread over the course of a few weeks (see fig 32 on next page). This decay is probably the result of a leak on the left side (from the exterior) of the window where the weatherboarding has decayed, leaving a small gap along the edge of the window. This issue is discussed in greater detail in the Wood section.

Figure 31 Efflorescence by baseboard in room two. Evidence of crypto-efflorescence is seen by the plaster powder left on the floor.
Photo by David Casteel, 2010

Figure 32 Efflorescence under the southern window in room five. Right: Photo taken Sept 27, 2010. Left: Photo taken Dec. 1, 2010. Arrows show areas of significant change. The later photo shows that within this time lapse significant crypto-efflorescence has affected the area, causing a great deal of the plaster's outer layers to fall off. Photos by David Casteel, 2010.

Recommendations for Preservation of Plaster

The plaster at the Rising Sun Tavern is varied in its condition. Suggested repairs will help stabilize and improve the appearance of the plaster that is currently damaged. Recommendations for routine maintenance is also given to prolong the lifespan of the existing plaster.

Recommendations for repair

•Address the source of moisture causing the efflorescence in room two. Investigation of gaps into wall may yield more information regarding the water problem. If the inside of the wall cavity is not found to be excessively damp, sealing these gaps may reduce or resolve efflorescence (see Wood section for suggestions for repairing the window apron).

•Address the source of moisture causing the efflorescence in room five (see recommendations for repairing the possible leak in this window in the Wood section).

•Remove and replace plaster heavily damaged by efflorescence. Carefully chip away the plaster with a small trowel or crowbar. If existing lath is also damaged by the moisture, this should be replaced with new riven lath. If the lath is in good condition, it should be removed, cleaned of all remaining plaster, and soaked to prevent warping and buckling and to promote the binding of the plaster to the substrate. The new plaster much be prepared using a similar mixture to the sample that is removed, but a three to one ratio of lime powder to fine sand is a good starting point for historic plaster. Other substances, such as brick dust, can be added to the mixture to match the color of the existing plaster. Three coats must be applied, starting with the scratch coat (which will contain more sand, as well as other aggregates such as hair), followed by the straightening coat, and finishing with the finishing coat, which should join seamlessly with the existing plaster so as not to separate and crack. The plaster should be about the consistency of peanut butter when applied, and should be applied in a diagonal motion, encouraging keying. Adequate time, (up to two weeks) should be allowed between

coats for complete drying, so that trapped moisture does not cause separation of coats afterwards. If this method is not feasible due to cost or time the existing efflorescence can be removed with a dry stiff-bristled brush. The surface should then be wiped clean with a damp cloth. This solution is inferior in this situation, as much of the plaster has been lost due to crypto-efflorescence, and the damage is increasing, meaning the plaster is already impregnated with moisture.

•The replastering of the entire north wall of the hall (in the stairwell) is recommended if any work is to be done to this area. The cracking combined with bowing of the plaster surface indicates not only structural stress but possible de-keying of the plaster. If the plaster is no longer keyed, any minor repairs to the plaster on this wall could cause the entire plaster surface to fail.

•The filling of cracks is not necessary for the structural integrity of the material, but many of the cracks in the plaster of the Rising Sun Tavern are large and unsightly. The plaster on each side of the crack should be removed down to the lath so that the width of the gap in the plaster is about six inches. Metal lath can be installed over the existing lath to prevent further cracking. However, if the area is susceptible to moisture issues, metal lath is not recommended, as it will rust and deteriorate. The gap is then patched in the same way as described above. If the crack reappears and seems to be expanding, a structural engineer should be consulted because the cracks may be due to structural movement, and repairs to the structural system should be made before further attempting to repair the plaster.

•Current material filling the holes in the plaster should be removed and the holes should be refilled using at least a base coat and finishing coat of plaster, as the use of only finishing layer may result in the sinking in of the plaster as it sets.

•Microcracks may be left as is, however if desired, these can be filled in by wiping the surface with limewater, which helps the cracks re-calcify and seal. These cracks seem to be humidity related, although the relative humidity observed in rooms where microcracking is more intense was not higher. Therefore the space between the plaster and the roofing material should be checked for moisture. In the 1938 restoration these areas were filled with rockwool insulation, which can retain moisture for long periods of time when exposed. This is a possible cause for these cracks and should be investigated further.

Recommendations for maintenance

•Keep plaster clean to prevent buildup of dust and grime. In areas susceptible to water damage, this can prevent the buildup of efflorescence on the surface and ultimate surface failure (as can be seen in room five). Wipe down walls with a clean cloth at least once a week.

•Keep relative humidity and temperature as consistent as possible, as fluctuations can cause cracking or microcracking.

Windows

What condition are the windows in and what should be done?

This section provides an organized presentation of the significant characteristic and condition details of the windows of the second floor. Information presented includes:

Location

Type of window and materials

Condition of the glass noting any cracked lights

Condition of the paint

Presence, location, and type of mold

Presence and type (common names) of insects found between the window and plexiglass cover

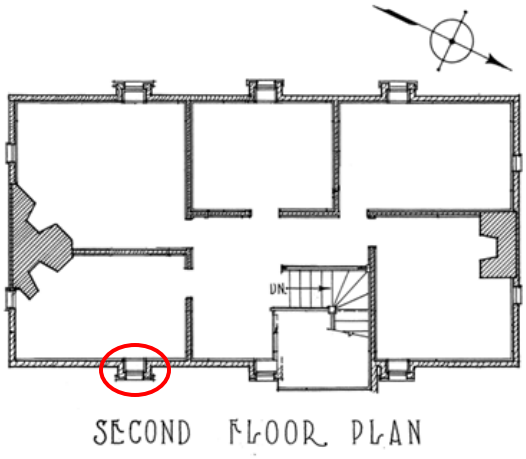
Notes on the position of the plexiglass cover

Other significant defects or notes

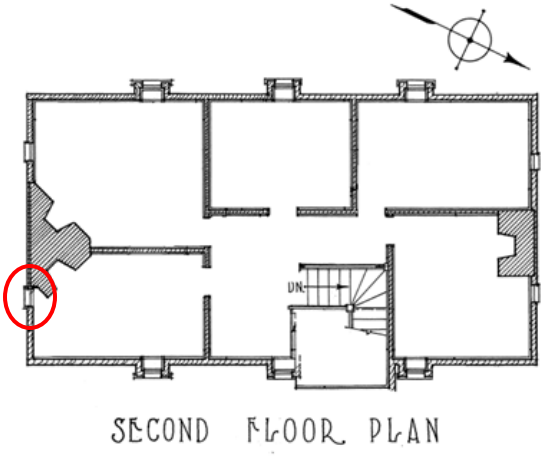
Presence of window alarm

Analysis of data and subsequent recommendations for repair and preservation of the windows and materials will be made following the schedule.

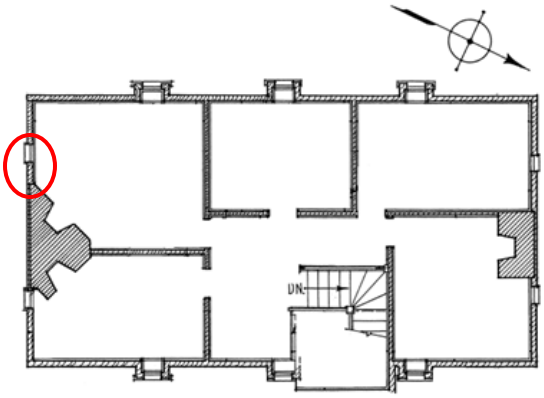
Room	1
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	
Paint	chipping
Mold	mild mold growth bottom left corner, black mold
Insects	
Plexiglass Cover	detached on bottom and left edge
Other Defects	
Alarm	



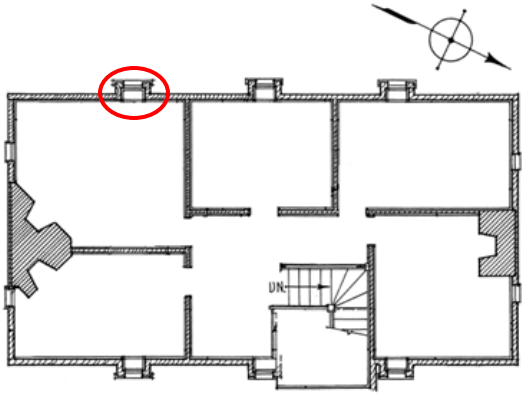
Room	1
Window	2
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	1 - top sash lower right light
Paint	chipping
Mold	
Insects	ladybug
Plexiglass Cover	detached left edge
Other Defects	
Alarm	



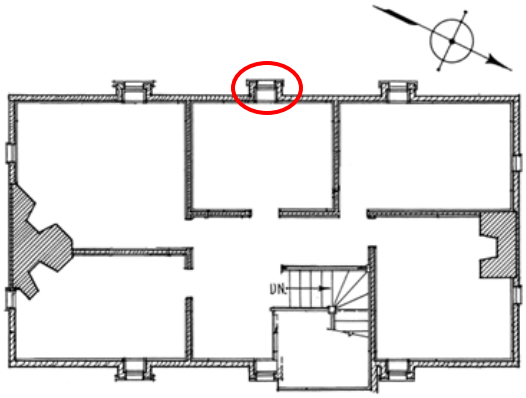
Room	2
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	3 - top sash lower and upper left lights, bottom sash upper left light
Paint	significant peeling on muntins and frame
Mold	mold growth left side, black mold
Insects	ladybugs, bees, flies
Plexiglass Cover	
Other Defects	-apron lifted away from wall 1.8 cm -plaster decay below (efflorescence) -hot glue repair bottom right corner
Alarm	



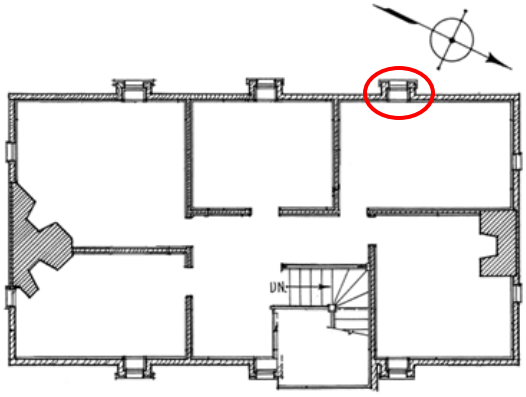
Room	2
Window	2
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	2 – top sash lower left light, bottom sash lower right light
Paint	cracking/peeling
Mold	
Insects	wasps, bees, flies
Plexiglass Cover	skewed, detached on right edge
Other Defects	
Alarm	yes



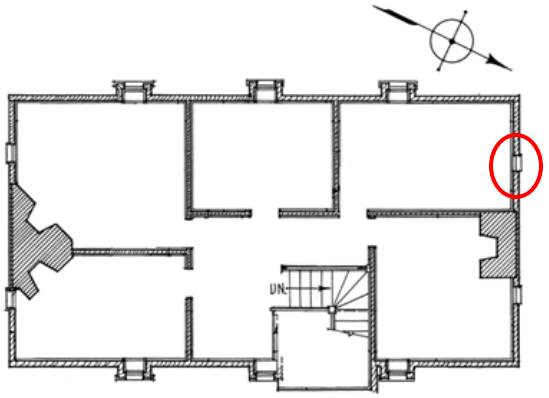
Room	3
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	2 – top sash lower right light, bottom sash upper left light
Paint	cracking/peeling
Mold	mild mold growth on left side, black mold
Insects	bee (and other debris)
Plexiglass Cover	detached from right and left edges
Other Defects	
Alarm	yes



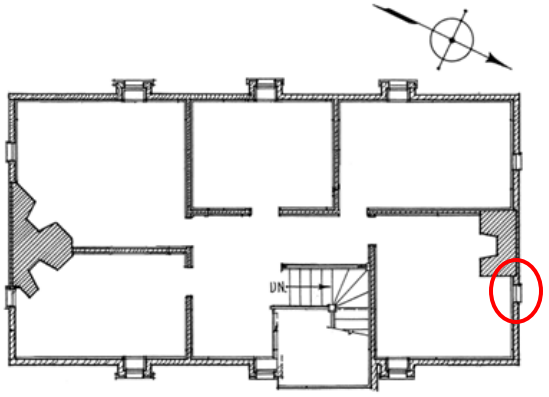
Room	4
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	1 – top sash upper right light
Paint	peeling
Mold	
Insects	
Plexiglass Cover	detached from top left and bottom left edges
Other Defects	
Alarm	yes



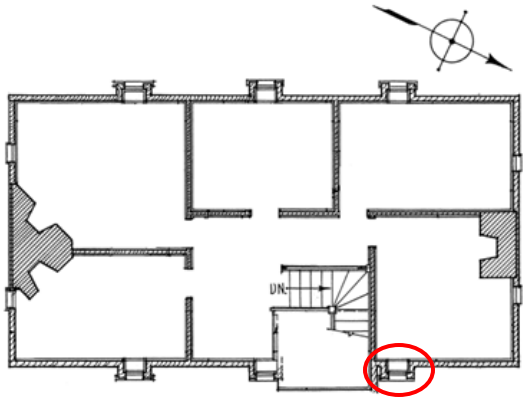
Room	4
Window	2
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	2 – top sash lower left light, bottom sash upper right light
Paint	cracking
Mold	
Insects	stinkbug
Plexiglass Cover	
Other Defects	-piece of wood nailed to interior right edge, possible former repair
Alarm	



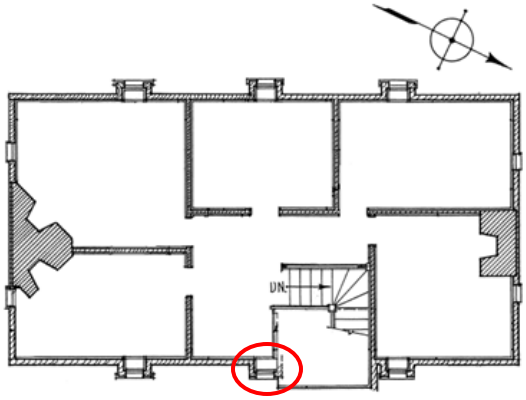
Room	5
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	
Paint	cracking
Mold	
Insects	fly
Plexiglass Cover	
Other Defects	-plaster decay below (efflorescence) -former hot glue repair bottom left corner of frame
Alarm	



Room	5
Window	2
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	
Paint	cracking
Mold	
Insects	
Plexiglass Cover	
Other Defects	
Alarm	



Room	Hall
Window	1
Type/material	4/4 double-hung sash, wood and glass
Glass – cracked lights	2 – bottom sash upper and lower left lights
Paint	peeling
Mold	
Insects	flies, ladybugs
Plexiglass Cover	detached from left and top edges
Other Defects	
Alarm	



Condition Assessment

For the most part, the windows are in sound condition, with only minor and easily repaired problems.

Paint - The most common problem was cracking and peeling of the paint on the muntins and casing. This can be caused by a number of factors, including prolonged exposure to the sun, changes in temperature or relative humidity, moisture in the substrate, incompatibility of paint layers, and everyday wear and tear. As mold was present on some of the painted elements of a few windows, it is possible that the peeling of the paint was in some cases related to humidity or moisture.

Glass - The glass in the windows of the Rising Sun is plate glass, indicating it is not original to the structure, and is in fairly good condition. Cracking of the glass lights in windows is usually the result of changing temperature, movement of the structure due to settling, or impact. The cracks in the lights in the windows at the Rising Sun Tavern is mild, and is probably not causing any related problems such as heat loss or moisture penetration.

Wood - Much of the wood of the window elements is probably replacement, installed in the 1938 restoration, and is still in good condition. Worth noting is window one of room two, where the apron has lifted off of the wall, most likely due to warping or unstable attachment to the framing (see fig. 33). There is also slight damage to the left side of the interior casing of this window (see fig. 32).

Fig 32 - Room 2/window 1. Note damage to wooden casing

Plexiglass covers - All the windows have a plexiglass cover with a wooden frame attached with Velcro to the interior casing. The purpose of these covers is to reduce heat loss through the windows and control interior temperature. Many of the frames have become warped and no longer remain attached to the windows on all sides.

Insects - None of the insects found in the windows pose any threat to the structural or aesthetic integrity of architectural elements. Their presence is not harmful, but may indicate gaps in windows or elsewhere in the structure where more harmful insects may enter or heat and energy may be lost.

Other Damage - Window one in room two and window one in room five both have damage to the plaster in the form of efflorescence directly below the bottom right corner. This problem is caused by the absorption of moisture containing soluble salts into the plaster. When the moisture evaporates, it draws the salts to the surface, where it is crystallized. The presence of efflorescence below the windows indicates a possible leak, the source of which should be explored more thoroughly, and will be discussed in later sections.

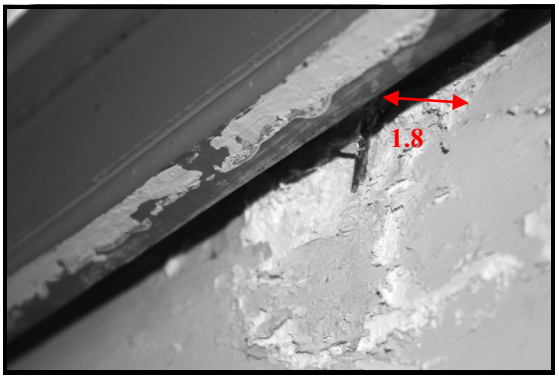


Fig 33 - Room 2/window 1. Apron lifting away from wall, approx. 1.8 cm

Recommendations for Preservation of Windows

As stated, the windows in their current state for the most part do not pose pressing problems. However, several minor repairs and regular maintenance can help extend the longevity of the existing windows.

Recommendations for repairs/remediation:

•Remove insects from sills and reattach plexiglass covers.

•Remove mold with a bleach solution and a clean cloth. Start by wiping the surface clean with the damp cloth, then gently wiping the area with the bleach solution. To begin with, use a very dilute solution with about one cup of bleach to one gallon of water. If this does not remove the mold completely, increase the strength of the solution by small amounts.

•Scrape areas of peeling and chipping paint and touch up paint with matching color (see paint analysis for matching color techniques).

•Reattach the loose apron on window one in room two, using appropriate nails to prevent re-loosening. Cut nails or even wrought nails, while harder to obtain, are more secure in such situations than wire nails. Make sure the nails are securely in studs when repositioning the board. If board becomes loosened again, it should be replaced with a non-warped element.

•Replace cracked lights.

Recommendations for maintenance:

•Keep interior window casings clean by wiping periodically with a clean cloth to prevent dust buildup. This can help prevent further mold growth because mold 'feeds' on organic material in dirt and dust that collect on such surfaces.

•Keep plexiglass covers attached to window casings, except if any moisture buildup is noticed. In this case detach the covers on one side to allow ventilation and prevent moisture damage to paint and mold growth. Attached covers will prevent heat loss, decrease temperature fluctuations that could be causing the cracking of the glass and paint, and keep insects from entering.

Paint Analysis

What can the layers of paint on an architectural detail tell us and how does this apply to other areas in the Rising Sun Tavern?

The following section discusses the process and results of a basic paint analysis test performed on the lower right side of the casing of the southern window in the southwest room. The application of these concepts to the preservation of other painted surfaces in the Rising Sun Tavern is then presented in the form of recommendations for preservation techniques in these areas.

Paint Analysis Methodology

Determining what colors were painted on a surface at what general stage in a building's life can tell the preservationist several things. It can be roughly determined how long each layer of paint existed on the wall before being covered by the next layer by examining layers of dirt in between layers of paint and/or primer. The color of the paint layers can give information, based on cost and availability, can help determine dates as well. The room use can also be generally determined based on what color was chosen. Color preference and trends can also be noted for certain time periods, as well as tendency towards glossy or matte paint. Most importantly, the paint layers can be used for restoration purposes to decide what color to paint the walls. The color can be matched to the Munsell color book chips to obtain an accurate match. However, the preservationist must keep in mind that the paint may have changed color due to fading or oxidation, and adjust their new paint color accordingly. Through chemical and pigment analysis more information can be obtained.

Analysis Results and Munsell Distinctions

	Layer	Primer, Paint, Dirt, or Substrate	Munsell Color	Notes
Youngest	1	paint	2.5 Y 4/4	fairly high gloss
	2	primer	5 GY 9/1	matte
	3	paint	5 BG 8/1	
	4	paint	2.5 BG 5/4	
	5	primer	10 Y 9/1	matte
	6	paint	10 PB 6/1	matte
	7	paint	7.5 B 6/4	
	8	paint?	7.5 B 6/4	reflective/sparkly?
Oldest	9	substrate		wood

Figure 34 Area of paint damage used for paint analysis. Layer one is the outermost paint layer, while layer nine, the substrate, is the wood.
Photo by David Casteel, 2010

As this location for paint analysis was revealed naturally and not intentionally for the purpose of paint analysis, the layers are at times difficult to see and it is impossible to distinguish dirt layers. However, knowing that most of these decorative elements were replaced in the 1938 restoration, this analysis showed a great deal of repainting since that date, possibly suggesting that the paint was subject to fast wear, and needed to be repainted frequently. Layer number eight presents an anomaly, and its 'sparkly' appearance may indicate that this is a layer of glue or other material residue on the substrate.

Recommendations for Preservation and Repair of Paint

•When repainting or touching up any area inside or outside the house, make sure that a thorough paint analysis is done to ensure color and composition compatibility. Simple paint matching can be done using a Munsell Book of Color, however the color of the paint may have faded over time and the color label may be inaccurate. This is especially important if a large painting project is carried out, where the goal is to match a paint color of a previous era. In this case, more specialized pigment analysis should be carried out.

Other Issues – Insects and Mold

What threats are insects and mold posing to the Rising Sun Tavern?

This section addresses areas of concern for the second story of the Rising Sun Tavern not yet sufficiently discussed in the condition analysis of the other architectural elements. The section provides information on the current situation regarding insects and the presence of mold within the house.

Insects

Condition Assessment

The insects present in the Rising Sun Tavern's insect traps do not pose any structural threat to the building, but may be a sign of other issues. The most common insects found in the traps laid in discreet locations in the corners of rooms were (listed by common names for ease of identification and understanding):

-Spiders of various types
-Drugstore beetles
-Cave crickets
-House crickets
-Brown centipedes
-House centipedes
-Boxelder bugs
-Ants
-Stinkbugs

The most common insects found in the windows were:

-Bees
-Wasps
-Houseflies
-Ladybugs

Figure 34 Insects collected in trap in room one underneath southern window.
Photo by David Casteel, 2010

As mentioned, none of these insects pose a direct threat to the structural integrity (such as eating/boring into wood). However certain insects present may be indicative of other reasons for concern within the structure. Cave crickets, for example, breed in environments that are continually dark and moist. The presence of these crickets indicates the existence of such an environment in the structure, which could be causing or experiencing moisture damage. These insects and nearly all the others listed feed on organic matter when they can find it. The quantity of these insects indicates a steady food source, such as dust and grime buildup on building surfaces, or cloth and other delicate materials on display from the museum's collection.

Recommendations for Managing Insects

•The quantity of insects present does not warrant any direct removal or preventative measures at this time, but traps should be monitored and if an increase in insect activity is noticed, action should be taken to remove the population or the source of sustenance.

Mold

Condition Analysis

There is black mold present on several surfaces throughout the second floor interior and attic. The most common area for mold is the surface of HVAC vents in the ceilings of all the rooms (see fig. 35). The presence of mold on this metal surface suggests that excess humidity is present within the structure at certain times, which collects and condenses on the cool surfaces, creating a moist environment in which mold can breed. The mold is also present on several of the interior window casings, indicating a buildup of moisture in these areas. This could mean that the windows are letting in excess humidity, which is collecting along their edges on the framing elements. The last place mold was observed in the Rising sun was on the interior of the weatherboarding on the north wall as seen from inside the attic. This indicates that moisture is entering the attic in significant amounts, which not only poses a threat to the siding itself, but to the framing and masonry elements exposed in the attic.

Recommendations for Management of Mold

Although black mold is harmful in large amounts, the colonies located at the Rising Sun do not appear to be serious or active at this time. However, steps can be taken to remediate the existing mold and prevent new mold from growing.

•To remove mold, first wipe area with a clean, dry cloth to remove any loose dust or grime. The area should then be gently wiped with a cloth dampened in a dilute bleach solution (about one cup bleach to one gallon of water). If this solution is not strong enough to remove the mold, strengthen the solution by small amounts.

•If necessary, a very mild antifungal spray can be used to remove mold from these areas. However, care should be taken to select a product that will not harm the historic materials.

•In order to prevent further mold growth, a relative humidity should be maintained around 50%.

•Surfaces should be wiped clean at least once a week, to prevent dust or grime buildup, which can provide food for mold to grow by.

Figure 35 Mold seen on the ceiling vent in room five
Photo by David Casteel, 2010

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Appendix A

Chain of Title

Mutual Assurance Policies

Grantors or Devisors Last Name	Grantors or Devisors First Name	Grantors or Devisors Title	Grantees or Devisees Last Name	Grantees or Devisees First Name	Recorded -Book	Recorded -Page	Date	Kind	Property Description
Wallace	H. Lewis	Special Commis-sioner	Association for the Preser-vation of Vir-ginia Antiq-uites		LL	456	5.13.1907	Not Listed	Commencing at a point on the Southeast corner of the property sold by G.B. Wallace on Caroline Street and runnign thence Southeasterly along Caroline Street 56 Feet and 1/100 of a Foot to the property of Madison Embrey, thence at right angles along the line of said Embrey's property Southwesterly 132 Feet, to the prop-erty bought by G.B. Wallace, thence at right angles along the line of said Wallace property 56 Feet and 49/100 of a Foot, thence at right angles, Eastwardly along the line of said G.B. Wallace 132 Feet to the beginning point.
Wallace	Gustavus B.	Exectutive for Elizabeth Wallace, Deceased	Wallace	John H.	Q	43	1.30.1851	B&S	Two Lots in the Town of Fredericksburg, on Caroline Street, des-ignated as Lots 87 & 88
Wallace	Thomas & Polly		Wallace	John	F	190 D.C.	4.19.1808	Bonds	One fourth of all those two lots of land lying situate on Caroline Street
Wallace	Gustavus Brown		Wallace	John	C	336 H.C.	4.20.1801	Not Listed	To the said John Wallace three-fourths of and the said Thomas Wallace to hold one-fourth thereof all those two lots of land situate on Caroline Street. Aforesaid known by the Numbers 87 and 88 and at present occupied by Mary Fisher
			Wallace	Thomas					
Wallace	Gustavus Brown		Spooner	George W.B.	B	322 H.C.	3.22.1792	B&S	Part of Two Lots of land commencing at the Lower Corner thereof at the intersection of Caroline and Fauquier Streets and running up thence 264 Ft up Fauquier Street to its intersection with Princess Anne Street, from thence 264 along Princess Anne Street 40 Ft. and from thence in a direct line through Lots to Caroline Street and from thence down the said street to beginning, in the Town of Fredericksburg Plan numbered 87 and 88
Smith	Larkin & Mary E.		Wallace	Gustavus B.	B	314 H.C.	4.28.1792	B&S	See description givin in Deed Book E pg 877
Washington	George Augustine & Francis		Smith	Larkin	B	291 H.C.	7.6.1791	B&S	See description givin in Deed Book E pg 877
Washington	Charles & Mildred		Washington	George Augustine	A	315 H.C.	10.6.1786	B&S	See description givin in Deed Book E pg 877
Lewis	Warner		Washington	Charles	E (Spotsy)	877	8.3.1761	B&S	Lots 87 and 88 being adjacent to Lots 89 and 90 as laid out in 1760 by Surveyor of Spotsylvania County

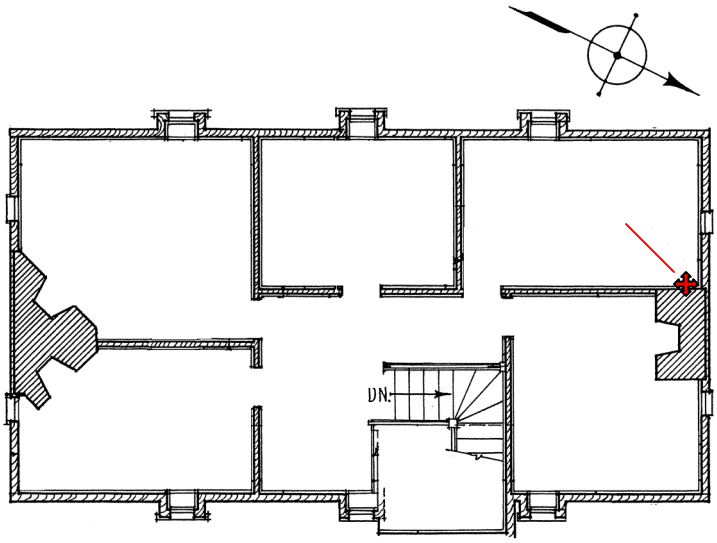
Table 1: Chain of Title

Policy Number/ Location	Date	Policy Holder's Last Name	Policy Holder's First Name	Policy Holder's Title	Occupant's Last Name	Occupant's First Name	Amount (for tavern only)	Description of Drawing
#75D/R1/vol. 3	5.12.1796	Wallace	Gustavus Brown	_____	Fisher	James	$1700	Full length 'portico' on street side, small center porch on rear with shed roofs to either side
#4336/R11/vol. 81	12.26.1822	Wallace	John	_____	Verone & Henry	_____	$2000	Full length porches, both 12'x50', on street side and in rear
#6228/R12/vol. 87	12.30.1829	Heirs of John Wallace	_____	_____	Verone	Mrs.	$1250	Full length porch on street side, no porch in rear
#7569/R12/vol. 91	4.3.1830	Wallace	John H.	Executive for John Wallace, deceased	_____	_____	$2000	Porches on street side and in rear, same size but not full length (no dimensions given)
#9423/R15/vol. 98	11.15.1836	Wallace	John H.	Executive for John Wallace, deceased	Wallace Mc Donald	H. (& brother) _____	$2000	Full length porch on street side, no porch in rear
#12460/R17/vol. 108	12.7.1842	Wallace	John H.	Executive for John Wallace, deceased	Wallace	H. H. (& others)	$2000	No porches shown
#15563/R19/vol. 118	11.18.1850	Wallace	John H.	Executive for John Wallace, deceased	Hodges Cole	Mr. B. B.	$1800	No porches shown

Appendix B
Sample Sheets

Before removal of brick sample

After removal of brick sample. Sample site is marked.



SECOND FLOOR PLAN

(Sample taken from attic above)

SAMPLE SHEET – SAMPLE RS1

Sample type: Brick

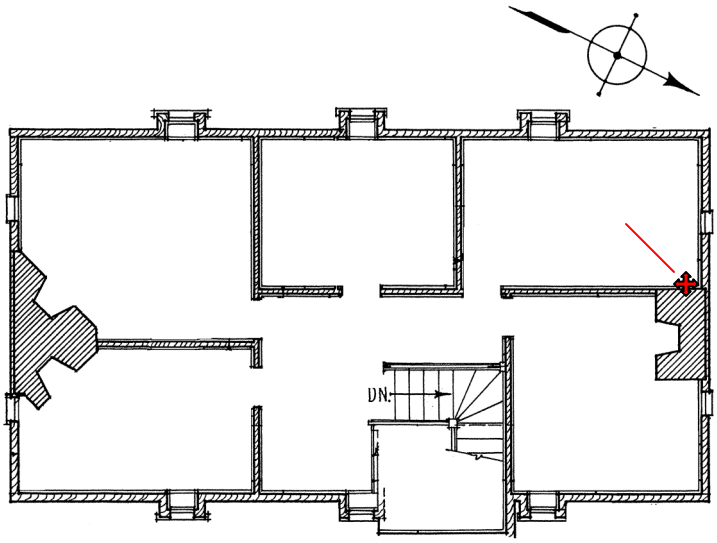
Location: Chimney on the north side of the building. From the attic portion of the chimney on the nearest side to the attic entrance (Western side). Taken from the middle of the stretcher portion of a brick.

Location Coordinates: 3' 1" up from bottom of the visible chimney and 4" in from edge closest to the north

Description: Fragile and crumbling. Damage was visible on and around the area where the sample was taken. Not much effort was put into the gathering of the sample as it crumbled off easily. The area where it was gathered no longer had the out protective portion of the brick present.

Before removal of mortar sample.

After removal of mortar sample. Sample site is marked.



SECOND FLOOR PLAN

(Sample taken from attic above)

SAMPLE SHEET – SAMPLE RS2

Sample type: Mortar

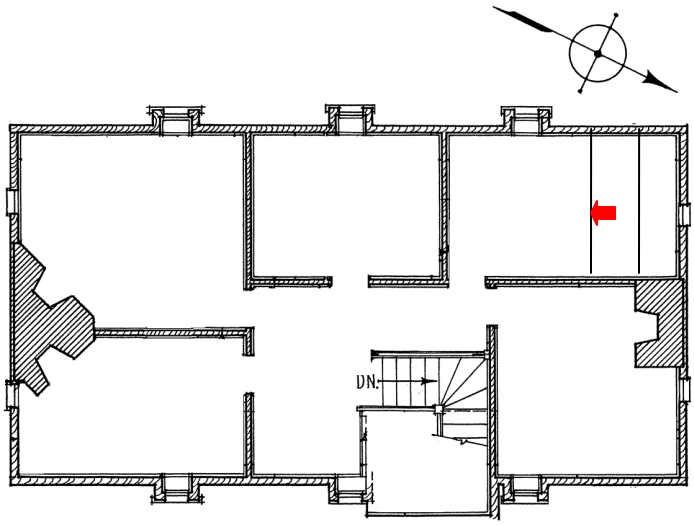
Location: Chimney on the north side of the building. From the attic portion of the chimney on the nearest side to the attic entrance (Western side). Taken from the corner of a mortar joint.

Location Coordinates: 2'11" up from bottom of the visible chimney and on the edge closest to the north

Description: Suffering from some deterioration. Damage was visible on and around the area where the sample was taken. It wasn't very difficult to remove the sample.

Before removal of joist sample.

After removal of joist sample. Sample site is marked.



(Sample taken from attic above)

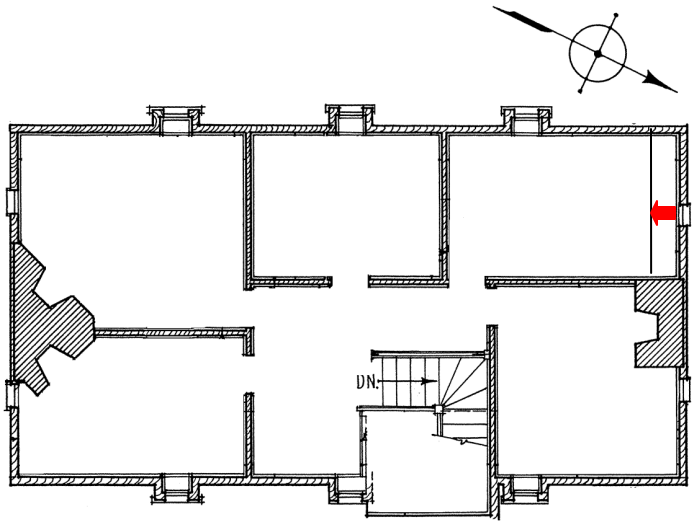
SAMPLE SHEET – SAMPLE RS3

Sample type: Wood

Location: Second joist to the south of northern sill, northern edge of joist

Location coordinates: 2 feet 2 inches west along the joist from southwest corner of the entrance to the attic

Description: Approximately 1.5 x .25 x .25 in. Joist is hand hewn, in fairly good condition. Wood has been softened some by age, sample removal was not difficult.



(Sample taken from attic above)

Before removal of rafter sample.

After removal of rafter sample. Sample site is marked.

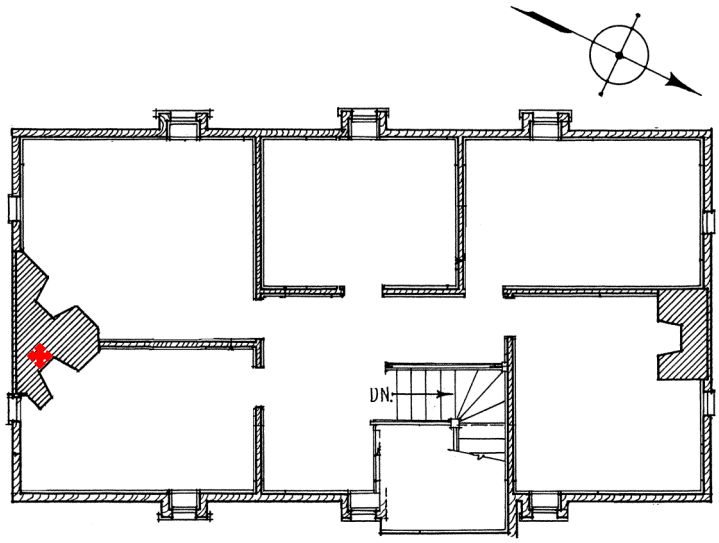
SAMPLE SHEET – SAMPLE RS4

Sample type: Wood

Location: Second rafter south of the north end of the structure, south edge of rafter. On western side of structure.

Location coordinates: 4 feet 10 inches from the western end of the rafter.

Description: Approximately 1.5 x .25 x .25 in. Rafter is hand hewn, in fairly good condition. Rafter had been softened some by age, sample removal was not difficult.



SECOND FLOOR PLAN

Image of mortar sample before picked up

SAMPLE SHEET – SAMPLE RS5

Sample type: Mortar

Location: Chimney on the south side of the building; from the southeast room. Found non-attached and hanging out of the metal barrier to the inside of the chimney.

Location Coordinates: Unknown, from the interior of the chimney

Description: Suffering from some deterioration since it was not connected. Good sized sample.

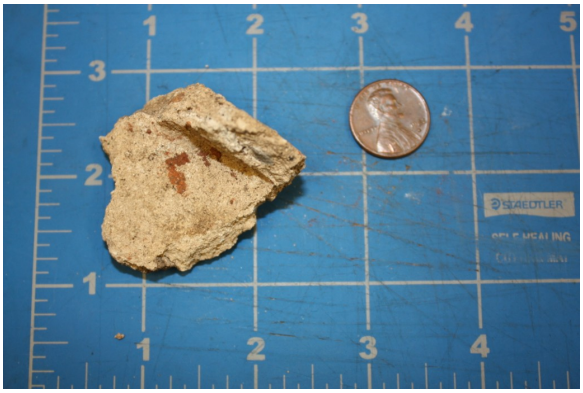


Image of mortar sample

Appendix C

Nail Chronology

Floorboard Mapping